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APPENDIX TO THE JOURNALS

OF THE

SENATE AND ASSEMBLY

OF THE

FORTY-FIFTH SESSION

OF THE

LEGISLATURE OF THE STATE OF CALIFORNIA

VOLUME V



CALIFORNIA STATE PRINTING OFFICE
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2—Report of State Mineralogist, 1922.
3—Report of Superintendent of Public Instruction, 1920–1922.
4—Report of Bureau of Labor Statistics, 1921–1922.
5—Report of California Highway Commission, 1920–1922.
6—Report of Secretary of State, 1920–1922.
7—Report of Division of Engineering and Irrigation, 1921–1923.
8—Report of Civil Service Commission, 1920–1922.
9—Report of Board of Education, 1920–1922.
10—Report of Department of Institutions, 1920–1922.

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CALIFORNIA STATE MINING BUREAU
FERRY BUILDING, SAN FRANCISCO
FLETCHER HAMILTON State Mineralogist

San Francisco] [January, 1921

REPORT XVII

OF THE

STATE MINERALOGIST

MINING IN CALIFORNIA DURING 1920

CALIFORNIA STATE PRINTING OFFICE
Sacramento, 1921

8725

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LETTER OF TRANSMITTAL.

To His Excellency, the Honorable WILLIAM D. STEPHENS,
Governor of the State of California.

SIR: I have the honor to present herewith Report XVII of the State Mineralogist, which is a detailed review of mining in California during the calendar year 1920.

The up-to-date and authentic information contained herein has been made possible on account of the fact that the field men in charge of the Bureau's branch offices have been able to establish a close personal contact with the mineral industry, such as never before has been attained. It is believed that this is an innovation which will be appreciated by the mining public, and which will be of real value in assisting in the development of California's mineral resources.

Respectfully,
FLETCHER HAMILTON,
State Mineralogist.

January 1, 1921.


CALIFORNIA STATE MINING BUREAU
FLETCHER HAMILTON
STATE MINERALOGIST
OUTLINE MAP
OF
CALIFORNIA
SCALE
OREGON
NEVADA
PACIFIC OCEAN
MEXICO
SISKIYOU
MODOC
SHASTA
LASSEN
TRINITY
TEHAMA
PLUMAS
GLENN
BUTTE
SIERRA
MENDOCINO
LAKE
COLUSA
YUBA
NEVADA
PLACER
EL DORADO
YOLO
SONOMA
NAPA
SOLANO
AMADOR
ALPINE
MARIN
SAN FRANCISCO
CONTRA COSTA
SAN JOAQUIN
ALAMEDA
STANISLAUS
TUOLUMNE
MARIPOSA
SANTA CLARA
MERCED
MADERA
MONO
INYO
SAN BENITO
MONTEREY
FRESNO
VISALIA
TULARE
KINGS
SAN LUIS OBISPO
KERN
BAKERSFIELD
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
RIVERSIDE
ORANGE
SAN DIEGO
IMPERIAL
LEGEND
Mining Division Boundaries
Mining Division Offices.

INTRODUCTION.

During the year 1920 the field work of the Bureau was carried on through an organization consisting of a chief technical assistant to the State Mineralogist, with headquarters in San Francisco; chief field assistant in charge of the Los Angeles branch office; a field assistant and branch office at Auburn, and a field assistant and branch office at Redding.

The boundaries of each of the four districts, served by the various field offices, are shown on the map printed on the opposite page.

The personnel of the field staff during 1920 was as follows:

San Francisco Field Division:

E. S. Boalich.

W. O. Castello (resigned June).

C. McK. Laizure (January–August).

Los Angeles Field Division:

W. B. Tucker.

Redding Field Division:

E. Huguenin (resigned August).

C. McK. Laizure (August–December).

Auburn Field Division:

C. A. Logan.

At the beginning of the calendar year all field men were instructed to visit every section of their respective districts at some time during the ensuing twelve months and to submit a detailed report covering all phases of the mineral industry in their counties, including general mining conditions, future outlook, and definite data regarding all activity and development work noted.

The results obtained are included in this publication. Some of them are less complete than was originally contemplated, but lack of sufficient funds to adequately man the engineering staff, is responsible for that condition.

In the San Francisco field division in particular it was found impossible to carry on many field investigations which would have been valuable. At the first of the year three men were assigned to that district. By the middle of summer one had resigned, and another was transferred.

The Redding district also suffered from a change of district engineers which, of necessity, took place in the midst of the summer when most of the field work must be done.

However, to the best of its ability, the Bureau is working to carry out in letter and in spirit the injunction of the law under which it was established, which provides that aid and assistance in every possible manner, shall be given California's mineral industry.

In the following pages references, unless otherwise mentioned, are to facts and conditions as of *some* time in 1920. In some instances field work was done by the Bureau previous to that year, but the results had not been published; in that event proper notation has been made.

As is always the fact in the Bureau's work, too much credit can not be given to mine owners and operators, local commercial organizations, and the general mining public throughout the length and breadth of the state.

The cooperation and encouragement received from those called upon by the members of the Bureau are never ending sources of inspiration to attempt to give better service and more service to the industry which brought California into existence and which is capable of expansion beyond the limits of the imagination.

It is not possible to enumerate individual names to whom credit should be given, although they include practically every one mentioned in the report, and many more.

FLETCHER HAMILTON,
State Mineralogist.

SAN FRANCISCO FIELD DIVISION.

By E. S. Boalich.

Part I.

SCOPE OF INDUSTRY.

The San Francisco district, consisting of twenty-eight counties, embraces the central, western, and valley counties of the state, extending from Mendocino and Glenn counties on the north, to and including Monterey, Kings and Tulare counties on the south; also that portion of the southern Sierra Nevadas covered by the counties of Fresno, Madera, Mariposa and Mono. The district includes about 300 miles of the Coast Range, with the foothills and valleys to the east, and also quite a portion of the foothill and high mountain belt of the Sierra Nevada; consequently a great variety of commercial minerals are produced, including most of the structural and industrial materials.

The most important minerals occurring here are: asbestos, barytes, bituminous rock, brick and tile, chromite, cement, clay, coal, copper, diatomaceous earth, dolomite, feldspar, gems, gold, granite, lead, lime, limestone, magnesite, manganese, mineral paint, mineral water, miscellaneous stone, natural gas, petroleum, platinum, potash, pyrite, quicksilver, salt, silica, silver, soapstone and talc.

In the order of their value, the several leading products of the district are as follows: (1) petroleum, (2) cement, (3) quicksilver, (4) gold, (5) miscellaneous stone, (6) brick and tile (including pottery clay), (7) magnesite, (8) salt, (9) manganese, and (10) chrome.

Fresno County leads all others in the value of minerals, due to the petroleum output. Following in order of value of products in 1919, are tabulated the counties in this division:

Value of Mineral Production of San Francisco District by Counties, for 1919, Arranged in the Order of Their Importance. Numbers Preceding Names Refer to Rank in Entire State.

County	Value
4. Fresno	$21,643,898 00
14. Sacramento	2,275,827 00
15. Santa Cruz	2,245,056 00
18. Solano	1,672,084 00
19. Contra Costa	1,395,558 00
20. Alameda	1,304,685 00
21. San Benito	1,276,476 00
22. Santa Clara	1,048,571 00
25. Stanislaus	590,326 00
28. San Joaquin	449,000 00
30. Mariposa	410,535 00
32. Tulare	331,001 00
34. Sonoma	286,038 00
35. Napa	275,303 00
36. San Mateo	241,671 00
37. Marin	228,974 00
40. Monterey	148,504 00
42. Madera	110,683 00
43. San Francisco	65,541 00
44. Glenn	59,637 00
45. Mono	52,682 00
46. Kings	51,283 00
48. Merced	40,350 00
49. Lake	39,375 00
50. Yolo	25,466 00
51. Mendocino	14,214 00
54. Colusa	7,300 00
58. Sutter	---
Total	$36,290,038 00

GENERAL CONDITIONS DURING PAST YEAR.

FUELS.

Petroleum is the only fuel of importance produced in this district and practically the entire output comes from Fresno County. In spite of the fact that there is a natural decrease in production from all oil wells as time passes after their completion, the standing of Fresno County has been maintained at a constant level for some years. This means that new wells have been continually drilled and that the business is in a most healthy condition.

As a result of the growing oil shortage, efforts to discover new fields are being put forth on every hand. Wildcat wells are now (December, 1920) either being drilled, or plans for such work are being perfected, in the following localities:

Colusa County, west of Williams and Arbuckle.
Yolo County, near Esparto.
Solano County, near Suisun and near Vallejo.
Contra Costa County, near Walnut Creek.
Santa Clara County, near Los Gatos.
Stanislaus County, near Oakdale and near Turlock.
Merced County, near Waterford.
Monterey County, near Bradley and San Miguel.
Madera County, near Lanes Bridge.
Fresno County, near Clovis.
Kings County, southwest and southeast of Hanford.
Tulare County, near Exeter.

METALS.

Gold.

Sacramento and Mariposa counties are the chief gold producers in the San Francisco district. Output in Sacramento comes wholly from dredgers near Folsom and Natoma. In Mariposa there are a few operating quartz mines—a large number of properties appear worthy of further development, but the untenable position in which the gold mining industry finds itself has positively stopped any new operations. The increase in costs of all supplies, labor and transportation during the past four years has made it increasingly difficult for the gold miner to operate at a profit. The gold output of not only California, but of the other western gold states has decreased greatly. Many of the mines have been forced to close down.

The gold miner is decidedly at a disadvantage. The prices of other metals and products can be raised to meet conditions; but the gold miner's dollar, being the base, has to remain at the same face value though its purchasing power has dropped to approximately 47 per cent.

Manganese.

For many years the principal manganese producing section of California has been the Livermore-Tesla district, in Alameda and San Joaquin counties, but exceeded in 1915 by Mendocino and regaining the lead in 1916. In 1918-1919 the largest producing county was Stanislaus, which adjoins San Joaquin on the south, and whose manganese

belt is a part of the same geological province that includes the Livermore-Tesla district. Since the first of the present year (1920) the market has revived and several properties are being reopened both in the Mendocino and the San Joaquin-Stanislaus districts. The following quotations have recently (June 24, 1920) been offered:

44%–49.99% Mn at 76¢ per unit.
50%–52% Mn at 80¢ per unit.
52% and up Mn at 82¢ per unit.

Quicksilver.

Quicksilver production in California during recent years has come from twelve counties, all but three of which are in the San Francisco district, and the three in question (Kern, Siskiyou and Trinity) are relatively unimportant.

PRESENT ECONOMIC SITUATION.

By Walter W. Bradley.

"The famous mines at Almaden, Spain, are the largest world producers. These mines are owned by the government and operated by contractors using convict labor. The cost of production of quicksilver is stated to have increased from $8.29 a flask in 1900 to $15.22 in 1915. Their ore is high-grade, the material sent to the furnaces averaging 9%–11% mercury.

"For two or three years previous to the outbreak of the European war, our normal peace-time consumption of quicksilver in the United States was approximately 25,000 flasks annually; and our domestic production had fallen below 20,000 flasks per year. Of this 25,000-flask peace-time consumption, nearly 50% went into the manufacture of fulminate for explosive caps for mining, quarrying, and sporting arms ammunition as well as military ammunition. Our domestic production being inadequate, partly because of the low price and the lower average tenor of the ores mined, necessitated the importation of up to 5000 flasks annually. The enormous increase in munitions manufacture due to the war temporarily raised our requirements correspondingly.

"There were no imports of quicksilver into the United States for the year 1919. The exports (mainly to the Orient) were 9107 flasks valued at $817,428 for the year.

"The import duty of 10% ad valorem is not sufficient to protect our American miners against the competition of the convict-operated mines of Spain, where quicksilver can be produced for as low as $8 to $15 per flask as noted above. The duty should be at least $25 per flask to give us proper protection. The improvement in the price increased the number of operating properties in California during 1916-1918. Lower grade ores are being worked; and new methods of ore dressing and reduction have been tried.

"Following the signing of the armistice, all but about five of California's mines were closed, owing to the uncertainty of the future. The industry here is in danger of extinction due to the prospect of dumping from Europe, because we have not sufficient tariff protection.

"There are those who have taken the position that we should buy where we can get the metal the cheapest, and let our own industry "go hang," as "it is decadent" anyway. That is certainly not a patriotic attitude; nor a safe one either. Though its total value may be small, as compared with such as gold or copper, yet our American (which means mainly, California) quicksilver business has been an important and vital industry for about 70 years. A quicksilver mine can not be left idle "in reserve" and then opened up at a moment's notice for an emergency.

"If, and when, our American quicksilver industry is extinguished by lower-priced foreign competition, we will then be at their mercy, and they can later raise their price to any figure they want and we'll have to pay it. It is not fair to our American capital invested, nor to our California miners (also Nevada and Texas) not to be given protection against the convict-operated and other cheap-labor mines of Spain, Italy and Mexico.

"The meat of the situation is summarized by the Tariff Commission in the following:[1]

'In the case of quicksilver, the question can be squarely raised as to whether the production of this metal can be considered an effective American industry, inasmuch as abundant, cheaper sources of supply exist elsewhere. It is particularly an example of an industry whose products are placed on the market at high cost because of the relatively inferior natural resources of this country in the raw material.

'Quicksilver is an essential metal, however, of vital necessity in the conduct of war and widely used in the industries. It is stated that American resources, although low grade, can furnish an adequate supply for many years if a stable and sufficient price be guaranteed. Without tariff protection the United States will be dependent in large part on outside sources for a vital commodity, and a grave question of national expediency is involved.'

"In the opinion of the quicksilver men, and the writer, the last sentence, above, is the most important of all.

Uses.

"The most important uses of quicksilver are the recovery of gold and silver by amalgamation, and in the manufacture of fulminate for explosive caps, of drugs, of electric appliances, and of scientific apparatus. By far the greatest consumption is in the manufacture of fulminate and drugs.

"One new use for quicksilver is in the introduction of a small amount into the cylinders of steam turbines to improve the vapor pressure and thus increase effciency. This mercury is recoverable and can be reused, so that there is only a small proportional loss.

"Quicksilver is an absolutely essential element from a military standpoint, as there has not yet been produced an entirely satisfactory commercial substitute for it in the manufacture of fulminating caps for explosives. However, in order to reduce consumption of the fulminate, some potassium chlorate, picric acid, trinitro-tuluol, or tetranitro-methalmine is sometimes mixed with it. The Ordnance Department of the U. S. Army, however, will accept no substitutes, as they have thus far proven unreliable.

Concentration of Quicksilver Ores.

"For the above reason, and the fact that California has been, and still is, producing from 70% to 80% of the quicksilver yield of the United States, an investigation of the possibilities of concentration for

quicksilver ores, was undertaken by the State Mining Bureau. In the Bureau's investigation a wide variety of ores was tested by water concentration, flotation with oils, and a wet method by solution with an alkaline sulphide. Full details of this work, as well as furnace practices and descriptions of the California mines, are given in Bulletin No. 78, issued during 1918.

New Equipment.

"The most notable recent developments in the metallurgy of quicksilver is the adaptation of the rotary cement-kiln to the reduction of quicksilver ore at the New Idria mine, San Benito County. They have there installed five such furnaces, with a combined daily capacity of 500 tons. The lead of the New Idria Company in the matter of rotary furnaces was followed at the Sulphur Bank mine, Lake County; Bella Union or Rutherford mine, Napa County; Cloverdale mine, Sonoma County, and at the January mine, Yolo County. The Cloverdale is the only one of these mines at present (July, 1920) operating.

Production.

"Though some domestic yield of this metal is now obtained from Texas, Nevada, Arizona, and Oregon, the bulk of the output still comes from California.

The distribution of the 1919 product, by counties, was:

County	Flasks	Value
Lake	229	$20,604
Napa	644	58,140
San Benito	7,409	668,989
Santa Clara	3,012	271,762
Sonoma	1,418	119,142
Kern, Kings, San Luis Obispo, Siskiyou, Solano, Trinity, Yolo*	2,488	214,744
Totals	15,200	$1,353,381

"The outlook for 1920 promises a still lower yield of quicksilver. The New Idria mine in San Benito County, for some years the largest producer in the western hemisphere, is at present (July, 1920) shut down as the result of a fire which destroyed the tramway terminal, ore-bins, and electrical equipment necessary for the operation of their rotary kilns. They are rebuilding, and expect to have one furnace running on ore by September 1, and to add another each thirty days thereafter until all five are doing duty. Neither the New Almaden property nor the Guadalupe in Santa Clara County are producing, nor the Oat Hill mine in Napa County."

STRUCTURAL MATERIALS.

Brick and Tile.

Alameda, Contra Costa and San Joaquin are the largest producers of this class of material, in the district, followed by Sacramento, Fresno, and Santa Clara.

At practically all plants production in 1920 remained about normal.

*Combined to conceal output of a single operator in each.

Cement.

The district produces most of the cement manufactured in the state. Large plants are located at Davenport, Santa Cruz County; Cement, Solano County; Cowell, Contra Costa County; Napa Junction, Napa County, and a smaller plant at San Juan, in San Benito County. The production of these plants decreased in 1919, but the value of product increased. In a general way the several plants maintain quite steady production, the demand for cement being regulated by the amount of concrete construction work. Some of the plants have not been working to capacity and it is difficult to state whether the production for 1920 will be greater or less than for 1919. It is quite safe to say, however, that the production figures will not be greatly changed. The prospect for 1921 is for an increase in production, due principly to increase in highway construction.

Magnesite.

Magnesite is produced principally, in the Porterville district in Tulare County, the Napa and Sonoma counties district north of San Francisco Bay, and in Alameda, Santa Clara and San Benito counties.

Magnesite is a natural carbonate of magnesium, and when pure contains 52.4% Co_2 (carbon dioxide) and 47.6% MgO (magnesia). It has a hardness of 3.5 to 4.5, and specific gravity of 3 to 3.12. It is both harder and heavier than calcite (calcium carbonate), and also contains a higher percentage of CO_2, as calcite has but 44%.

Most of the California magnesite is comparatively pure, and is ordinarily a beautiful, white, fine-grained rock with a conchoidal fracture resembling a break in porcelain. The Grecian magnesite is largely of this character; while the Austrian varieties usually contain iron so that they become brown after calcining.

In California, the known deposits are mostly in the metamorphic rocks of the Coast Ranges and Sierra Nevada Mountains, being associated with serpentine areas.

The Washington deposits are stated to be associated with extensive strata of dolomitic limestones. The magnesite there appears to contain more iron than most of the California mineral, which makes it desirable for the steel operators. However, the experience of the past four years has proven that several California localities have sufficient iron in their magnesite to be serviceable in the steel furnaces.

It looks as if the main hope for the future for California magnesite lies in the development of the plastic business in the territory west of the Rocky Mountains; and in the manufacture of refractory brick to be utilized mainly by the copper and lead smelters in the same district. It is possible that, after ocean shipping has resumed its normal routes, California magnesite may be sent via the Panama Canal to the Atlantic seaboard; but, on account of our higher production costs, it is difficult to see how we can compete with the Grecian article at Atlantic ports.

Three new plants are making refractory brick here from California magnesite, one each at Porterville, Los Angeles, and Richmond. During 1917–1918, the output of the Refractory Magnesite Company at Preston, Sonoma County, was turned into bricks at the plant of the Stockton Fire and Enamel Brick Company, at Stockton, but the mine was closed in 1919. The mineral from this property is a natural ferro-magnesite

and has found a ready market for refractory purposes. That from the White Rock mines in Napa County also carries some iron.

Miscellaneous Stone.

Miscellaneous stone is the name used for that branch of the mineral industry covering crushed rock of all kinds, paving blocks, sand and gravel, and pebbles for grinding mills.

In 1920, as has been the case for a number of years past, Los Angeles led all other counties in the output of this material, but Alameda holds second place, followed by Sacramento, Contra Costa, and Fresno in the order named.

INDUSTRIAL MATERIALS.

These materials, many of which are mineral earths, are, with four or five exceptions, as yet produced on a comparatively small scale. The possibilities of development along several of these lines are large and with increasing transportation and other facilities, together with steadily growing demands, the future for this branch of the mineral industry in California is certainly promising. There is scarcely a county in the state but might contribute to the output.

Up to within the last few years, production has been in the majority of instances dependent upon more or less of a strictly local market.

The more important of these minerals thus far exploited, so far as shown by annual value of the output, are limestone, mineral water, pyrite, pottery clays, and diatomaceous earth.

SALINES.

Magnesium Salts.

Magnesium chloride is an important item in certain chemical uses, and in the preparation of Sorel cement in laying magnesite floors. Previous to 1915, Germany was the principal source of this chloride, which source has since, of course, been cut off. For this reason experiments have been made to prepare it by acid solution from magnesite, which is so abundant in California. Some of the salt companies began its commercial preparation in 1916, from the residual bitterns obtained during the evaporation of sea water for its sodium chloride.

In addition to the chloride, some magnesium sulphate, or 'technical epsom salts' was also made by the Oliver Chemical Company in Alameda County and the Whitney Chemical Company in San Mateo County. The Merle Magnesia Company at Redwood City, San Mateo County, produced magnesium carbonate.

Common Salt.

About 80% of the salt production in California comes from plants in Alameda and San Mateo counties where the waters of San Francisco Bay are evaporated. Output for 1920 remained at a normal figure.

OUTLOOK FOR 1921.

The mineral industry in the San Francisco district is so scattered and diversified that it is impossible to make any general statement as to the outlook for the coming year.

It is believed that the entire nation is entering upon a new era of industrial development. Crude substances which formerly came from

foreign countries are being sought at home. Manufacturers and large consumers are looking more and more to California and the west for sources of supply.

New factories, and branches of old established concerns are locating in the San Francisco Bay region and among them all there is a demand for almost every mineral substance on the list.

It would appear to be impossible to take other than an optimistic view of the future even in the face of "deflation" and prophesied hard times.

Mining as a whole is a basic industry. Its crude products are necessary to sustain life—as we know it and under conditions of living which we demand today. Minerals when dug from the ground represent new wealth—and in periods of depression such wealth should be particularly acceptable.

GEOLOGY.

Geography and Topography—Transportation Facilities, etc.

Unfortunately the State Mining Bureau has not been able to layout its field divisions with a great deal of regard for natural boundaries.

A limited amount of money is available to carry on the work and only a few men make up the engineering staff.

As a matter of administrative convenience and necessity the San Francisco division contains twenty-eight counties extending from the Pacific Ocean to the Nevada line—at one point—and from Glenn in north to Kings County in the south.

Geographically these counties fall into six groups which will be briefly discussed as follows:

I. North Coast Group.

(*San Francisco Bay north to Humboldt.*)

This region lies between the summit of the Coast Range and the Pacific Ocean, and is made up almost entirely of slates, cherts, limestones, sandstones and serpentines of Jurassic and Cretaceous ages.

Much of this territory is rough and rugged, and while there is a railroad from San Francisco to Eureka, the transportation facilities are not of the best, particularly as regards many of the mineralized sections which are accessible by wagon road only.

The climate is mild, with large annual rainfall. Power facilities are on the whole undeveloped and fuel (aside from wood) must be shipped in.

There are no particular outfitting and supply headquarters in the district, although in the southern portion there are several up-to-date and prosperous cities and towns.

Commercial minerals found here are quicksilver, manganese, magnesite, and others which would naturally be associated with rocks of sedimentary origin.

They will be discussed in detail under the "County" headings in Part II of this report.

II. South Coast Group.

(*San Francisco Bay south to San Luis Obispo.*)

This group of counties lies on the west of the Coast range of mountains, extending to the Pacific ocean. As in the case of group I the predominating rocks are of sedimentary origin although the formations are much more complex and broken than those along the north coast.

The mineral deposits, consisting of quicksilver, limestone, dolomite, barite and many others, lie in localities which as a rule are rugged and difficult of access. Climatic conditions are perfect, however, and the rainfall is not heavy. As previously mentioned, details relative to occurrence and distribution of minerals are given under the county chapters in Part II.

III. Bay Counties Group.

The counties surrounding San Francisco Bay produce a surprisingly large amount of minerals, and deposits of many which are not yet commercially utilized, have long been known to exist.

In the sedimentary formations of this section are found asbestos chromite, clay, coal, limestone, pyrite, etc., etc.

Transportation and power facilities are on every hand, markets are nearby, fuel and supplies are obtainable under the most favorable conditions.

IV. Sacramento Valley Group.

V. San Joaquin Valley Group.

The counties in groups IV and V cover the great interior valley region of the state most of which is covered with a mantle of recent alluvial deposits. However, almost without exception, the borders of these counties reach into the foothills of either the Coast Range on the west or the Sierra Nevada mountains on the east.

As mineralized areas are found at short intervals throughout both the above ranges, and as the valleys themselves contain deposits of clay and other mineral earths, petroleum, natural gas, etc., it is a fact that the counties under discussion produce, to some extent, practically every metal and mineral substance known in California.

No portion of this region is at a very great distance from a railroad; electric and other power is easily available, speaking in a broad way; and outfitting and supply centers are situated on every hand. Marysville, Sacramento, Stockton, Modesto, Merced, Madera, Fresno, Hanford, and Visalia are among the larger cities which dot the valley from north to south.

VI. Sierra Nevada Group.

The eastern portion of the San Francisco district is made up of Mono, Mariposa and portions of Madera, Fresno, and Tulare counties.

Most of this region is in the heart of the high Sierras and the geological formations consist entirely of granites and volcanic rocks of igneous origin.

The average elevation is very high and heavy snowfalls prohibit prospecting, or even traveling, in the winter months. This country

is extremely rough and rugged, and is handicapped by having no railroads and being difficult of access, in many portions, even by automobile or team.

Several power lines traverse this district, and wood and timber are plentiful. Supplies, equipment, etc., must, for the most part, be brought in from outside points.

Gold and silver mining is the principal industry.

Part II.

San Francisco District: By Counties.

ALAMEDA COUNTY.

By E. Huguenin and W. O. Castello.

The field work in this county was carried on by Emil Huguenin in 1917. Owing to lack of funds the report was not published at that time. Additional work was done by W. O. Castello in 1919 and information has also been obtained from reports furnished the Mining Bureau by operators. Data has also been drawn from recent bulletins on special subjects, namely Bulletin No. 76, Manganese and Chromium in California; Bulletin No. 78, Quicksilver Resources of California; and Bulletin No. 79, Magnesite in California (not yet printed).

Alameda County, created March 25, 1853, lies on the eastern or continental shore of San Francisco Bay, being bounded on the north, east and south by Contra Costa, San Joaquin, and Santa Clara counties, respectively. It has a land area of 732 square miles, 500 of which are rich agricultural bottom lands devoted to intensive farming and fruit growing. Its population is 344,177, about 75 per cent of which is grouped in the three principal cities, Oakland, Berkeley and Alameda, located on the bay shore.

Oakland, the county seat, has a population of 214,422. Its location as the natural point of transfer between land and water carriers for the great railroad systems that converge there, together with its large inner harbor has made it one of the important industrial centers of the Pacific Coast.

The county is traversed in a northwesterly and southeasterly direction by several mountain groups or ranges, which together form the eastern group of the Coast Range Mountains. These ranges become rugged and reach higher altitudes in the southeastern portion of the county, their continuation into Santa Clara County culminating in the Mount Hamilton Range. The mountains here comprise largely the metamorphic sandstones, jaspers, and serpentines of the Franciscan formation, in which occur the chrome, magnesite, and manganese deposits. This section is the most inaccessible in the county, being penetrated only by the dirt roads from Livermore, the nearest railroad station.

Alameda Creek, Arroyo del Valle, Arroyo Mocho and their tributaries form the principal drainage systems of the county. The former rises in the hills in Santa Clara County, flowing northward to Sunol, where it joins the latter, thence westward through the Niles Cañon, emptying into San Francisco Bay at Alvarado. The Arroyo del Valle rises in the extreme southeastern corner of the county flowing northwestward to Pleasanton, then almost due south to Sunol. The Arroyo Mocho parallels the Arroyo del Valle for the greater part of its length, being a few miles to the northeast.

MINERAL RESOURCES.

Although not classed as a mining county, Alameda produces a variety of minerals. These may be grouped according to their commercial importance and occurrence as follows: Crushed rock, sand, and gravel, combined in this report under the heading "Stone Industry," are produced mainly from the gravel beds of Alameda Creek and from the Franciscan sandstones in the hills bordering the bay. The production of salt by evaporating the bay waters along the East Shore ranks second in value of minerals produced. The manufacture of brick from the clay beds in the Livermore and Niles valleys ranks third. Pyrite is mined at Leona Heights, east of the city of Oakland. Chrome, magnesite, and manganese occur in the Franciscan areas in the southeastern portion of the county and their commercial exploitation was given a new impetus by the European war, due to the heavy demand for these minerals. Coal was mined for a number of years in Corral Hollow near the eastern boundary of the county, but no production has been recorded for the last fifteen years.

Asbestos, copper, limestone, mineral water and soapstone also occur in this county.

ASBESTOS.

A few tons of asbestos were mined on the hills east of Fruitvale, close to the Contra Costa County line, in 1915, by the John D. Hoff Asbestos Company, of Oakland. The fibre was short and the occurrence so limited that no further production has been made. It was ground and used with magnesite in the manufacture of fireproof tile at their plant.

BRICK AND CLAY.

The California Brick Company, established in 1909, operates a brick yard 1½ miles west of Niles between the main lines of the Western Pacific Railroad. The clay is obtained from a superficial deposit 20 feet thick, which covers many acres. It was formerly excavated by plowing and scraping, using teams, but a drag scraper, electrically operated, has been in use for the last two years.

The clay is conveyed to 3 dry pans, 2 stiff mud machines, 1 dry press and 4 repress machines. The bricks are then dried in waste heat driers, which utilize the waste heat from the kilns. This is accomplished by means of a large central tunnel, equipped with blowers, which runs between the two kilns, and connects with the brick drying chambers. The bricks are then burned in two Haigh continuous kilns, each 600 feet long and contains 42 chambers, total 84 chambers. The capacity of each chamber is 10,000 bricks, and the output of the plant is about 40,000 bricks daily. An interesting feature of the plant is a large traveling overhead electric crane which was formerly used for transporting the bricks to and from the kilns, but which is now used only for loading.

The entire plant is under one roof and the machinery is operated by electric power supplied by the Pacific Gas and Electric Company. There is a transforming station at the plant. Crude oil is used for the kilns.

Besides the dark red paving brick the company now manufactures sewer brick, common brick, paving fiber, partition tile, hollow building blocks and other products.

N. A. Dickey is president and A. C. Meyers is superintendent.

This company also operates the Livermore Fire Brick Works, at Livermore, described hereafter under that heading.

The California Pottery Company, established in 1872, operates a pottery at East Twelfth street and Polk avenue, Oakland. Most of the clay used is obtained from Amador and Calaveras counties, but the loam used for a filler is obtained from trenches excavated for street work about Oakland and South San Francisco. The company manufactures vitrified sewer pipe, chimney pipe, drain tile, flue lining, various terra cotta products and garden pottery. In the latter part of 1918 a lead pot machine was installed, the company having a contract with W. P. Fuller and Company for 100,000 of these pots, and also a contract with the National Lead Company for 25,000. The machine has a capacity of 6000 per 8 hours. The main equipment consists of 8 downdraught kilns, 1 sewer pipe press, 1 auger brick machine and repress, 3 dry pans and 2 wet pans.

A 110 horsepower steam engine supplies the power and the boilers are capable of generating 200 horsepower. Crude oil is used for fuel. About forty men are employed throughout the year. F. A. Castello is president and Franc. C. Aruda is superintendent at the plant.

California Pressed Brick Company operated, during a short period, a yard in the Niles Cañon, 1 mile northeast of Niles. The plant was equipped with downdraught kilns and is now partially dismantled. There is no prospect of its being reopened as the company is defunct.

N. Clark and Sons, Pottery. The pottery is at Pacific avenue and Fourth street, Alameda, and has been in operation over thirty-two years. Part of the plant was destroyed by fire in July, 1917, and the company was not allowed by the government to rebuild, the industry being classed as nonessential. It is now (May, 1919) being rebuilt and the plant will soon be operating at its old time capacity.

The highgrade clays are obtained from the company's pits in Amador County and a calcareous shale was previously quarried from a bank near Walnut Creek, Contra Costa County. The latter material was used as a filler and has not been utilized since the fire.

An average of 25 men were employed during the last year, but when running to capacity the plant will employ from 125 to 150 men.

Clay is hauled to the pressers by elevators and the various products are hauled by electric trucks. The material will be dried in 2 steam heated driers, and burned in 17 downdraught and muffle kilns. There are dry and wet pans, sewer pipe, and brick presser, etc. A 500 horsepower Corliss steam engine operated the plant. Crude oil is used for fuel.

The products are pressed brick, fire brick, sewer pipe, terra cotta, etc. Several of Oakland's largest buildings are faced with architectural terra cotta made at this plant, among which may be mentioned the Capwell Building, Federal Realty Building, and the T. and D. Theatre. Albert V. Clark is president and Geo. Q. Clark, secretary; main office, 116 Natoma street, San Francisco.

The **Livermore Firebrick Works.** This plant, located at Livermore, was originally built to burn magnesite. For many years, from 1910 until the latter part of 1918, it was operated by the Livermore Firebrick Company, F. A. Bishop, president. It is now under the management of the California Brick Company, who also operates a large plant west of Niles.

All the clay used is obtained from Amador and Placer counties. The equipment consists of 6 downdraught kilns, two 30-foot and four 26-foot, 2 square muffle kilns, 2 round muffle kilns just completed (May, 1919), 1 American repress machine, capacity 25,000, 1 auger machine capacity 25,000, and 1 dry press capacity 20,000. The products were formerly dried in steam heated driers which utilize the waste heat from the kilns.

Crude oil is used for fuel and electric power operates the plant. An average of 50 men are employed throughout the year. The products are fine brick, pressed brick, enamel brick and terra cotta. N. A. Dickey is president, A. C. Meyers, superintendent, and Will Hyslof, yard superintendent.

The **Remillard Brick Yard,** located 1½ miles northeast of Pleasanton on the main line of the Southern Pacific Railroad, was established in 1889 and has been operated continuously since. Only common red bricks are manufactured. The material is obtained from a superficial deposit of sandy loam 25 feet thick, by means of a drag line scraper operated by an electric hoist. The loam is loaded into cars and hauled by motor one-fourth mile to the yard, where it is passed through wet pans and soft mud machines. The bricks are dried in yard and burned in 2-16 compartment Hoffman kilns, of 20,000 daily capacity each. Fifty men are employed during the season. C. Remillard is president and F. W. Miller, secretary; home office, First and Clay streets, Oakland.

Bibl.: Repts XII, p. 381; XIII, p. 613. Bull. 38, p. 242.

CHROMITE.

Chromite occurs in the southeastern portion of the county in the serpentine areas which are common to the Franciscan group. The only important deposits known are those which occur on Cedar Mountain and which were first mined years ago. It is reported that over 6500 tons had been mined from this locality, up to the time of the break in the market at the end of 1918.

Clark Claim, Vernon Clark, Livermore, owner. This claim is on section 26, T. 4 S., R. 3 E., M. D. M., just east of the Newman mine. It is worked through an incline shaft and some ore was shipped in 1916 by the Noble Electric Steel Company under a lease. It is stated that there is an ore body of considerable size, but water was encountered which made operation difficult.

Bibl.: Bull. 76, p.115

Mendenhall Mine, situated near the old Newman Mine, operated by H. Towhey and Wiggin, and credited with a total production of about 3000 tons. When visited (May, 1919) the mine had not been in operation for the past few months but the operators had just completed the construction of a dry concentrating plant with which it is

planned to treat the low grade ore on the dump. This ore was from 8% to 32% Cr_2O_3 and it is believed the concentrate will run from 45% to 52% Cr_2O_3. The plant will handle about 60 tons of ore per day and will produce about 8 tons of concentrate. The equipment consists of a Herman ball mill, Stebbins dry concentration, 4 gasoline engines, pump, etc. It is planned to install a wet concentrator table later, if the market warrants. There are several thousand tons of low grade ore on the dump and considerable ore was shipped during the latter part of 1917 and the first part of 1918. Very little work has been done during the last few months, only one man being kept at work at the mine to hold the lease. About 25 tons of ore are on hand at Livermore and a few tons at the mine. The total production from this mine is said to be over 3500 tons. S. V. Newman of Livermore is owner.

Bibl.: Repts. XII, p. 36; XIII p. 48. Bull. 38, p. 267; Bull. 76, p. 115. U. S. G. S. Bull. 430, p. 173.

Newman Mine, formerly known as the **Mendenhall Mine,** lies about 15 miles by road southeast of Livermore in section 26, T. 4 S., R. 3 E. E. C. Harder* in his description of this property writes as follows: "The ore occurs in irregular lenticular pockets and stringers in more or less decomposed serpentine. Where the serpentine is much decomposed it is soft and broken and has a brown stain. The chorme ore that occurs in this rock is generally soft and friable and a dull grayish-black color, but that in the fresh serpentine is glossy black in color and contains very little intermixed serpentine. Some masses of fairly compact ore are found within pockets of soft ore, as if they were not yet thoroughly disintegrated."

Development consists of several open cuts, and tunnels, totaling about 800 feet in length. The larger lenses or pockets appear to have been exhausted. Considerable work has been done here by the Noble Electric Steel Company during 1916. They mined and shipped several hundred tons to their smelters at Heroult. For the last two years it has been, and is at present (May, 1919) under lease to J. W. Clark and D. McDonald, Livermore, and considerable ore was shipped during the latter part of 1917 and the first part of 1918. Very little work has been done during the last few months, only one man being kept at work at the mine to hold the lease. About 25 tons of ore are on hand at Livermore and a few tons at the mine. The total production from this mine is said to be over 3500 tons. S. V. Newman of Livermore is owner.

Bibl.: Repts. VII, p. 36; XII, p. 48. Bull. 38, p. 267; Bull. 76, p. 115. U. S. G. S. Bull. 430, pp. 173-174.

COAL.

Coal was discovered in Corral Hollow in 1862, and shortly afterwards a few mines were opened up. However, a comparatively small production was made until 1897. Operations in this field ceased entirely in 1902, because of the inferior quality of the coal, which made its competition with outside coal impossible, as well as the high cost of extraction due to the steep dip and faulted nature of the beds.

*U. S. G. S. Bull. 430, pp. 173–174.

The **Beckman-Linden Engineering Corporation**, 593 Market street, San Francisco, have (June, 1919) purchased the Tesla property and begun the erection of buildings and equipment for mining and grinding the coal. It is intended to produce a powdered product which will be used as fuel for boilers, and which will be fed into the fire boxes by air blasts, similar to crude oil. This method has proved satisfactory in other localities. It may be used at the property for the production of electric power. Extensive operations are planned, so that the near future may witness the return of the old time activities in this district.

The Corral Hollow field was visited and described in detail by George Otis Smith in his report on "The Coal Fields of the Pacific Coast,"* from which the following brief extract is quoted:

"The Mount Diablo and Corral Hollow fields are in rocks of Eocene (Tejon) age . . . The Tejon formation consists of light-colored sandstones and associated shales and probably measures about 1000 feet in thickness . . . In Corral Hollow the rocks are much the same as on the north side of Mount Diablo, but here the faulting is more extensive and the dips of the coal beds much higher, being from 30° to 80°.

"There are a number of seams but the productive ones are the Eureka and the Summit. The Eureka has been developed to a considerable extent and is 10 to 12 feet in thickness. The roof is solid sandstone, but the floor is less satisfactory. The Summit seam averages 7 feet of clean coal and has an excellent floor of hard sandstone, but the roof is slate, which from its shaly character involves expense in timbering . . .

"The Tesla coal, as tested at the Union Iron Works in San Francisco, was found to be uniform quality, burning freely, with an ash percentage of between 8 and 9 per cent, with comparatively few clinkers. The following analysis of the Corral Hollow lignite, by R. C. Hilk, may be considered as typical for the best grade of California coal.

Moisture	10.80%
Volatile combustibles	43.10%
Fixed carbon	38.57%
Ash	7.53%
	100.00%

Bibl.: Repts. X, p. 91.; XII, p. 39; XIII, p. 51. U. S. G. S. 22d Annual Report, Part III, pp. 501-504.

LIME AND LIMESTONE.

Pleasanton Lime and Cement Company. This company has a lease on a limestone deposit that is situated half way between Sunol and Pleasanton on the Western Pacific Railroad. Very little development has been done on the deposit only occasionally a few tons being burned and distribution for fertilizing purposes. The stone is burned in 2 patent kilns equipped with oil burners. For the past few years just enough work has been done on the property to hold the lease. Philip Kolb, of Pleasanton is president.

*U. S. G. S. 22d Annual Report, Part III, pp. 501-504.

McLaughlin Company's Lithographic Stone Quarry* is in the SW. ¼ of the SW. ¼ of the SE. ¼ of section 35, T. 1 S., R. 2 W., M. D. B. and M., close to the Contra Costa County line. The property consists of 8 acres. The stone from the croppings is found to be quite hard but not homogenous as it contains silica in quantities sufficient to be a detriment for lithographic work. The croppings which are about 570 feet in length, run slightly south of east and north of west and dip southerly 75 degrees. The walls are of sandstone and conglomerate.

The vein is about 5 feet thick and has been opened by a 30′ open cut which was made about 15 years ago by J. Ramage. This cut has uncovered the vein for a distance of about 25 feet along the strike and 20 feet high. Considerable stone from this cut is to be seen on the dump.

That part of the vein that has been exposed to the elements seems to have been hardened and bleached and is very light grey in color. The stone seems to have some very small fractures but they are not harmful. The stone that is available at the present time has some of the properties of a good lithographic stone such as taking grease, oil and ink, and being acted upon by acids, but it has not quite the fineness and uniformity of grain required for engraving work. As is shown, however, by the results of a practical test made by Schmidt Lithographic Company, it could be used for "penning", that is, for painting the design upon the surface of the stone instead of cutting the design into the stone. The character of the stone in depth can only be determined by doing development work. The property is idle.

MAGNESITE.

Magnesite was mined in Alameda County as early as 1886, the deposits being located on Cedar Mountain about 13 miles southeast of Livermore. The magnesite occurs in a decomposed serpentine rock and is a yellow clay in which are imbedded large boulders. It lies in pockets and small veins, the latter running in all directions. Magnesite croppings and considerable float have been found in Rock Ridge west of Cedar Mountain and separated from it by the Arroyo del Valle, but no large deposits have yet been uncovered.

Bibl.: U. S. G. S. Min. Resources, 1886, p. 696.

The Cedar Mountain Magnesite Mine, located in section 27, T. 4 S, R. SE., M. D. B. and M., about 14 miles southeast of Livermore at an elevation of 3250 feet. It has, since 1917, been under lease to J. W. Clark and D. M. McDonald of Livermore. Previous to this, since January, 1915, it was under lease to Clark and Wente.

Over 2000 tons of magnesite were shipped from this deposit in 1916 and about 1160 tons were sold to John D. Hoff Asbestos Company in 1917. This latter brought from $12 to $14 per ton. Very little work has been done since 1917. About a car load of ore is at present on hand (May, 1919). The magnesite from this deposit is, as a rule, of excellent quality.

There are a series of small magnesite outcrops running east of north and dipping eastward. Wherever these croppings have been uncovered or dug into they show up as tops of lenses which widen

*From an unpublished report by W. W. Bradley.

out below the surface. The largest lens was developed by a glory hole and cut. A tunnel driven 10 feet below the bottom connected with a chute, through which the ore was hauled. Work was also done on several croppings to the north of the glory hole.

There is an oil burning flat hearth type furnace at the property which was built by Mr. Swindell who worked the mine in 1914. It has now been partially dismantled. The furnace was designed especially to produce a "deadburned" magnesite and had a capacity of 5 tons of calcined material per 24 hours. It is said to have produced a very uniform burn, but its cost of operation was higher than that of shaft furnaces, as it required more labor to operate and its fuel consumption was greater per tons of magnesite calcined. Water for the camp is obtained from a well on the property.

M. C. Crocker, 1023 Insurance Exchange Building, San Francisco, is the owner.

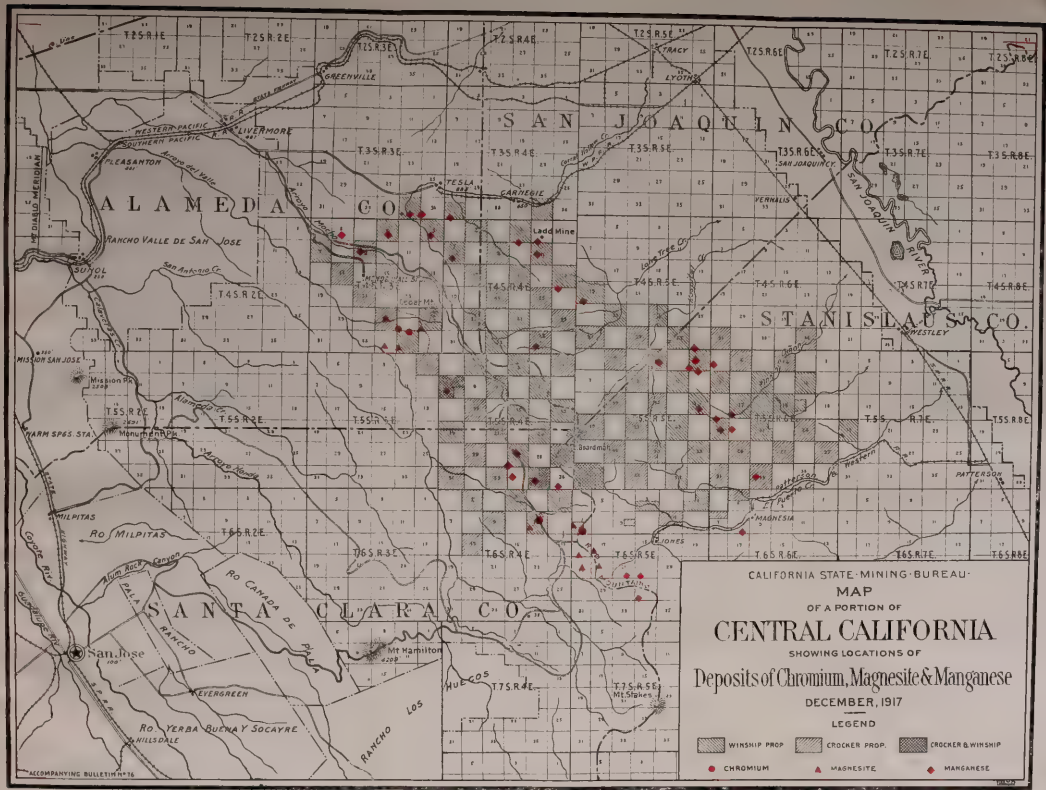
Hayes Ranch Deposit. Some small croppings of buff colored magnesite occur in the SW. ¼ of section 24, T. 4 S., R. 2 E., about 11 miles southeast of Livermore near the summit of Rocky Ridge. Some large boulders of pure white float were found in a ravine north of and below the outcrop. Several tunnels were driven into the hill under these boulders in hopes of striking an ore body but none was encountered. On the east slope of the ridge numerous boulders have been found. Cuts have been made along the slope at several places in all of which boulders of high grade ore have been found. It is very possible that these boulders are in place being formed as a gradual replacement of serpentine, however, considerable development is necessary to fully determine this. There has been no rock shipped from this prospect and it is idle. An old wagon road from Livermore gives easy access to the property which is under lease to E. P. Newhall of Livermore.

MANGANESE.

The manganese deposits of Alameda County are confined to the region southeast of Livermore, in what is known as the Tesla Quadrangle of the U. S. Geological Survey. They occur as interbedded lenses in jaspers of the Franciscan formation varying in extent and thickness as well as character. In places the ore is deposited as the porous black oxide, but often merely as stains and partial replacements along cracks in the jasper.

A few of the deposits were worked in the eighties and occasional mining has been done since then. In 1917 and the first part of 1918 under the stimulus of war conditions considerable ore was shipped from this district and several new properties were opened.

John Berendiere Mine. In section 14, T. 4 S., R. 3 E., 12 miles southeast of Livermore on the ridge northeast of the Arroyo Mocho at an elevation of 1750 feet. On the surface there is a large outcrop of jasper heavily stained with manganese. Several open cuts have been made, the largest of which is about 10 feet deep and 10 to 12 feet in diameter, from which considerable ore was taken, and at the bottom of which is exposed a ledge of good ore. About 40 feet below this a tunnel was driven, from which some fairly good ore was taken. This tunnel was continued for some fifty feet, but failed to strike the main ore body in



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Plate I. Map of a portion of Central California, showing deposits of chromium, magnesite and manganese.

the cut mentioned above, as it appears to be driven too low and too far to one side. A car load, about 50 tons, of ore was shipped in 1917 and 1918 by Mr. Young on a royalty basis and there is at present (May, 1919) about 15 tons of ore at the mine. The ore was hauled down the side of the hill on a sled and dumped into a small bunker, from which it was loaded directly into a truck. Has not been worked for several months. The ore is a porous black oxide, associated with the jasper and shale of the Franciscan series. The general strike of the bed is north and south and the dip 50° to the east. John Berendiere of Livermore is owner.

Bibl.: Bull. 76, p. 25.

Black Jack Mine is in the same section as the above Berendiere Mine, adjoining it on the southeast. It was first opened in 1885 and some small shipments made. This deposit is described by E. C. Harder as follows: "The country rock is jasper, thin layered and separated by seams of shale. The jasper layers differ in thickness from a fraction of an inch to several feet. The same layer varies in thickness, pinching out locally in many places. Most of the shale seams are thin. Both shale and jasper are greenish gray, except where stained red or black by iron or manganese.

"The ore occurs in several interbedded lenses or pockets a few feet thick and of small extent. It is soft, friable black oxide contained in cavities between numerous intersecting quartz seams, or as seams intersecting jasper fragments. Most of the quartz seams are later infiltrations, but the fragments are residual from jasper, which the ore has replaced. The seams are generally vitreous and the fragments earthy. In some places yellow decomposed jasper fragments have been largely replaced by manganese oxide; elsewhere only a surface layer is replaced. The deposits commonly have a footwall that is thin bedded and more shaly than the hanging wall."

Development consists of a 50-foot tunnel and several small cuts.

There are several small croppings on this property southeast of and below the Black Jack. A couple of shallow trenches expose a small deposit below the road. About a carload of ore was shipped from this deposit in 1917-1918 and there are several tons at the mine. It was idle (May, 1919) at the time visited. H. T. Overacker, Livermore, is the owner.

Bibl.: Bull. 38, p. 335; Bull. 76, p. 25. U. S. G. S. Bull. 427, pp. 161-162.

Buckhorn Claim. Chas. J. Jansen of Livermore has a claim in section 31, T. 4 S., R 3 E., about 16 miles southeast of Livermore, on the Arroyo Mocho. A few shallow cuts have been made on a prominently outcropping jasper ledge, which can be traced for 300 feet along the surface. The strike is approximately north and south. Some high grade ore was exposed and a few tons were shipped in the latter part of 1917. No recent operations (May, 1919).

Bibl.: Bull. 76, p. 25.

Camp No. 9, formerly known as the **Merchant Mine,** is 9 miles southeast of Livermore on the Arroyo Mocho road, in the NW. ¼ of section 9, T. 4 D., R. 3 E. It was opened in 1888 and has been worked

intermittently since. It has been under lease for several years to James J. Cummings of Livermore, and was subleased in 1916 to F. M. Doak, who took out about 50 tons of ore and then ceased work. Development work was later carried on by Cummings and over 1,000 tons of ore was shipped up to first part of 1918. It has been idle for some months past (May, 1919).

The vein varies from 6″ to 39″ in width, strikes approximately 10° north of west and dips 45° to 60° W. The ore consists of both the black oxide and steel gray carbonate. This is the only occurrence of rhodochrosite found in Alameda County, one other noteworthy occurrence in the State being that of the Ladd mine in San Joaquin County.

Development consists of two tunnels; the upper one about 5 feet above the level of the county road is in about 100 feet, and the second one, some 30 to 40 feet lower, is in about 150 feet. The upper tunnel follows the vein part way, but no ore was taken out except that broken in the course of driving. Stoping has been done above the lower tunnel and some good ore taken out.

M. I. Crocker, 354 Pine street, San Francisco, is the owner.

Bibl.: Repts. XII, p. 329; XIII, p. 506. Bull. 38, p. 335; Bull. 76, p. 26.

Crosby Prospects. Situated in SE. ¼ of SW. ¼ of section 30, T. 4 S., R. 3 E., one-half mile by trail from the Crosby Ranch, which lies 12 miles from Livermore. Owned by the Wm. Crosby Estate. On the northerly prospect a large block containing about 50 tons of siliceous ore is exposed on the surface. On the other prospect, about 500 feet south of the first, there is a bed of massive chert three feet thick, containing a few pockets of manganese oxide. The northerly prospect promises to develop ore.

Dewhirst Mine, Mrs. Amanda Dewhirst, Livermore, owner. McDonald and Clark of Oakland, lessees. Lies 12 miles southeast of Livermore in NE. ¼ of SW. ¼ of section 22, T. 4 S., R. 3 E., and is reached by the Cedar Mountain road. A lenticular body of massive manganese oxide ore striking east and dipping 50° south, in radiolarian chert, has been exposed in an open cut and a drift. From the drift ore was stoped nearly to the surface. Some ore was shipped 1917-1918 which ran 34% Mn., and high in silica.

Elliott and Searles, of Oakland, in the latter part of 1917 opened new workings on the south slope of Man Ridge, 20 miles southeast of Livermore, on or near section 7, T. 5 S., R. 4 E. Several hundred tons of ore were shipped from this deposit. The ore body is from 10′ to 12′ thick, but its relation to the surrounding cherts is obscured.

Ellis Ranch Deposit. A small vein of manganese ore has been exposed by an open cut on the ranch of Edward T. Ellis, 8 miles southeast of Livermore on the Tesla road, in section 28, T. 3 S., R. 3 E. First discovered over 30 years ago. Two small cuts, about 10 feet apart, have been made on the vein, which outcrops near the bottom of a gulch one-fourth mile south of the road. The ore is hard and blue black in color, a replacement in the jasper beds in which it occurs. Where exposed it was about 18″ in width. Several tons of ore running 42% or 43% were shipped during the recent activities. Property is idle at present (May, 1919).

R. Friggel Prospect is in the NW. ¼ of section 22, T. 4 S., R 3 E., near the Dewhirst mine. Several blocks of siliceous manganese oxide lie in the soil on this claim. The relation to the country rock is not clear, but the manganese is thought to be landslide material. No commercial ore was seen here and no ore has been shipped.

Kelly Ranch Deposit. Located in section 5, T. 4 S., R. 3 E., 8 miles southeast of Livermore and one mile north of the Arroyo Mocho road, at an elevation of 1450 feet. There are two bodies of massive oxide ore here, the northerly one varying from 5 to 7 feet in thickness and separated from the southerly one by a body of barren jasper 6 feet thick. This property was until recently under lease to Holbrook and McGuire of San Francisco, who spent several thousand dollars in prospecting and development. It is said that there are from 3000 to 4000 tons of ore blocked out, but it is low grade and siliceous. Now under sublease to a Mr. Springer. Mrs. Kelly of Livermore is the owner.

Newhall Manganese Lease, sometimes called the **Bailey Mine,** is 10 miles southeast of Livermore in the SW. ¼ of NW. ¼ of section 10, T. 4 S., R. 3 E., on the east side of the Arroyo Mocho at an elevation of 2200 feet above the sea level. There is said to be a well defined vein of manganese ore in jasper from 1 foot to 4 feet in width.

The property was subleased to C. F. Wente in the summer of 1917 and several hundred tons of ore were later shipped. Idle May, 1919.

Newman Manganese Mine, formerly known as the **Estacia** or **Fratis Mine,** is on Cedar Mountain 18 miles southeast of Livermore in section 22, T. 4 S., R. 3 E. This deposit has been worked at long intervals in a small way since 1880. Interbedded lenses of manganese occur in jasper. The croppings have a strike of N. 30° W., dipping about 25° to the southeast. Development consists of a number of shallow cuts, which exposed an ore body varying up to 8′ in width. The ore is a soft friable black oxide contained in cavities between numerous intersecting quartz seams.

Leased to Clark and McDonald in September, 1917, who since that time took out about 14 tons of 49% ore. Idle May, 1919.

Reay Deposit, W. R. Reay, 2153 Lake street, San Francisco, owner, is in section 36, T. 3 S., R. 3 E., M. D. M. On a line between section 35 and section 36 there are croppings of rather good-looking manganese ore. About 300 yards or so east of the above-mentioned occurrence near the top of the ridge and well within the boundaries of section 36, is a large outcrop of chert, mixed with the black oxide of manganese. Undeveloped. An old wagon road, which could be put in repair for a nominal sum, passes nearby via Mitchell Ravine to Corral Hollow near Carnegie, a distance of 2½ miles. Other occurrences of manganese reported from this section also.

J. W. Root, Livermore, produced several carloads of manganese ore, in the first part of 1918, from a claim which he located on Man Ridge, in either section 7 or 18, T. 5 S., R. 4 E.

Scott and Winegar Mine, sometimes known as the **Man Ridge Mine,** comprises two claims owned by Chas. Scott and P. S. Winegar of Livermore. Reached by 2½ miles of rough road connecting with the

Arroyo Mocho Road, at a point 20 miles southeast of Livermore. The mine is near the summit on the south slope of Man Ridge in unsurveyed land, which would be in section 7, T. 5 S., R. 4 E. On the south side of a small knob there are some caved workings from which the Noble Electric Steel Company produced 600 tons of ore in the spring of 1917. The elevations of the different workings vary and it is not clear if all the exposed ore is in the same or in different horizons; some faulting is seen, however. In one working two distinct horizons of ore occur, separated by a few feet of barren, thin-bedded chert.

The **Standard Magnesite Company** owns a manganese property on Man Ridge, 20 miles southeast of Livermore, in section 7, T. 5 S., R. 4 E. Considerable production was made from this property during 1918, but operations were discontinued in November, 1918. The ore was hauled to Livermore and shipped. There is a 75-foot tunnel, with several cross cuts. An average of five men were employed. H. C. Haecke is president; home office, 244 California street, San Francisco.

Winegar Manganese Mine is 90 miles southeast of Livermore in the ridge east of the Arroyo Mocho alongside of the Camp Bessie Road, in section 4, T. 5 S., R. 4 E. The development consists of a short tunnel which is said to cut a lense of manganese ore. Very little work has been done at this property in recent years. H. V. Winegar of Livermore is the owner.

Winship Properties, K. D. Winship, 350 Post street, San Francisco, owner. In Alameda County, near Tesla, these properties include the following sections (see map, Plate I) which have manganese prospects or workings: Section 35, T. 3 S., R. 3 E.; sections 1 and 3, T. 4 S., R. 3 E.; section 31, T. 3 S., R. 4 S., M. D. M., leased to Joseph P. Donovan, Livermore. Some indications of manganese have also been noted on section 7, T. 4 S., R. 4 E., and on section 7, T. 5 S., R. 4 E., Donovan reports (December 10, 1917) that on section 31, above noted, he has driven a 250-foot crosscut, and is now in a body of ore of good grade showing at least six feet in width.

MINERAL PAINT.

There is a deposit of red chert on the property of John Berendiere, 12 miles southeast of Livermore on the Arroyo Mocho Road. This is in section 14, T. 4 S., R 3 E., and only about 100 feet from the manganese deposit of the same owner, described above. A sample of this rock was submitted to the Paraffine Paint Company's factory at Oakland, and experiments were made (May, 1919). It was found to have properties of sufficient value to warrant further investigation. A rock similar in color and properties, used in the manufacture of linoleum, has been obtained for years by the above company from Pennsylvania.

The deposit appears, on the surface, to be of considerable extent, as outcrops were noted at several places on the hillside.

The rock is dark red in color, highly stratified, quite uniform in quality and color, and has a greasy, schistose appearance on some of the cleavage faces.

MINERAL SPRINGS.

Although there has been no commercial production of mineral water in Alameda County there are several groups of mineral springs, the

waters of which are mostly used for domestic purposes. At the largest of these, Piedmont Springs, a recreation park has been conducted for a number of years.

The following descriptions of the Alameda County Springs are quoted from a report of Gerald A. Waring,* who made an exhaustive study on the springs of California.

"**Mayhew Spring** is about 200 yards north of Niles depot. It is situated in an orange orchard and is surrounded by a cement stone curbing which forms a reservoir about 4 feet in diameter and 10 feet deep. A small pipe and faucet furnish an outlet from a point about 3 feet below the surface, but the yield is only about 1 gallon a minute of water that had an observed temperature of 67° in the reservoir.

"The spring was known to the Spaniards in the early days and is still used to slight extent for drinking. Bubbles of gas continually rise in the reservoir, but the water is only faintly sulphureted. The spring is situated on a gentle alluvial slope at the mouth of a drainage wash, between hills of sedimentary rocks that are probably of Tertiary age.

"**Mendenhall Springs** are 11 miles by road southeast of Livermore on the steep southwestern side of the cañon of Arroyo Mocho, 500 feet above the stream. Two springs here seep from short prospect tunnels 50 yards apart that were driven many years ago in search of gold. The water was early noticed to be perceptibly mineralized, the perceptible taste apaprently being due to magnesia, and a number of years ago it was bottled as Aqua de Vida (Water of Life) Springs Water.

"The water of the southern spring is piped to a tank and furnishes a domestic supply: the other spring supplies a watering trough in the barnyard. Their flows are respectively one gallon and half a gallon a minute.

*U. S. G. S. Water Supply Paper 338.

"The following analyses show that they are essentially primary saline and secondary alkaline waters, the upper spring having the higher salinity:

Analyses of Water from Mendenhall Springs, Alameda County, California.

(Constituents in parts per million.)

	1		2		3	
Temperature					14° C. (58° F.)	
Property of reaction:						
Primary salinity	35		31		42	
Secondary salinity					18	
Tertiary salinity						
Primary alkalinity	8		1			
Secondary alkalinity	57		68		40	
Tertiary alkalinity	54		2		32	
Constituents	By weight	Reacting values	By weight	Reacting values	By weight	Reacting values
Sodium (Na)	136	5.91	96	4.16	148	6.43
Potassium (K)	5.5	.14			Trace	Trace
Calcium (Ca)	95	4.72	106	5.30	104	5.17
Magnesium (Mg)	41	3.36	44	3.61	46	3.77
Aluminum (Al)	3.3	.37			3.6	.40
Manganese (Mn)					Trace	Trace
Sulphate (SO_4)	178	3.70	144	3.00	374	7.78
Chloride (Cl)	42	1.18	38	1.08	52	1.48
Carbonate (CO_3)	278	9.25	270	8.99	183	6.11
Silica (SiO_2)	7.2	.24	7.2	.24	9.4	.32
	786.0		705.2		920.0	
Carbon dioxide (CO_2)	164	7.45	Present	Present	79	3.58
Hydrogen sulphide (H_2S)					18	1.06

1. Lower Spring; analyst and authority, Winslow Anderson (1888).
2. Lower Spring; analyst, Falkenau and Reese, authority, 8th Cal.
3. Upper Spring; analyst and authority, Winslow Anderson (1889).

"The water is apparently of surface origin and has become somewhat mineralized from the materials through which it percolates. The tunnels are driven into thin-bedded cherts and crushed shales that belong to the Franciscan group.

"The property was improved as a mountain resort. In 1909 accommodations for 75 people were provided by several cottages and by a dining room in the main building. It has not been in operation as a resort for a number of years (June, 1919).

"**Piedmont Springs** are in a recreation park on the hillside 3 miles north of Oakland.

"Two mineralized springs, which are known, respectively, as Sulphur and Magnesia springs, rise in a ravine that extends through the property. The springs have been curbed and covered, and the ravine has been graded for a walk. The waters are piped about 100 yards downstream into two drinking basins in a grotto-like spring house that is built against a rock face at the side of the ravine. A third basin in the spring house is supplied from the municipal water main. The water of both springs is noticeably sulphureted, and that of the Magnesia Spring also tastes distinctly alkaline. The following analyses show the characters of the waters. Both have noteworthy primary salinity and secondary alkalinity, but although the sulphur spring is characterized by secondary salinity, the magnesia spring has high primary salinity.

Analyses of Water from Piedmont Springs, Alameda County, California.
(Analyst and authority, Winslow Anderson, 1889; constituents are in parts per million.)

	Sulphur spring		Magnesia spring	
Temperature	16°C. (60°F.)		14°C. (58°F.)	
Properties of reaction:				
Primary salinity	42		23	
Secondary salinity	15		----------	
Tertiary salinity	----------		----------	
Primary alkalinity	----------		36	
Secondary alkalinity	43		41	
Tertiary alkalinity	29		59	
Constituents	By weight	Reacting values	By weight	Reacting values
Sodium (Na)	151	6.55	113	4.93
Potassium (K)	7.4	.19	31	.78
Calcium (Ca)	58	2.92	23	1.13
Magnesium (Mg)	77	6.35	35	2.88
Iron (Fe)	Trace	Trace	14	.51
Aluminum (Al)	Trace	Trace	4.1	.45
Sulphate (SO_4)	329	6.84	33	.69
Chloride (Cl)	82	2.32	53	1.49
Iodide (I)	Trace	Trace	Trace	Trace
Carbonate (CO_3)	196	6.53	215	7.16
Metaborate (BO_2) a	14	.32	38	.89
Silica (SiO_2) b	87	2.87	72	2.38
	1,001.4	----------	631.1	----------
Carbon dioxide (CO_2)	39	1.78	62	2.80
Hydrogen sulphide (H_2S)	61	3.58	Trace	Trace

a Reported as "borates," recalculated from $Na_2B_4O_7$.
b Reported as "silicates," assumed to be SiO_2.
The second analysis is given by Anderson[1] as from an "iron spring," but this is believed to be the same spring that is now known as the Magnesia Spring.

"**Sweet Springs,** another group of magnesic springs that are associated with serpentinous rock, rise at the border of a small meadow on a low saddle between two ravines 18 miles southeast of Livermore. The group, which is known as Sweet Springs, includes 10 that issue for a space of 200 yards along the southeastern side of the meadow and 4 others that issue on its eastern side. They range in size from mere seepages to flows of 6 or 8 gallons a minute, the total yield being perhaps 30 gallons a minute. The water has a distinctly sweet taste. The locality has been used by range stock as a watering place.

"The principal springs rise from the northern border of an area of pyroxene rock and serpentine which cover the slopes to the south, the slopes north of the springs being of siliceous sandstone. The sandstone probably belongs to the Franciscan group of altered sediments, which occupies considerable areas in the Coast Ranges, and the serpentine bears its usual intrusive relation to the sediments.

"**Warm Springs.** Four warm springs that issue on a hillside bordering the lowland at the southeast end of San Francisco Bay have given the small town of Warm Springs its name. They are situated about 2 miles northeast of the town, within the private grounds of Mr. Joseph W. Stanford. One of the springs rises in the lawn adjacent

[1]Anderson, Winslow, Mineral Springs and Health Resorts of California, p. 223, 1892.

to Mr. Stanford's residence. It has been inclosed to form a covered reservoir about 12 feet square, which furnishes part of the domestic supply and yields perhaps 5 gallons a minute. Two other springs rise beside a walk a few yards away, in open basins from which there are flows of approximately 1 and 4 gallons. The larger of these springs has a temperature of 86°. The fourth spring is 200 yards southward, in a little swale on the southern side of a knoll. It yields perhaps 5 gallons a minute, of water 90° in temperature, which is collected in a small covered reservoir and piped to the grounds for domestic and garden use.

"The water of all the springs is faintly sulphureted and is considered to be somewhat mineralized by sodium salts. Sandstone, gravel and some calcareous material form the hill slopes here."

PYRITES.

Massive irregular shaped deposits of pyrites occur in rhyolite at Leona Heights, about 4 miles southeast of the City Hall at Oakland. These deposits have been mined for many years, the pyrites being used exclusively for the manufacture of sulphuric acid. The ore contains occasionally small masses of chalcopyrite mixed with the pyrite, as well as small quantities of gold and silver.

In discussing the origin of these deposits Andrew C. Lawson* states: "The deposits are metasomatic replacements of the rhyolite, formed at a time when the ground water stood higher with reference to the ore bodies than it does at present. The retreat of the ground water to lower levels, owing to the deformation and dissection of the region, has led to the partial oxidation of some of these deposits and the consequent production of gossans of hematite and limonite. . . . It is worthy of note that these pyritic deposits are confined to the rhyolite and that the unoxidized rock contains minute crystals of pyrite, which are rather thickly but sporadically scattered through it, and also that the rhyolite is the only rock in the district containing disseminated pyrite crystals.

"It is probable not only that the ore replaced the rhyolite but that the materials that were originally disseminated through the rock have been concentrated during the process of replacement. The rhyolite has been decomposed by sulphuric acid produced by the oxidation of the disseminated pyrite near the surface of the rhyolite. The formation was originally much thicker than it is now, and as the surface was gradually lowered by erosion the process has been continuous. Theoretically, one result of the process, besides the chemical attack on the silicates, should be that, as the available oxygen became exhausted near the surface, the ferrous sulphate would descend to lower parts of the formation and be reduced in the ground water to sulphide. The course of these descending solutions and the sites favorable to the precipitation of the sulphides on reduction would be determined by the rock structure. The deposits are very similar in their essential features to larger and more cupriferous deposits in similar rocks elsewhere, many of which have been explained as the result of ascending magmatic water. The genesis of the deposits at

*U. S. G. S. San Francisco Folio, p. 22

Leona Heights, however, is apparently simpler; they may be ascribed to the action of ordinary meteoric water."

Alma Mine. This property, opened in 1892, is operated by the Stauffer Chemical Company, 624 California street, San Francisco. The ore body strikes northwest and southeast, varying in width from 12 to 18 feet. It has been developed by over 5000 feet of tunnels and drifts. The old workings took fire and were abandoned, and a new adit was driven to cut the ore body at a lower level. Gravity trams are used for hauling ore to a small crushing plant and bunkers alongside of the railroad. The ore is used by the Stauffer Chemical Company, in their plant at Stege, Contra Costa County, for the manufacture of sulphuric acid.

Bibl.: Bulls. 38, p. 349; 50, p. 169.

Leona Heights Mine lies about 1 mile to the south of the Alma mine on the strike of its ore bearing zone. The deposit here is very irregular and considerably faulted, varying in width from 10 to 30 feet. Development consists of 2 tunnels, 100 feet vertically apart, the lower being about 400 feet long. A winze sunk 40 feet in the lower or main working tunnel showed good ore at bottom. The workings extend to about 20 feet above the upper level. There are about 1000 feet of tunnels and drifts in the mine. The ground is soft and wet and requires heavy timbering; square sets are used throughout. The mine is equipped with a crushing plant, consisting of a Blake jaw crusher, set of 16″ rolls, screens, etc., operated by a 30-h.p. gas engine. The ore is crushed by a $\frac{3}{8}$″ size before being trammed in the 1600′ aerial tramway, to the bunkers at the railroad. An average of 400 tons of ore, averaging at least 46% sulphur are produced per month. Six men are employed. This property is owned by the Realty Syndicate of Oakland, but is operated under lease by the Leona Chemical Company, of which D. A. McDonnell, Syndicate Building, Oakland, is president and general manager.

Bibl.: Bulls. 38, p. 349; 50, p. 170.

SALT.

The recovery of salt by evaporating the water of San Francisco Bay in the marshes along the east shore has been an important industry for many years. Refineries have been established at the larger properties for the production of table and dairy salt, while at the smaller ones only the crude salt is produced.

The waters are pumped into clay vats, which vary in area from 1 acre to 20 acres. As evaporation progresses, the water is drawn from one vat to another until it is sufficiently concentrated for the salt to crystallize. The salt is gathered during the fall of the year, before the winter rains commence.

Those at present engaged in this profitable industry in Alameda County are as follows:

American Salt Company. Mrs. Mary Marsicano, 781 Green street, San Francisco, owner; office, 611 Broadway, San Francisco. Property 2 miles west of Mount Eden. Solar evaporation. Only crude salt produced. Six men employed.

California Salt Company, 762 Mills Building, San Francisco. This company, established in 1901, owns and operates three salt works, two of which are located southwest of Alvarado, the third at Hayward Landing, the property embracing about 6000 acres of marsh land. Their refinery is located 3 miles southwest of Alvarado. The treatment here for the production of table and high grade salts is radically different from the processes employed at the other plants around the bay.

Evaporation in the solar vats is only carried on until the solution becomes saturated, being then transferred to a large tank into which soda ash is introduced to precipitate the magnesium salts present. The solution is pumped into a series of six 25,000-gallon tanks, where the magnesium salts are allowed to settle. The brine is drawn off into concrete vats and pumped into vacuum pans where the final precipitation is accomplished.



Photo No. 1. Solar evaporation vats and salt stacks at the California Salt Works southwest of Alvarado, California.

The salt for other purposes than table and dairy, is produced by evaporating to dryness in the clay vats, washing, drying in wooden driers, crushing and screening. The vacuum plant is equipped with 4 pans, each with a daily capacity of 25 tons; the crushing plant is equipped with two 6′ x 34′ rotary driers, 3 sets of rolls and revolving screens, having a total daily capacity of 100 tons. A 500-h.p. oil burning boiler generates steam for pans, as well as for motors which operate the plant. Ninety Japanese laborers are employed throughout the year. W. G. Henshaw is president, and H. C. Coward, manager.

Commercial Salt Company. The works are located 2 miles west of Baumberg Station. Only the crude rock salt is produced. From 2 to 10 men are employed during the harvest.

Continental Salt and Chemical Company, 1 Drumm street, San Francisco. The works are located 1½ miles west of Alvarado, adjoining the property of the California Salt Company. There is a large storage house which has a capacity of 30,000 tons, and the salt immediately after harvest is stored here to protect it from the elements until ready for the refinery. The process employed is one of thoroughly washing the salt crystals to free of impurities. This is accomplished by first

treating with two washes of cold brine, followed by a boiling hot brine wash, and lastly a hot fresh artesian water wash. A system of drain drags transfers the salt to the different washes, as well as through the original drier designed by the company. The capacity of the plant is 200 tons daily. Thirty men are employed. V. S. Hardy is president and L. Largente, secretary.

Crystal Salt Company. This company produces salt at two locations, one southwest of Alvarado, the other near Newark. Twenty men are employed during the harvest. Only crude salt is produced. Plummer Brothers Estate, 37 Front street, San Francisco, owner.

The Pioneer Salt Company. This company owns over 500 acres of marsh land, 3 miles southwest of Mount Eden, and have been in operation for many years. Solar evaporation is carried on in mud vats and the salt is harvested and stacked during the autumn. It is washed and ground, several thousand tons being produced annually.

A. L. Johnson, R. F. D. No. 2, Hayward, produces a small quantity of salt each year, the works being west of Mount Eden Three men are employed during the harvest.

A. Lindenberg, R. F. D. No. 2, Hayward. The works are 2 miles west of Russel Station, comprising 60 acres of marsh land. One man is employed.

Madson Salt Works. Situated 1½ miles west of Russel Station. The work is performed by Japanese labor on contract. About 1000 tons of rock salt are harvested yearly. Formerly owned by C. Madson and Sons, R. F. D. No. 2, Hayward. Sold to California Salt Company in 1918.

Peter Mathiesen, R. F. D. No. 2, Hayward, produces a small quantity of salt each year, employing 2 men during the harvest.

The Oliver Salt Works, established in 1872, is 2 miles southwest of Mount Eden. The salt is evaporated to dryness in the clay vats,



Photo No. 2. Washing and stacking machine at The Oliver Salt Works. The salt is shoveled onto the side dump cars shown in foreground and hauled by gasoline motor to the plant.

which cover several hundred acres, and hauled in 1-ton cars by gasoline motors to the mill, where it is thoroughly washed, dried, and granulated. From 50 to 130 men are employed during the year, according to the season, producing about 30,000 tons yearly. The company has erected a chemical plant and is manufacturing magnesium chloride, magnesium sulphate, and potash salts as a by-product from the mother liquor. The magnesium sulphate ($MgSO_4$) runs 99.81% pure; the potassium chloride (KCl) from 76% to 95%, and a potash fertilizer is manufactured which runs from 10% to 30% K_2O. A. A. Oliver of Mount Eden is manager.

A. Schilling and Company of San Francisco own a large acreage of marsh lands between Alvarado and Newark and have a plant of considerable size for the production of salt.

Solar Salt Works, owned by the B. F. Barton Estate, are located 3 miles southeast of Mount Eden. The salt after being gathered is washed and granulated. A small gas engine is used to operate the plant. Several thousand tons are produced yearly. Six men are employed during the year. W. F. Barton, 10 East street, San Francisco, is in charge of the property.

Martin Tuckson owns 47 acres of marsh lands west of Russel Station and produces a small quantity of rock salt each year. It is not refined.

Union Pacific Salt Company operates a large plant 3 miles west of Mount Eden at the edge of the bay. This property is equipped with 100 wooden vats, each 225 feet long, 16 feet wide, and 10 to 12 inches deep, in which the saturated brine is introduced for the final evaporation. Each of these vats is thoroughly cleaned before the solution is introduced, thus insuring a clean product. The salt is shoveled into 1½-ton cars and hauled to the mill, where it is washed, first using brine, then fresh water. After washing it is passed through rotary driers equipped with steam jackets, then ground and sized. Thirty Japanese laborers are employed at 18 cents per hour. W. F. Barton, 10 East street, San Francisco, is president and manager.

STONE INDUSTRY.

The **California Building Materials Company** operates a large plant on Alameda Creek at Niles. A combination drag line and slack line scraper electrically operated is used to excavate and convey the material to the mill, where it is crushed, screened and washed, then stored in bunkers below from which it can be loaded directly into cars. A Brown-Holt steam crane is used for switching purposes and for loading cars from the reserve dumps in the yard. Electric power from the Pacific Gas and Electric Company runs the mill. Water for washing the sand and gravel is pumped from wells on the property. F. N. Woods, Jr., is president and manager; the home office at 500 New Call Building, San Francisco. This company has recently obtained possession of the Grant gravel pit, described below.

Cañon Gravel Company, formerly known as the **Niles Cañon Stone Products Company.** Located in Niles Cañon, about ½ mile east of Niles. The plant was built in the latter part of 1916 and remodeled, January to March, 1918. The gravel is excavated from the bed of Alameda Creek by an electrically operated drag line scraper. The crushing plant consists of a grizzly, two gyratory crushers, a No. 5 and a No. 2, and a 16-foot revolving screen in 4 sections. The product is washed while being screened, water being furnished at the rate of 500 gallons per minute by a 35-h.p. motor and a vertical centrifugal Byron-Jackson 4″ pump. A 100-h.p. motor operates the scraper, a 50-h.p. motor runs the crusher and a 30-h.p. the screen. The capacity of the plant is 300 tons per 8 hours. It does not run continuously but as the demand for the product warrants.

Elliot Gravel Pit, owned and operated by the Southern Pacific Railroad, is about 2 miles east of Pleasanton at Elliot siding along the Arroyo del Valle. The gravel is excavated by a steam shovel which loads directly onto gondolas, the material being used without further treatment for ballast or concrete work.

Bibl.: Bull. 38, p. 313.

Estudillo Quarry. This quarry is located on the Foothill boulevard opposite Estudillo avenue. The stone is an altered basic rock, much fractured with serpentine in the seams. Very little quarrying has been done here recently, and the crusher has been removed. Mrs. Matilda Ravekes of San Leandro is owner.

Bibl.: Bull. 38, p. 313.

Grant Gravel Pit is located at Elliot siding 2 miles east of Pleasanton, and adjoins the pit of the Southern Pacific Railroad on the west. Until just recently, the early part of 1919, this was operated by the Grant Gravel Company, J. D. Grant, president, and H. G. Hotchkins, superintendent. It is now in the possession of the California Building Materials Company, G. W. Woods, Jr., president, office 500 New Call Building, San Francisco, and is held partly under lease from the Southern Pacific Company and partly under ownership. Max Cazin is superintendent at the plant.

The old company operated very little during the last year or so due to curtailed demand during the war. There is an enormous deposit of gravel here along the bed of the Arroyo del Valle.

There are two drag line scrapers, electrically operated, with a crusher in conjunction with each scraper. These dump the gravel into chutes and it is then loaded directly into large side dump cars, and hauled to the crushing plant by a small locomotive. After re-crushing, the material is conveyed to the screening or sizing plant, which is a separate unit, by belt conveyors. The capacity of plant when in full operation is about 2000 tons per day. The new company had not up to May, 1919, put the plant in operation. It expects to produce the following products: Regular concrete rock from ½″ to 1½″ size; small concrete rock from ¼″ up to 1″; so-called ''pea gravel''; sand, and what is termed ''straight run,'' which is gravel direct from the river bed, with or without crushing, but without screening or sizing. Pea gravel is used for roofing material, yard surfacing material, etc. Straight run is used mostly for ballast.

The **Lake Chabot Quarry** is 2 miles east of San Leandro south and across the cañon from the dam at the foot of Lake Chabot. It was opened in 1886 by the E. B. and A. L. Stone Company, who erected a crushing plant and operated the quarry for many years. It was later sold to D. V. Toffelmier of San Leandro. The rock is a hard blue metamorphosed sandstone with a heavy overburden of red jasper. In places the jasper is decomposed to a red dirt. Only the jasper is being quarried. It is used for road material in the vicinity.

Bibl.: Bull. 38, p. 315.

Leona Heights Quarry. This property, located on the summit of a prominent ridge about 4 miles east of Broadway, Oakland, has been worked for over 20 years. It was opened by the California Improvement Company, later becoming the property of the E. B. and A. L. Stone Company. In 1913 the new plant was constructed by the Leona Quarries Company, Incorporated, of which A. C. Brown was president and Frank W. Bilger, vice president and manager. It is understood the company went through insolvency and the quarry has not been worked for years.

The rock is a fine grained trap, well adapted for macadam and concrete. It was quarried in a glory hole approximately 500 feet long, 150 feet wide and from 90 to 130 feet deep. The rock was hauled about one-fourth mile in 4-yard cars by an electric motor through a tunnel, which connects with the bottom of the glory hole, to the head of a 1000-foot gravity tramway. At the foot of the tramway the crushing and sizing plant is located. This plant is equipped with one No. 8, two No. 5, and one No. 3 gyratory crushers; 36″ Simonds disc crusher; three 20-foot trammels; bucket elevator, and conveyors. It was operated by electric power, 400 h.p. being required. The capacity was 1000 yards per 10 hours. A spur track of the California Railroad runs to the bunkers below the crusher. At present time, May, 1919, it is understood that Bates and Boreland contemplate working this quarry.

Bibl.: Repts. XII, p. 388; XIII, p. 624. Bull. 38, p. 313.

Mountain View Cemetery Quarry. The Mountain View Cemetery Association formerly quarried a deposit of thin bedded red chert back of the cemetery which is located at the terminus of Piedmont avenue, Oakland. The rock was used for roadways about the cemetery. The quarry has been abandoned for some time.

Niles Sand, Gravel and Rock Company commenced operations in 1912, adjoining the plant of the California Building Materials Company on Alameda Creek. Here a large Lidgerwood drag line excavator operated by electric motors is used. This excavator runs on rollers and by means of a long boom gathers the material and deposits it in the cars that carry it up the inclined cable railway, where it is dumped into a hopper and fed on a belt conveyor that takes it to the top of the plant, where it is crushed, washed and sized. The motor installation on the excavator consists of a 112-h.p. motor to operate the drag line bucket, a 22-h.p. motor for working the excavator, and two 6-h.p. motors direct connected to air compressors to furnish air to operate the brakes.

The water for washing the material is pumped from fresh water wells adjacent to the plant by means of a 1000-gallon-per-minute centrifugal pump operated by a 50-h.p. motor. A locomotive crane is used for loading cars and switching purposes about the yard. The capacity of the plant is 1000 yards per 10 hours. Sixteen men are employed.

The home office is at 810 Mutual Bank Building, San Francisco: W. H. Ford is president and Howard C. Plummer, secretary and manager.

Oakland's Paving Company's Quarry. This is one of the largest quarries around the bay and has been worked almost continuously since 1870. It is situated on McAdams street, about two blocks east of Broadway, Oakland. The rock is a hard, fine grained, bluish gray metamorphosed sandstone, of the Franciscan formation. There are two large circular open cuts each, about 500 feet in diameter and from 100 to 130 feet deep. The rock is quarried in several benches, by air drills and by hand, and transferred to the crusher in 1-ton cars. The crushing plant is equipped with 5 gyratory crushers, two No. 5, two No. 4 and one No. 2, and has a capacity of 600 yards per day. There are 3 bucket elevators, trommels, etc. Electric power is furnished by the Great Western Power Company, about 270 h.p. being utilized. The products are 2½" macadam rock, 1½" and 1" concrete rock and ¾", ½" and ¼" screenings. The rock is sold for building construction and street work. Anson S. Blake is general manager and A. E. Bontrager is superintendent at the quarry. Home office, 5000 Broadway, Oakland.

Bibl.: Repts. X, p. 125; XII, p. 386; XIII, p. 624. Bull. 39, p. 312.

Ransome-Crummey Company formerly operated a quarry on the old Fish Ranch road, 5½ miles southeast of the Oakland City Hall, on the same ridge and about 1 mile south of the Leona Heights Quarry. This is now owned by Bates and Boreland, Oakland Bank of Savings Building, Twelfth and Broadway, Oakland. The rock appears to be a continuation of the Leona Heights deposit, a hard, gray, trap rock. It is quarried in a large glory hole and the material hauled through a tunnel which is connected with the bottom of the hole to a 700-foot gravity tramway which feeds directly into the crushing plant alongside of the spur track at the foot of the ridge. The equipment at the plant consists of two No. 5 and one No. 3 gyratory crushers; 2 bucket elevators, and 3 trommels. Two 50-h.p. electric motors supply the necessary power to operate the plant, whose capacity is 600 yards per 10 hours. This plant has been idle for some time, but the present owners expect to operate it in the near future (May, 1919).

Bibl.: Bull. 38, p. 315.

George Small of Decoto has a deposit of moulding sand near Decoto, over a thousand tons of which were shipped to Oakland and San Francisco during 1916, for light plate moulding.

Spring Construction Company. The old quarry of this company, located on Greenwood Terrace, Berkeley, has been abandoned for years. The rock was used mostly for macadam roads in the vicinity of the quarry.

Bibl.: Bull. 38, p. 315.

Hyland Quarry of the Bates and Boreland Company, located in Dimond Cañon, about 2 miles east of Oakland. Operated at intervals as demand warrants.

MISCELLANEOUS CHEMICAL WORKS, COMMERCIAL PLANTS, ETC.

The **Air Reduction Sales Company** have a plant at Park avenue and Halleck street, Emeryville, for the production of oxygen from the air. This company has at present twenty-eight plants throughout the United States, twenty of which produce oxygen and eight of which produce acetylene. There are more plants under construction.

The air is drawn through two large cylindrical tanks about 20′ high and 4′ in diameter, in which the carbon dioxide (CO_2) is eliminated by caustic soda. The air goes to a compressor and then to an expansion engine, where it is liquefied. The liquid air is then treated in a "Claude" separating tank of French make, which separates the nitrogen from the oxygen. It has a capacity of 100 cubic meters per day. The oxygen is marketed in two sizes of steel cylinders, both under 1800 pounds pressure and containing 100 and 200 cubic feet respectively. About 85% of the product is sold to the shipyards, the balance going to garages, etc. About 30 men are employed. A. S. Blagden is president; home office, 120 Broadway, New York. K. L. Brackett is Pacific Coast manager, and G. B. Hunt is superintendent at the plant.

Barbour Chemical Company have a chemical works at 766 Fiftieth avenue, Fruitvale, for the manufacture of sulphuric and hydrochloric acid, barium sulphate, barium carbonate, barium nitrate and other products. It has not been in operation for the past year or so, during the latter part of 1918 and first part of 1919, owing to decline in market. When in operation the pyrite for the manufacture of acids was obtained from the Mountain Copper Company at Keswick, and the barytes from the deposit at El Portal, Mariposa County. There is a rotary kiln for burning the crude barytes.

Home office is in the American National Bank Building, 495 California street, San Francisco.

From latest reports (June, 1919) it is understood the property is about to be sold.

The **Judson Manufacturing Company** has for 35 years operated an iron and steel manufacturing plant at Emeryville station in West Oakland. Iron ores from Shasta County are utilized, also chrome, dolomite, limestone, silica, magnesite, manganese and fire clay from the state.

The plant consists of a structural steel shop, capacity about 1000 tons per month; modern machine shop; pattern, bolt and shafting shops; rolling mills; open hearth steel furnaces, etc.

Crude oil is used for fuel, about 7000 barrels being used per month. Plant machinery is run by electricity from the Pacific Gas and Electric Company, about 2000 h.p. being required. An average of 650 men are employed.

H. E. Bothia is president and D. L. Johnson general superintendent.

Paraffine Paint Company have a large plant at the foot of Powell street, Oakland, a few blocks north of Emeryville. It includes a roofing

manufacturing plant; paper mill; paint plant; linoleum plant; and an oil refinery for the manufacture of asphalt.

The products are paint, linoleum, wall board, and several kinds of roofing material. Some soapstone and lime rock from California are used, and the company owns an asbestos property near Placerville.

About 300 men are employed. R. S. Moore is president and the home office at 40 First street, San Francisco. This company also operates a paper and board mill at Antioch and one at Los Angeles.

Pacific Graphite Works, located at Fortieth and Linden streets, Oakland. W. C. Chedic owns the works, as well as a large deposit of graphite 3 miles south of Carson City, Nevada, the latter being held under the title of the Carson Black Lead Company. The lump graphite is shipped to the works, where it is ground in an 8′ x 4′ tube mill and refined and classified by air blowers. The silica falls first, and the different sized products are deposited in different chambers. It is sold for the manufacture of paints and lubricating oils.

The **Pacific Guano and Fertilizer Company** have a grinding and mixing plant at Second and Bristol streets, West Berkeley. The product is made by grinding and mixing together bones, shells, nitrate of soda, super-phosphate, sulphate of ammonia, blood, etc. The nitrate of soda is obtained from Chili, while the super-phosphate is made at the plant of the Union Super-phosphate Company, a subsidiary concern located at Stege, Contra Costa County. The principal market is throughout California and in the Hawaiian Islands. About 100 men are employed at the plant. Geo. N. Wilcox is president of the company; home office at 343 Sansome street, San Francisco; Mr. Anderson is superintendent.

Philadelphia Quartz Company of California. Works at Sixth and Grayson streets, West Berkeley. Principal product is silicate of soda, the production being about 1250 tons per month. It is marketed throughout the Pacific Coast and in Japan. The plant has been built about two years. From 25 to 30 men are employed. Clay and sand are obtained from Amador County, the two being separated at the plant. The sand is used for the production of the silicate of soda, and most of the clay is sold. The company has five plants in the East. G. R. Hunter is in charge of the works.

The **Pure Carbonic Company** have a plant at Third and Virginia streets, West Berkeley, for the manufacture of carbon dioxide (CO_2). The lime rock is obtained from Santa Cruz County. There are two vertical furnaces, only one of which is now in use, the other being old style. About 700 pounds of rock are put in for each charge, and 70 pounds of coke are required, per charge, for fuel. The time required for each charge is about three-quarters of an hour. The carbon dioxide is carried from near the top of the furnace, and after various treatments is marketed in two sizes of steel cylinders, holding 20 and 50 pounds respectively, and each under 1000 pounds pressure. The production is about 7000 cylinders per 16 hours. The larger cylinders can be filled practically as fast as the smaller ones. The carbon dioxide is used for extinguishing fires, charging mineral water, etc. About 2000 cylinders were recently (April, 1919) sent to the Argonaut mine, Amador County, to extinguish the fire in that mine.

The **San Francisco Sulphur Works**, located at Seventh street and Snyder avenue, West Berkeley, is owned by the Stauffer Chemical Company, home office 624 California street, San Francisco. This is a sulphur refinery, the raw material coming from Texas, Louisiana and Japan. The process consists of sublimination, condensation, grinding and classification through various sized screens. The products are various grades of pure sulphur.

An oil refinery at the same plant is near completion (May, 1919), at which it is planned to manufacture all kinds of vegetable oils, such as cocoanut oil, etc.

Standard Chemical Company. T. Seymour Hall, manager. Plant located at Emeryville; formerly in East Oakland. Products are tree and plant sprays, for insects, mildew, etc.; plant stimulant; rodent poison; and a cooling compound for steel cutting tools. Some sulphur is used, which is obtained from the San Francisco Sulphur Company (Stauffer Chemical Company).

West Coast Calsomine Company. Located at Fifty-first and Grayson streets, West Berkeley, on the main line of the Southern Pacific Railroad. The siding is called Livny. The products are calsomine, whiting, graphite, ochres, yellow iron oxides, etc. Chalk is obtained from England; limestone from El Dorado County, about 5000 tons per year; barytes from Nevada County, 2000 tons per year; clay from Lincoln, Placer County, 1000 tons per year; graphite from the state of Nevada, 200 tons per year. About 50 men are employed. John Stauffer is president, and C. W. Norrell, secretary.

COLUSA COUNTY.

Colusa County is one of the Sacramento Valley counties whose western edge extends into the Coast ranges. Its mineral resources are confined principally to that section. Gold was produced at the Manzanita Mine as early as 1865. Quicksilver production began in 1875. The total value of its mineral products to date has amounted to several million dollars. The principal products have been sandstone, mineral water, quicksilver, gold and silver, stone industry, salt, brick and chromite. These deposits and other undeveloped mineral resources are described in detail in the Fourteenth Report of the State Mineralogist. Bulletin No. 76 covers the manganese and chromite deposits and Bulletin No. 78 contains detailed description of the quicksilver mines of the county.

During the year 1920 active operations have been carried on in developing gold and quicksilver properties, mineral water and petroleum. Chrome and manganese mining ceased on the signing of the armistice. Changes in ownership have been noted.

Table of Mineral Production.

Year	Gold and silver	Quicksilver		Sandstone		Mineral water		Stone industry	Miscellaneous and unapportioned
	Value	Flasks	Value	Cu. ft.	Value	Gallons	Value	Value	
1875		700	$58,905						
1876		407	17,908						
1877		463	17,382						
1878									
1879									
1880	*$4,908								
1881	3,500								
1882	2,575								
1883	1,000								
1884	1,530								
1885	45,000								
1886	11,617								
1887	7,461								
1888	6,000								
1889	13,626								
1890	2,810								
1891									
1892									
1893	300								
1894				20,000	$7,500				
1895		1	40						40 tons, $400; salt
1896		58	2,064			50,000	$12,530		
1897		43	1,510			31,500	1,620		8 tons, 100; salt
1898						21,000	1,050		21 tons, 420; salt
1899						5,000	1,120		20 tons, 300; salt
1900		275	12,350			53,500	12,350		20 tons, 80; salt
1901	1,890	235	10,575	88,981	80,082	92,200	20,220		18 tons, 270; salt
1902	850	605	26,100	99,395	87,456	142,305	79,698		270 M., 2160; brick
1903		510	21,708	146,828	312,500	174,000	85,000		18 tons, 396; salt
1904		1400	16,526	100,000	200,000	156,170	38,051	$1,250	18 tons, 360; salt
1905		326	12,321	118,954	276,988	160,000	80,000		18 tons, 180; salt
1906				88,821	101,802	197,375	49,344		300 M., 1800; brick
1907	742	17	648	86,954	78,259	254,075	51,233	3,500	18 tons, 225; salt
1908	584	21	900	73,284	43,971	200,000	88,000	850	150 tons, 1700; salt
1909		11	545	47,070	24,034	150,000	75,000	620	16 tons, 240; salt

1910				112,947	56,505	150,000	75,000	16,500	10 tons, 125; salt 1596; unapp.
1911		5	230	101,029	50,027	126,300	68,150	16,702	
1912				51,137	15,804	165,330	39,061	15,300	
1913				34,927	15,550	132,720	32,931		
1914				16,000	7,300	92,000	24,951		
1915						91,480	15,003	1,000	
1916		285	26,648					550	(1) $15,605
1917								600	(2) 15,721
1918								700	(3) 15,700
1919								4,900	(4) 2,400
Totals	$104,303	4,385	$226,359	1,186,327	$1,448,298	2,455,045	$851,212	$62,472	$59,857

Totals.

Gold and silver	$104,303
Quicksilver	226,359
Sandstone	1,448,298
Mineral Water	851,212
Stone industry	62,472
Miscellaneous and unapportioned	59,857
Grand total	$2,752,501

*1880 to 1890, U. S. Mint Reports.
†Flasks of 75 pounds since 1904; previously 76½ pounds.

Cerise Mine. This property was formerly a part of the Manzanita mine and also includes the old Cherry gold mine. It is situated in the Sulphur Creek district, section 29, T. 14 N., R. 5 W. Owners, Ellis, Turman and Austin; Geo. C. Ellis, president; Frank Turman, secretary; Chas. L. Austin, general manager; post office, Wilbur Springs. The nearest railroad connection is at Williams, twenty-six miles east, reached by good automobile road direct from mine. There is no timber. Water from Bear Creek is piped 8000 feet to the property, which lies at an elevation of 1400. The mine was discovered in 1863 by Cherry, Northey et al., and was worked intermittently until 1916, when it was taken over by Chas. L. Austin. The Manzanita claim was located February 21, 1863, the Monticello, March 19, 1863, the North Star, March 12, 1883, the Monticello mill site and Hughs mill site, March 19, 1883. All were patented in 1893. The total area is about one hundred acres and the claims cover the lode for 2000 feet.

The country rock is slate and serpentine. The deposit consists of mineralized slate beds without definite walls. Values are confined to seams in the oxide zone. Below twenty feet sulphides appear disturbed throughout the whole rock. The gold is finely divided and combined with various mineral salts.

The mineralized beds average about one hundred feet wide and have a general northerly strike and easterly dip. These beds have a proven length on the surface of three hundred feet each. The greatest vertical depth below the outcrop is one hundred feet, reached by tunnel. Tunnels and drifts totaling 1000 feet have been run, 300 feet being in ore. Ore reserves are estimated by the management to approximate 500,000 tons. The method of mining will be by quarrying. The mine is equipped with three semi-Deisel engines, three gas engines, ball mill, machine shop and assay office.

The ore carries both cinnabar and gold and during the past four years efforts have been directed to developing a process for the recovery of the gold. Reduction equipment has not been decided upon, as experimental work is still being carried on.

Prospecting was active at the time of visit, with six men employed. Sinking costs $25 per foot. Labor is paid $5 a day; transportation one-half cent a pound. Details in regard to former operations are described in Bulletin No. 78 under "Manzanita Mine."

Clyde Mine. San Francisco capitalists took over this property under lease and bond in 1919 and active development work was carried on for some months, but it was stated that the ore bodies did not prove of sufficient size to warrant further work and operations ceased. The mine has been idle since.

MANGANESE.

Manzanita Mine. (See under Quicksilver.)

Black Diamond Manganese Mine. Abandoned.

MINERAL PAINT.

Ruby King Mineral Paint Company. The mill at this property has been closed down and dismantled, but some shipments of crude ore have been made.

MINERAL WATER.

Cooks Mineral Spring. This spring was not opened as a resort during the year, but casual parties can find camping accommodations. A small amount of water was bottled for shipment.

Jones Hot Sulphur Springs. These springs have been purchased by the Wilbur Springs Company and are now a part of the Wilbur Springs property.

Wilbur Hot Sulphur Springs. J. W. Cuthbert, owner, F. K. Lippitt having retired. A new concrete hotel was erected in 1915.

PETROLEUM.

Active prospecting for oil began at several points in Colusa County during the year. The **Mountain House Standard Oil Company** began drilling near Mountain House (Venado post office) and had reached a depth of seventy feet at the time of visit. The **Blue Ridge Petroleum Company** were erecting a rig west of Arbuckle preparatory to drilling. A report on these and other operations will be found in Bulletin No. 89, now in preparation.

QUICKSILVER.

None of the quicksilver properties of Colusa County were in operation during the year, with the exception of the Cerise mine, the ore of which carries gold values. See under Gold and Silver.

Empire Group. Now owned by R. A. Boggess, 1610 Sutter street, San Francisco.

Manzanita Mine. This property has been purchased by the Wilbur Springs Company. Idle.

Wide Awake Mine. Owner A. A. Gibson, Oakland.

SANDSTONE.

Both the **Colusa Sandstone Company's** quarry and the **McGilvray Stone Company's** quarries near Sites have been closed down and the narrow gauge railroad which formerly connected with the Southern Pacific main line at Colusa Junction has been torn up.

CONTRA COSTA COUNTY.

By E. Huguenin and W. O. Castello.

(Field Work in 1919.)

INTRODUCTION.

Contra Costa County, created February 18, 1850, is one of the East Bay counties and adjoins Alameda County on the north. It has a water front of 70 miles, nearly all of which is on deep water, and a land area of 714 square miles, approximately 400 square miles of which are under cultivation. Its population as estimated from registration figures for 1918 is around 65,000.

The county is traversed by both the Southern Pacific and the Santa Fe Railroad, the former following the coast line throughout its length. Its proximity to San Francisco, together with its deep water frontage and excellent railroad facilities, has led to the establishment of many important industries along its shore. Among the most important of these may be mentioned the Standard Oil Refinery at Richmond; the Union Oil Refinery at Oleum; the Selby Smelter at Selby; the California and Hawaiian Sugar Refinery at Crockett; the Mountain Copper Company's Smelter, and the Shell and Associated Oil Refineries near Martinez; and the Pacific Coast Shipbuilding Company's shipyards at Bay Point.

Richmond is the largest city, having a population of about 25,000. It is the terminus of the Santa Fe Railroad and essentially an industrial city. Here are located the Standard Oil Refinery, the Pullman Car Shops, Western Pipe and Steel Company, Pacific Porcelain Ware Company, Los Angeles Pressed Brick Company, Santa Fe Shops, and many other important industries.

Martinez, with a population of 5000 is the county seat. It is located on Carquinez Straits which forms the boundary line between Contra Costa and Solano counties. Antioch, Pittsburg, Bay Point, Port Costa, and Crockett, all located along the northern waterfront, are important industrial towns.

Two ridges of the Coast Range Mountains strike northwest and southeast across the county, the most prominent being the eastern ridge which culminates in Mount Diablo at an elevation of 3849 feet above sea level. This peak is an important landmark, being visible from all the surrounding country, and forming the western boundary of the San Joaquin Valley at this place. The western ridge lies close to the coast and its crest is more regular, but its highest peaks are less than 2000 ft. in elevation above the sea level. Extending westward from this range is a wide plateau which slopes gently towards San Francisco Bay. San Ramon Creek flowing northward across the middle of the county between the two ridges, joins Walnut Creek which empties into Suisun Bay. Marsh Creek, which rises in the east slopes of Diablo, flows northeastward into the San Joaquin River. These are the only streams of importance in the county.

MINERAL RESOURCES.

Comparatively few minerals are produced in Contra Costa County, with the exception of the structural materials, brick, cement, limestone, and crushed rock. The coal fields on the northwesterly slope of Mount Diablo, opened in 1865, were large producers up until 1903, since which time very little coal has been mined. The mines are now practically idle. The production of mineral water from Alhambra Springs near Martinez has been an established industry for the past twenty years.

The minerals in order of their value are: cement; crushed rock and sand, combined under the heading stone industry; brick; coal; limestone; lime, mineral water, and under the miscellaneous item, asbestos, clay and copper.

Other minerals that are known to occur in the county are manganese, quicksilver, and soapstone.

BRICK AND CLAY.

The **Carquinez Brick and Tile Company** formerly operated a brick yard at Eckley, near Port Costa, for the manufacture of common red brick. The property has been idle since 1914, and the plant was torn down in 1918. R. W. Harrison, 149 California street, San Francisco, is president.

N. Clark and Sons. This company formerly quarried a deposit of calcareous shale at Walnut Creek, ½ mile north of the town on the Southern Pacific Railroad. It has not been worked for some time, as part of the Alameda pottery was destroyed by fire in July, 1917. It is now being rebuilt and no doubt the quarry will be worked again in the near future. The shales are thin bedded and the deposit is developed by an open cut whose face is approximately 150′ wide and 70′ high. The material is broken down by hand drilling and blasting, through a chute onto a loading platform alongside of the railroad. It is shipped to their plant at Alameda, where it is used as a filler in the pottery work. (See under Alameda County.)

The **Coast Firebrick Company** in the early part of 1919 completed the construction of an extensive plant at Richmond. The home office is in the Oakland Bank of Savings Building, Oakland, Mr. Lynn in charge. The company will manufacture fire brick and other clay products.

Diamond Brick Company, 242 Balboa Building, San Francisco; Sumner Crosby, secretary. A brick yard for the manufacture of common red brick was built at Pittsburg by this company in 1915. The plant was abandoned, and has been partially dismantled.

Los Angeles Pressed Brick Company. (See Richmond Pressed Brick Works.)

Pacific Porcelain Ware Company. Home office, 67 New Montgomery street, San Francisco; Newton W. Stern, president and general manager. The works of this company are at Richmond, and are very extensive, consisting of two vitreous china plants, one of which is at San Pablo, for the manufacture of all types of sanitary porcelain ware,

and a porcelain enamel cast iron ware plant. The minerals used in the manufacture of the porcelain ware are shipped to the plants from the several different counties as follows: fire clay from Amador, common clay, Napa; quartz, Placer, and feldspar from Monterey, San Bernardino and Tulare counties. Borax is supplied by the Pacific Coast Borax Company. The quartz and feldspars are used for the glazing.

For the manufacture of porcelain ware the clay is first thoroughly mixed in solution, then screened and filtered through a press to get rid of water. Cakes from press containing 25% moisture are put through the pug mill and the clay is then ready for moulding. All moulding is hand work. The moulded objects are allowed to dry and



Photo No. 3. Moulding room at the Richmond plant of the Pacific Porcelain Ware Company.

then burned in updraught kilns, after which the glaze is applied, by submerging the object in the glaze solutions. It is then dried and reburned to produce the final glaze. The drying is done in steam heated rooms. The plants are equipped with 9 updraught kilns using crude oil fuel.

The feldspar and quartz are crushed at the San Pablo plant. This is equipped with a Joshua Hendy jaw crusher and a 6′ Hardinge mill, as well as 2 ball mills. The Hardinge mill has lately been installed to replace the ball mills. Electric power is used to operate the plant. Over 100 men are employed by the company. W. C. Potter is superintendent.

Port Costa Brick Company owns and operates a brick yard ¾ mile east of Port Costa at edge of Carquinez Straits. A bank of blue shales, in places decomposed to reddish clay are quarried by pick and shovel

in a large open cut about 1000′ beyond the yard. It is shovelled into a large side dump car which is trammed by a gasoline motor to the works. The equipment consists of a stiff-mud machine and Hoffman continuous kiln. The capacity of the plant is 40,000 bricks daily. Electric power from the Great Western Power Company is used to run the works. About 300 h.p. is utilized. Twenty-five men are employed during the season. Only common red bricks are manufactured. C. G. Berg is president and W. S. Hoyt, secretary; home office 119 Jessie street, San Francisco; B. F. Ferrario, superintendent at the plant.

Richmond Brick Company formerly operated a brick yard 1 mile west of Richmond. The plant, equipped with a patent kiln of the company's design, has been idle for several years, and the company is disorganized.

Bibl.: Bull. 38, p. 242.

Richmond Pressed Brick Works. The Los Angeles Pressed Brick Company erected this plant at Point Richmond in 1907 for the manufacture of common red, vitrified, and fire brick, roofing and floor tile. The clay from which the common brick and tile are manufactured occurs in a hard bed varying up to 39′ in thickness, located on the hill back of the plant. A bank of red shale about 1000′ north of the yard is quarried for the manufacture of the paving brick. The clay is excavated by a drag line scraper, and must first be loosened by blasting. A gravity tram transports the material to the plant, which is equipped with a stiff mud machine, capacity 100,000; a Fernhold brick press, capacity 16,000; and three 36′ down-draught kilns. The common bricks are burned in field kilns. Electric power is used to operate the plant, and crude oil fuel in the kilns. From 15 to 20 men are employed during nine months of the year. The company operates several large brickyards in Los Angeles and Riverside counties. Howard Frost is president and H. B. Potter, secretary; home office, 410 Frost Building, Los Angeles.

CEMENT.

The **Cowell Portland Cement Plant** is situated about 10 miles southeast of Bay Point at the base of Lime Ridge. The Bay Point and Clayton Railroad, a standard-gauge road, connects the plant at Cowell with the main lines of both the Santa Fe and Southern Pacific railroads at Bay Point.

The quarry from which both the lime rock and clay are obtained is on the ridge back of the plant. The lime rock is a travertine which occurs as superficial deposits over the ridge; several of the patch-like deposits have been exhausted. It varies considerably in character, the greater part being compact and drab colored. In places it is bluish in color and brecciated. Small patches of porous white tufa are occasionally encountered mixed with the other rock.

The present working quarry is at the summit of the ridge. It is opened by a large semicircular cut whose face is about 20′ high and several hundred feet across. Air drills are used in quarrying, and after blasting the rock is loaded into 6-yard cars by steam shovels. A string of 3 cars is hauled by a dinkey engine ½ mile around the ridge, where



Photo No. 4. Cowell Portland Cement Plant.

the cars are transferred to a gravity tramway 1500 feet long. This transports the rock to the crusher at the terminus of the railroad, less than ½ mile from the cement mills. The rock is crushed and then hauled by a standard locomotive to the various bins at the plant.

From the bins the materials are fed to five 5′ x 60′ rotary driers, 2 of which are for the clay and the remaining three for the lime rock. The latter is then conveyed by a system of Peck carriers to 8 ball mills and subsequently to storage bins, where hourly samples are taken. The clay after drying is pulverized in 2 Williams pulverizers, and then stored in bins, from which also, hourly samples are taken. The proper mixture is then automatically made before being fed to the tube mills. Ten 5′ x 22′ and two 7′ x 22′ tube mills reduce the mixture to a fine powder, which is introduced to the kilns. There are 8 kilns 7½′ x 110′ in size. The temperature in the kilns is controlled by an original electric stack signal, designed and patented by the company, whereby a red light is flashed in a glass case bearing the kiln number, when the gas temperature in the stack exceeds a certain degree. The clinker is passed through four 5′ x 60′ rotary coolers, and then conveyed to the storage bins, which are housed in the same building with the kilns. The 40 bins have a total capacity of 125,000 bbls. The clinker is sampled, the samples being briquetted for strength tests, before it is pulverized. The ball mills and 14 tube mills perform this final operation.

Each ball mill, tube mill, and kiln is driven by an independent motor, so that any unit can be cut out without interferring with the operation of the remaining plant. The electric power to operate the entire plant is supplied by the Great Western Power Company, whose main transmission line crosses the property. It is delivered at 100,000 volts and reduced and distributed at 440 volts. It has been estimated that it requires 1 h.p. for each barrel of cement produced. The capacity of the plant is 4000 bbls. From 200 to 235 men are employed. Owner, Henry Cowell Lime and Cement Company, 2 Market street, San Francisco; W. H. George is general manager, and W. R. Kleckner, superintendent.

COAL.

The coal beds of Contra Costa County lie on the northern slopes of Mount Diablo, about 6 miles south of Pittsburg, and are limited to a belt about 2½ miles in extent, striking in a general east and west direction. The field became an actual producer in 1861, and was mined for many years. Several large mines were opened and railroads were constructed from both Pittsburg, formerly called Black Diamond, and Antioch to the field. The two largest producers were the Black Diamond and Pittsburg companies. The former is said to have produced over $1,000,000 during the period from 1865 to 1884. The coal beds were mined to water level, when work ceased, and they have been practically idle since 1902. The old buildings are gone and very little remains to attest to its former activity.

The beds are described by George Otis Smith of the U. S. G. S.* as follows: "The coal beds of the Mount Diablo field are three in number. The uppermost is the Clark, the next the Little, and the lowest the Black Diamond. The section of that part of the Eocene rocks in

*22d Annual Report, Part III, p. 500.

which the coal beds occur is quite variable, so that the stratigraphic distance between the Clark and the Black Diamond seams varies from 300 to 400 feet in different parts of the field. The Clark seam has been a favorite in the different mines, and has been worked continuously throughout the field. It has a thickness of from 2 to 4 feet of coal, which is generally free from slate, and the seam for the most part possesses a good floor and roof. As is the case with all the coal seams of California, the outcrop is generally a light, soft shale, not at all resembling coal, and marketable coal is not found in the seam until a depth of at least 100 feet is reached. The Little seam is more irregular in thickness, but where worked has about 2 feet of good, clean coal.



Photo No. 5. Old camp of Nortonville, looking northward; dumps of the Black Diamond Coal Mine in the foreground.

The character of the roof and footwall, however, makes this coal more expensive to mine than that in the Clark seam. This is also true of the Black Diamond seam, which, while the thickest seam of the three, having from 3 to 4 feet of coal, has associated with it such amounts of slate and bone as to make the mining expensive and often dangerous on account of the swelling of the bone, which causes crushing of mine timbers."

An analysis of the Black Diamond coal, as given by R. B. Smyington, former engineer for the Black Diamond coal mine, is as follows:

Water	10.5%
Volatile hydrocarbons	28.1%
Fixed carbon	40.7%
Ash	20.7%
	100.0%

The coal from this field can not compete with the harder coals from outside of the state for the ordinary commercial purposes, but its proximity to the growing industrial towns along the northern water front will undoubtedly cause it to be mined again. It can be used for producer gas or as fuel at the property to develop power which could be transmitted to the nearby towns.

Bibl.: Repts. VII, p. 142; VIII, p. 160; XII, pp. 43-46; XIII, pp. 51-52. U. S. G. S. 22d Annual Rept., Part III, p. 500.

LIME AND LIMESTONE.

Henry Cowell Lime and Cement Company's Quarry. The quarry has been described under the heading "Cement." It was first opened for the burning of lime and it was not until 1907 that the cement mills were erected. There are 4 standard continuous kilns below the quarry, but practically all of the limestone now produced is used in the manufacture of cement.

Bibl.: Bull. 38, pp. 66-67.

The **Spreckels Sugar Company** formerly operated a quarry on the same ridge, but about 2 miles south of the Cowell Company's quarry. The lime rock is travertine, essentially the same as that occurring on the Cowell property. It was shipped to the sugar mills at Crockett, and also to the Selby smelter, where it was used for fluxing purposes. The quarry was closed down in 1915 and later sold to the Henry Cowell Lime and Cement Company. All buildings have been removed and the property is used as a cattle range.

MANGANESE.

Manganese occurs on Red Rock in San Francisco Bay just off the Contra Costa coast, and included within the county limits. This deposit is described by A. C. Lawson* as follows: "The ore occurs on the southwest side of the island as an integral part of the radiolarian chert. The chert here has a west-northwest strike and a nearly vertical dip, and consists of the usual rhythmical alternation of thin beds of hard, flinty to quartzose chert, and partings of shale, the whole having a reddish color. . . . A belt parallel to the strike of the chert includes interstratified layers of psilomelane, which, by reason of their black color, present a bold contrast to the adjoining rocks. Most of the layers are about one-fourth to one-half inch thick and replace locally the usual shale parting, but in places the psilomelane is much thicker. Some of the layers of the chert adjoining these layers of psilomelane are also so charged with that mineral as to be quite black, though they are still hard and siliceous. The psilomelane also occurs in minute particles in the shale between the chert beds, making it black. The borders of the belt in which these layers of psilomelane occur are not sharply defined, but the mineral has been mined in open cuts from 2 to 6 feet wide. The ore appears to be essentially a primary deposit, contemporaneous with the deposition of the silica that formed the cherts, although doubtless some of the psilomelane has since migrated into adjoining beds."

*U. S. G. S. San Francisco Folio, No. 193, p. 23.

"The shale partings north of the manganese ore outcrop on Red Rock are abnormally thick, generally measuring from half an inch to 2 inches, and at some places the shale is 1 to 2 feet thick. It has a soft, earthy consistence, and a shaly structure and is prevailingly red, though the color grades locally into yellow. This shale was at one time mined as a mineral paint.

Some small bunches of manganese ore have been found on the southeast side of Mount Diablo, but nothing of commercial importance has as yet been developed.

MINERAL WATER.

Alhambra Springs. A group of 6 more or less mineralized springs are situated in a narrow cañon 6 miles south of Martinez in section 2, T. 1 N., R. 3 W. Three of the springs have been developed, but of these only two are utilized. The principal spring, known as No. 1, fills a housed-in pool 6 feet square on the eastern bank of the ravine. It is strongly saline, as shown in the analysis below. No. 2 spring rises in a cement-covered joint on the western edge of the stream channel several hundred yards south of No. 1. The waters of No. 2 are less strongly mineralized.

Analysis of Water from Alhambra Springs.

(Analyst, Thomas Price and Son; authority, advertising matter.)

	Grains per United States gallon	
	No. 1 Spring	No. 2 Spring
Calcium chloride	157.24	----------
Magnesium chloride	24.25	----------
Potassium chloride	7.58	1.395
Sodium chloride	492.65	2.028
Calcium bicarbonate	----------	19.247
Magnesium bicarbonate	----------	14.680
Sodium sulphate	2.46	15.548
Sodium sulphide	8.39	----------
Ferrous carbonate	1.16	----------
Aluminum oxide	----------	0.238
Aluminum sulphate	2.13	----------
Silicon dioxide	1.22	0.758
Total residue	697.10	53.894

Water from the two springs is piped to tanks and thence to the bottling works beside the railroad at Martinez. The waters of No. 2 are used in the manufacture of ginger ale and other carbonated drinks, while that of No. 1 is bottled for medical use. Various blends of the two waters are made for medicinal purposes. The waters have been on the market for over twenty years. Owner, Alhambra Mineral Springs Company, L. M. Lassell, Martinez, California.

Bibl.: Rept. XIII, p. 508; U. S. G. S. Water Supply Paper 338, pp. 293-294.

Byron Hot Springs.[4] "On the western border of San Joaquin Valley, near the eastern corner of Contra Costa County, a number of mineralized springs—Byron Hot Springs—rise in a saline flat that is

[4] U. S. G. S. Water Supply Paper 338, pp. 109-112.

partially inclosed by low hills. A large, well appointed hotel and four or five cottages have here formed one of the most noted spring resorts of the State. The place is easily reached by automobile from the eastern side of San Francisco Bay'' . . . ''A small, warm sulphur spring supplies a drinking basin in the main grounds; warm sulphur mud and water baths and a sulphur plunge are about 250 yards southeast of the hotel grounds. A strongly sulphureted spring, 83° in temperature, forms a slightly used drinking pool at one side of Sulphur Plunge, and on the opposite side is a well from which mineral water is pumped to bathtubs in the hotel.'' . . . ''About 250 yards beyond the Sulphur Baths and Sulphur Plunge is an inclosed swimming pool, known as the Gas Plunge, in which the temperature is about 88°. Between the two bathing establishments are two cemented drinking springs, known as the Hot Salt and the Liver and Kidney springs. The Hot Salt, with a temperature of 120° and a flow of about 2 gallons a minute, rises in a small, domed, concrete house; the Liver and Kidney Spring rises in a concrete basin 25 yards southward. In 1908 its temperature was 73°, but its flow was not appreciable. Near the base of a hill 250 yards to the southwest is a tile-lined basin or well, marked ''Surprise,'' which contains strongly saline water about 70° in temperature.

The following are analyses of waters from five of the springs:

Analyses of Water from Byron Hot Springs, Contra Costa County, California.

(Constituents are in parts per million.)

	1		2		3		4		5		6		7		8		9		10		11	
Temperature	41° C. (105° F.)		21° C. (75° F.)		21° C. (70° F.)		19° C. (67° F.)		35° C. (97° F.)		14° C. (58° F.)		50° C. (122° F.)		50° C. (122° F.)		49° C. (120° F.)		32° C. (90° F.)		35° C. (54° F.)	
Properties of reaction:																						
Primary salinity		54		46		50		84		85		84		82		82		79		93		37.5
Secondary salinity		0		0		0		16		12		16		15		15		19		7		37.5
Tertiary salinity		0		0		0		0		0		0		0		0		0		0		0
Primary alkalinity		31		36		39		0		0		0		0		0		0		0		0
Secondary alkalinity		18		18		11		3		3		3		3		3		1		4		1
Tertiary alkalinity		178		141		23		Trace.		2		1		1		1		1		10		Trace.
Constituents	By weight.	Reacting values.	By weight.	Reacting values.	By weight.	Reacting values.	By weight.	Reacting values.	By weight.	Reacting values.	By weight.	Reacting values.	By weight.	Reacting values.	By weight.	Reacting values.	By weight.	Reacting values.	By weight.	Reacting values.	By weight.	Reacting values.
Sodium (Na)	143	6.20	149	6.49	260	11.67	1,250	181.80	1,193	182.30	1,353	189.21	3,735	192.10	3,741	192.97	3,886	168.96	2,631	115.76	103,816	1,515.09
Potassium (K)	17	.42	23	.59	45	.12	206	7.56	207	7.84	13	1.09	318	8.42	324	8.28	33	.84	324	8.29	1,377	39.65
Lithium (Li)					0	.00	Tr.	Tr.			2.0	.29	Tr.	Tr.			12	1.71				
Ammonium (NH_4)					.1	.01	17	.95	18	.98	13	.71			.5	.03	10	.57	Tr.	Tr.	Tr.	Tr.
Barium (Ba)	Tr.	Tr.			Tr.	Tr.	13	.18	11	.16	7.8	.11	Tr.	Tr.	2.0	.03	6.2	.09	Tr.	Tr.	1.4	.02
Strontium (Sr)					Tr.	Tr.	Tr.	Tr.			.9	.02	Tr.	Tr.			.8	.02				
Calcium (Ca)	10	.50	10	.52	15	.77	554	27.67	538	26.81	583	29.09	654	30.16	695	30.19	701	34.96	113	5.61	14,980	747.44
Magnesium (Mg)	12	.98	12	1.01	8.8	.72	91	7.51	94	7.71	130	10.65	70	5.76	69	5.64	109	8.98	51	4.22	3,473	285.75
Iron (Fe)	2.1	.07	*2.2	.08	1.5	.05	5.6	.20	5.9	.21	3.9	.13	7.0	.25	7.0	.25	2.5	.09	5.9	.21	22	.80
Aluminum (Al)																						
Manganese (Mn)					0	.00					0	.00					0	.00				
Sulphate (SO_4)	38	.80	22	.45	60	1.25	15	.31	13	.28	Tr.	Tr.	11	.23	10	.21	Tr.	Tr.	38	.80	797	16.58
Nitrate (NO_3) and nitrite (NO_2)					0	.00					0	.00					0	.00				

Chloride (Cl)	117	3.29	125	3.52	190	5.34	7,861	221.68	7,755	218.70	7,982	225.09	7,125	200.92	7,142	201.40	7,527	212.27	4,504	127.02	195,050	5,500.66
Bromide (Br)	-----	-----	-----	-----	1.9	0.2	Tr.	Tr.	Tr.	Tr.	18	.23	Tr.	Tr.	Tr.	Tr.	18	.22	1.8	.02	.7	.01
Iodide (I)	-----	-----	-----	-----	2.1	.02	9.3	.07	10	.08	17	.13	Tr.	Tr.	0.4	Tr.	16	.13	9.8	.08	1.4	.01
Sulphide (S)	-----	-----	-----	-----	6.2	.36	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Carbonate (CO_3)	122	4.68	142	4.72	179	5.98	204	6.79	209	6.95	127	4.24	166	5.54	165	5.50	72	2.40	183	6.11	1,932	64.40
Metaborate (BO_2)	Tr.	Tr.	-----	-----	15	.35	Tr.	Tr.	-----	-----	69	1.60	Tr.	Tr.	-----	-----	48	1.11	-----	-----	-----	-----
Arsenate (AsO_4)	-----	-----	-----	-----	0	.00	-----	-----	-----	-----	0	.00	-----	-----	-----	-----	0	.00	-----	-----	-----	-----
Phosphate (PO_4)	-----	-----	-----	-----	1.0	.03	-----	-----	-----	-----	Tr.	Tr.	-----	-----	-----	-----	Tr.	Tr.	-----	-----	-----	-----
Silica (SiO_2)	54	1.78	*51	1.70	46	1.54	17	.57	17	.57	31	1.02	34	1.12	34	1.13	30	.99	19	.62	15	.40
	515.1	-----	536.2	-----	800.5	-----	13,332.9	-----	13,170.9	-----	13,379.9	-----	12,670.9	-----	12,099.9	-----	12,471.5	-----	7,910.5	-----	321,389.5	-----
Carbon dioxide (CO_2)	223	10.15	180	8.18	0	.00	-----	-----	66	3.02	14	.65	25	1.15	26	1.16	8.7	.40	218	9.90	Tr.	Tr.
Hydrogen sulphide (H_2S)	42	2.47	38	2.25	25	1.49	-----	-----	-----	-----	0.4	.02	-----	-----	-----	-----	.6	.04	53	3.10	-----	-----

*The silica and ferrous carbonate in the Anderson analysis were interchanged before recomputation, comparison with the other analyses indicating that a typographical error had resulted in a misstatement of these values.

1. White Sulphur Spring. Analyst, G E Colby (1887). Authority, advertising matter.
2. White Sulphur Spring. Analyst and authority, Winslow Anderson (1889).
3. White Sulphur Spring. Analyst and authority, Curtis and Tompkins (1911).
4. Liver and Kidney Spring. Analyst, G. E. Colby (1887). Authority, advertising matter.
5. Liver and Kidney Spring. Analyst and authority, Winslow Anderson (1889).
6. Liver and Kidney Spring. Analyst and authority, Curtis and Tompkins (1911).
7. Hot Salt Spring. Analyst, G. E. Colby (1887). Authority, advertising matter.
8. Hot Salt Spring. Analyst and authority, Winslow Anderson (1889).
9. Hot Salt Spring. Analyst and authority, Curtis and Tompkins (1911).
10. Black Sulphur Spring. Analyst and authority, Winslow Anderson (1889).
11. Surprise Spring. Analyst and authority, Winslow Anderson (1889).

"The adjacent hills are composed of cherty gravels and other finer sediments that represent marine deposits, but the origin and character of the springs seem to be due to the local formation of a saline marsh. Several unsuccessful attempts have been made to obtain fresh water here. The domestic supply is pumped from a well 1¾ miles eastward."

Bibl.: Repts. VIII, p. 163; XII, p. 331; XIII, p. 510.

Ferndale Springs. Two carbonated springs issue from a bank of thick bedded sandstone on the south side of Vaca Cañon about 6 miles south of Martinez. The water from the principal spring is now bottled and marketed by the Richmond Soda Works, 1134 Ohio street, Richmond, R. H. Curry, owner and manager. The natural water is sold in 5-gallon jars for drinking purposes, and it is also used in the preparation of several soft drinks.

Bibl.: Water Supply Paper 338, p. 208.

Sulphur Spring in Pine Cañon.* "A moderately sulphureted spring emerges about 4 miles in a direct line northward from Danville, in Pine Cañon, which is at the western base of Mount Diablo. The water forms a clear pool, about 15 inches wide and 4 feet long, in thick bedded sandstone at the southern side of the creek. The yield is larger than is usual for springs of this class, being estimated at 5 gallons a minute, and the temperature of the water (67°) is also somewhat above the normal. The spring has not been improved, but it has been visited by occasional picnic parties. There are seepages within 5 yards of the spring, and 1½ miles further eastward, upstream, sulphureted water seeps from a bluff on the northern side of the creek. Only one spring of appreciable flow was observed along the cañon, however."

Sulphur Spring Near Walnut Creek.* "A group of sulphur springs lies near the northeastern base of a low ridge about 2 miles northeast of the town of Walnut Creek. The largest spring is on the ridge about 100 yards from its eastern base and 25 yards north of the county road. When the place was visited, the water rose in a board-curbed pool protected by a latticed house and was piped to a cattle trough a few yards away. It yielded about 3 gallons a minute of mildly sulphureted water, 81° in temperature." . . . "Five other smaller springs issue in a belt extending 350 yards along the base of the ridge, in and near the barnyard of Sulphur Springs farm. Two of them have been piped to watering troughs near by. The other three are of seeping flow and form only small marshy places."

"The ridge is composed of sandstone the dip of which is nearly vertical, and strike 5.30° E. (magnetic) along the trend of the ridge. The steep inclination of the beds shows that intense movement has taken place here, and a fault . . . extends along the border of the valley land. This structural break probably accounts for the rise of the springs and also for their thermal character."

QUICKSILVER.

Quicksilver was formerly mined on the east slope of the north peak of Mount Diablo, in section 29, T. 1 N., R. 1 E. During the late seventies the **Ryne Quicksilver Mine** was operated and is said to have pro-

*Water Supply Paper 338, p. 270.

duced as high as 85 flasks a month. The occurrences are very limited in extent and there has been no work done for a number of years.

Bibl.: Rept. VIII, p. 162. U. S. G. S. Mon. XIII, p. 378.

STONE INDUSTRY.

Under this heading are included crushed rock and sand.

The **Antioch Sand Plant** is located 1½ miles east of Antioch in the sand dunes bordering the San Joaquin River. A spur track of the Santa Fe railroad is laid to the property. A 20-h.p. electric motor operates a drag line scraper which empties into the freight cars below the platform. Four 50-ton cars can be loaded daily, only one man being necessary to control operation. The cars are switched by using the electric hoist which operates the scraper. The sand is fine grained and very clean. It is used for mixing with asphalt for road and street work. Owner, E. B. and A. L. Stone Company, 210 Rialto Building, San Francisco.

The **Bates, Boreland and Ayer Quarry,** also known as the old **Stege Quarry,** has been worked for over 20 years. It has been idle since August, 1918, due to lack of construction and street work. The quarry is on the ridge east of Stege, over 1000′ in elevation above the crusher, which is alongside a spur track of the Santa Fe, and adjoining the plant of the Hutchinson Company. The rock is a hard gray metamorphosed sandstone. A gravity tram 4960 feet long brings the rock from the quarry to the crusher. The present crusher was erected three years ago, and has a capacity of 450 cu. yds. per 10 hours. The bunkers below the crusher have a capacity of 3000 yards. Twenty men are employed. Owners, Bates, Boreland and Ayer, Oakland Bank of Savings Building, Oakland. C. D. Bates is manager. The owners formerly operated a quarry in San Pablo Cañon, the rock being used exclusively for the San Pablo Dam project of the East Bay Water Company.

Blake Brothers Quarry. See San Pablo Quarry.

Christen Quarry. This small quarry lies ¼ mile west of Pacheco. The rock is a soft buff-colored sandstone. It was quarried occasionally by the county officials for macadamizing the roads in that district. There is no equipment at the quarry, and it has not been worked for some time. J. M. Christen of Pacheco is the owner.

Bibl.: Bull. 38, p. 316.

Healy-Tibbetts Construction Company. See Point Molati Quarry.

The **Holland Sandstone Brick Company** operates a sand plant 1 mile east of Antioch in the sand dunes along the San Joaquin River. The method of handling is the same as at the Antioch Sand Plant, drag line scraper operated by electric hoist. One man is employed. The company was organized to manufacture a brick from this clean sand, and a large plant was erected. The bricks were not a success and the old plant has been partially dismantled. H. A. Buck, 22 Battery street, San Francisco, is president.

Hutchinson Company. (See Point Richmond and Stege Quarries.)

The **Oakland, Antioch and Eastern Railroad Company** operates a quarry alongside of the railroad near Valle Vista. A light-colored volcanic rock is broken down by blasting and loaded onto the cars by steam shovel. It is used for ballast.

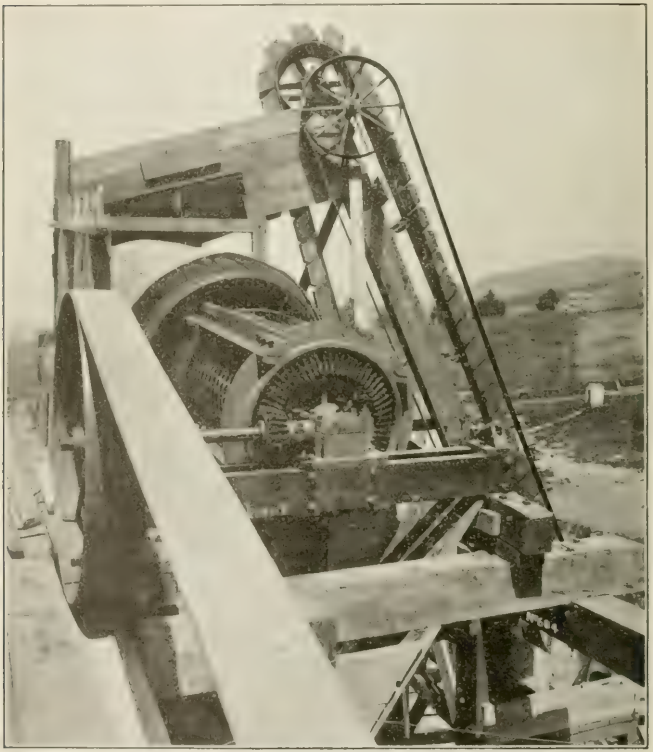


Photo No. 6. Detail of construction at the Bates, Boreland and Ayer Plant, showing arrangement of revolving screens, placed one within the other. Photo by courtesy of Meese and Gottfried Company.

Point Molate Quarry. The quarry is at the edge of San Francisco Bay 2 miles north of Point Richmond. The rock is a hard gray metamorphosed sandstone of the Franciscan formation. It is quarried in a large open cut whose face varies up to 100 ft. in height. Two steam shovels are in operation on the main floor of the crushing plant. In a pit 10 ft. below the main floor, 4 bull-wheel derricks are used to load rock in portable bunkers. These bunkers feed to skips which transport

the rock to the crushing plant. This plant is equipped with two No. 5 and two No. 3 gyratory crushers, trommels, bucket elevators and belt conveyors. It is operated by electric power. Steam power generated with crude oil fuel is used for operating derricks and hoists. Forty men are employed. The rock is used mostly for concrete in San Francisco and vicinity, to which it is shipped in barges at the quarry. Owner, Healy-Tibbets Construction Company, 9 Main street, San Francisco.

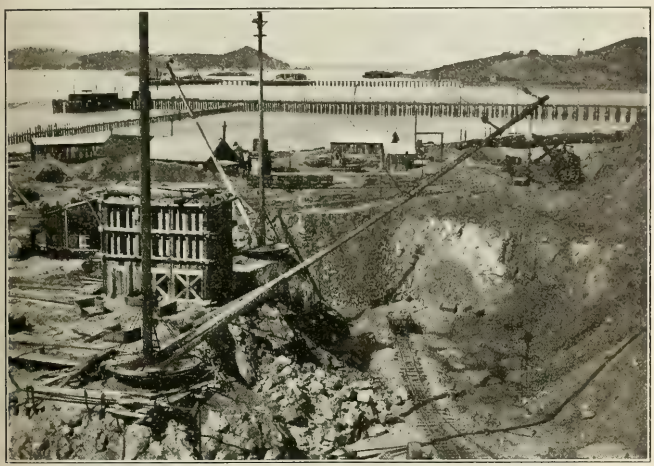


Photo No. 7. Point Molate Quarry looking westward, showing method of handling rock from pit by bull-wheel derricks.

Point Richmond Quarry. The Hutchinson Company, 444 Seventeenth street, Oakland, have been operating this quarry for the past five years. The rock is metamorphosed sandstone closely resembling that of the Point Molate and San Pablo quarries. It is quarried in a large circular open cut whose face is about 85 feet high. Air drills are used. The stone is shoveled into 1¼-yard cars and hauled by cable up an incline to the crushing plant. This consists of one No. 4 and one No. 3 gyratory crushers, bucket elevators and trommels having a capacity of 300 yds. per 10 hours. Electric power is bought of the Pacific Gas and Electric Company. The product can be shipped either by rail or water, as a spur track of the Santa Fe runs within 100 yds. of the plant. The best rock is used for concrete, and the poorer quality for ballast. Mr. Smalley is superintendent.

The San Pablo Quarry, also known as **Blake Brothers Quarry,** is at the edge of the San Francisco Bay about 1 mile north of Point Richmond, on the same range of hills as the Point Molate and Point Richmond quarries. The quarry is a circular open cut, approximately 480′ in diameter, having a face of 296′ in height at the highest point. The deposit here is very regular, consisting of a hard, gray siliceous sand-

stone. Steam locomotives haul the rock in 3½-yd. bottom dump cars of special design, to the 1000-yd. capacity crushing plant at the edge of the bay. Twelve cars are hauled per trip, and two locomotives are in constant use. A third is kept at the plant for emergencies. An Osgood steam shovel is used at the quarry.

The crushing plant, which has been in operation since 1907, was built in 2 parallel units, so that each may be operated independently. There are two No. 6, one No. 4 and two No. 3 gyratory crushers, four 15′ trommels and two 16″ belt conveyors 1240′ long, equipped with an automatic tripper for conveying the crushed rock to the storage bins. Tunnels



Photo No. 8. San Pablo or Blake Brothers Quarry. The face is almost 300 feet high.

have been built under the two bins, to house the belt conveyors that load the barges. These belts are 22″ wide and 1480′ in length. They load barges at the rate of 120 tons in 17 minutes. Electric power is used to operate the plant, 400 h.p. being required when running to full capacity. Each unit is driven by a separate motor. The storage bins have a capacity of 5000 cubic yards. A spur track of the Oakland Traction Company (electric) runs alongside the bunkers. Owner, Blake Brothers Company, 705 Balboa Building, San Francisco; Anson Blake is president; Edwin Blake, secretary; and J. Asmussen, superintendent at plant.

Slater Quarry. This quarry is situated ½ mile south of Pacheco. It is on the same ridge as the Christen quarry and the deposit is evidently a continuation of the same soft friable sandstone beds. The rock

was used occasionally for macadamizing roads in the vicinity, but the quarry is now idle. There is an outcrop of white limestone overlying the sandstone. This has not been developed and the cropping is small. A. E. Slater of Pacheco is the owner.

Bibl.: Bull. 38, p. 317.

Mrs. J. F. Scheller of Antioch owns a sand plant adjoining that of the Holland Sandstone Brick Company. A drag line scraper loads the sand directly into flat cars on a spur track of the Santa Fe, which runs into the property. When visited (May, 1919) the gasoline engine, which ran the scraper, was being removed and a 20-h.p. motor installed in its place. The sand is shipped to Oakland and San Francisco for use in asphalt pavements.

Stege Quarry, Hutchinson and Company, 444 Seventeenth street, Oakland, owner. The quarry is on the west slope of the Berkeley Hills, opposite Stege Station. A spur track of the Santa Fe runs up to the bunkers below the quarry. The rock is a metamorphosed sandstone. It is quarried in a large semi-circular open cut whose face is about 300 ft. high and about 300 ft. across. Three gyratory crushers, two No. 5 and one No. 3, handle all the rock, the capacity of the plant being 600 yds. daily. It is operated by electric power supplied by the Great Western Power Company. Fifteen men are employed. The rock is used for macadam and concrete purposes. Dwight Hutchinson is president of the company, and Hardy C. Hutchinson, secretary; W. R. Williams is superintendent at the plant.

MISCELLANEOUS CHEMICAL WORKS, COMMERCIAL PLANTS, ETC.

The Butters Electrolytic Zinc Syndicate have recently completed a plant about 2 miles east of Martinez, for the electrolytic refining of zinc ores and concentrates. The plant is located at Peyton Station on the main line of the Southern Pacific Railway. When visited, May, 1919, a few test runs had been made and final adjustments were under way. Ore and concentrates from the Afterthought copper mine in Shasta County were to be treated soon, and it was planned to treat custom ore later. The process consists of roasting in an open hearth furnace, and then leaching with sulphuric acid (H_2SO_4). The copper is first precipitated from the solution with zinc dust, and the metallic zinc is obtained by electrolysis.

The capacity of the plant will be about 3 tons of zinc metal per day. Twenty men are employed. A. V. Udell is superintendent and part owner. It is understood the plant is owned, in partnership, by five persons. Home office, Charles H. Butters, 6400 Chabot road, Oakland.

The **General Chemical Company** have an extensive plant at Nichols, about 2 miles east of Bay Point, on the shore of Suisun Bay. The products are the mineral acids, pyrite from Shasta County being used for their production. Between 300 and 400 men are employed. W. H. Nichols, Jr., is president of the company; home office at 25 Broad street, New York.

The **Giant Powder Company,** located at Giant, on the edge of San Pablo Bay, a few miles north of the city of Richmond, on the Southern Pacific Railroad. Principal product is blasting powder.

The **Great Western Electro Chemical Company** operate a large chemical plant about 1 mile east of Pittsburgh. The principal products are liquid chlorine, caustic soda, chloride of lime, and carbon tetrachloride. During the war the government took over and operated the chlorine plant. The electrolytic process is used in the manufacture of caustic soda. The carbon tetrachloride is the principal ingredient used in the manufacture of fire extinguishers.

Salt is the main crude material used and is obtained from works at Alvarada and Mount Eden. Lime is obtained from the Pacific Lime and Plaster Company at Sonora, Tuolumne County, and carbon bisulphide from the Stauffer Chemical Company.

The works are controlled by the Fleishhacker interests. W. H. Lowery is president; home office at 9 Main street, San Francisco.

Hercules Powder Company. Located at Hercules on the main line of the Southern Pacific Railroad, just north of the town of Pinole, and on the east shore of San Pablo Bay. Iron pyrites is used for the production of sulphur and sulphuric acid (H_2SO_4), about 50 tons of the latter being produced per day. The sulphuric acid is used for the manufacture of nitric acid (HNO_3) and other mixed acids which in turn are used in the manufacture of blasting and other kinds of powder.

Mountain Copper Company operates a large smelter on the south shore of Suisun Bay, about 1 mile northeast of Martinez. In connection with the smelter there is also a sulphuric acid plant and a plant for the manufacture of "Mococo" fertilizer. Built in 1905, it has been in operation almost continuously for the last 14 years. Recently (April, 1919) most of the plant has been closed down, owing principally to an over supplied copper market. When operating to capacity, between 150 and 200 men are employed. The main smelting equipment consists of 2 reverberatory furnaces, one 90-foot and one 60-foot; 2 stands of converters; 3 roasters, etc. The capacity is from 300 to 350 tons of crude ore daily, which yields from 10 to 15 tons of blister copper.

A great deal of ore comes from the company's mines in Shasta County, but some custom ore is also treated. The material consists of raw sulphides and siliceous ores, flotation copper concentrates, and roasted sulphides.

Both electric and steam power is used, a total of 500 horsepower being consumed. The slag has a value of 50c per ton for railway ballast, concrete aggregate, etc.

In the fertilizer plant, a phosphate rock obtained from Idaho is treated with sulphuric acid.

Home office is at 332 Pine street, San Francisco; T. B. Swift is superintendent at the plant.

The **Pacific Electro Metals Company,** until quite recently (the latter part of 1918) operated an electric smelter at Bay Point, for the production of the ferro and silico-alloys. The recent slump in the chrome and manganese market forced the plant to close. It has since (June, 1919) been taken over by the **Pacific Alloy and Steel Company,** who intend to begin operations soon.

The plant was designed by the Beckman and Linden Engineering Corporation, 593 Market street, San Francisco.

There are two large electric furnaces, each having a capacity of 12 tons of silico-manganese daily. Silico-manganese was the principal product, but some ferro-manganese was made.

Several additional furnaces of smaller capacity have been built, and it is expected that ferro-chrome, ferro-nickel, ferro-tungsten, and ferro-molybdenum will be made. The main furnace building is of reinforced concrete, 120 x 50 feet. The electrodes for the two large furnaces are 24 inches in diameter, hexagonal in shape and 7 feet long. Trouble was experienced at first in getting electrodes. A plant was erected in which these were made from lampblack residue from local gas plants.

The charge is shovelled around the electrodes and metal is tapped from the bottom, the process being continuous. In making silico-manganese, an ore carrying not less than 40% manganese and not over 20% silica is used, but one carrying 36% manganese and not over 18% silica could be used. The charge consists of ore, coke and iron turnings up to 3″ in diameter. Some of the coke used has been made locally from residue of California oil refineries. The silico-manganese produced carries 50% to 55% manganese, 20% to 25% silica, less than 1% carbon, not over .18% phosphorus and trace of sulphur.

This plant provides a market for such products as gas plant lampblack and crude oil residue coke, which have heretofore been of little or no value.

In relation to the above, it may be interesting to note that the Beckman and Linden Engineering Corporation have completed (June, 1919) the construction of a 1000-k.w. electric furnace at their laboratories, 41 Minna street, San Francisco. This will be used entirely for experimental purposes, and it will be at the disposal of any one interested in electric smelting processes. It is understood that there is only one other furnace of this kind in the United States, and that is at Niagara Falls.

The **Selby Smelting and Lead Company**‡ have for many years operated a large custom smelter at Selby, on the edge of San Pablo Bay, a few miles south of Vallejo Junction. This is claimed to be the largest smelter producer of gold in the United States, and employs several hundred men throughout the year. It is situated on the main line of the Southern Pacific Railroad, and hence receives ore shipments by both rail and water. Ores treated are principally those of gold, silver and lead, which come from all the Pacific Coast States, but principally from Nevada and California.

The plant represents an investment of approximately $4,000,000 and includes a 400-ton smelter, with lead stacks, a 200-ton lead reverberatory furnace, a refinery for parting lead and silver, a bag house having the Cottrell process for purifying the fumes, and a plant for the manufacture of bluestone.

The home office is in the Merchants' Exchange Building, 465 California street, San Francisco; H. B. Underhill, Jr., is president.

The **Union Super-Phosphate Company** have a plant at Stege, where phosphate rock, obtained from Wyoming, Idaho, and the Pacific Islands, is treated with sulphuric acid for the production of superphosphate. This is used by the Pacific Guano and Fertilizer Company, a subsidiary concern located in West Berkeley, for the manufacture of fertilizer. About 25 men are employed.

Mr. Kuch is superintendent at the plant; home office, 343 Sansome street, San Francisco.

‡Described in detail by T. A. Rickard, in the Mining and Scientific Press, April 8, 1916, Vol. 112, No. 15.

FRESNO COUNTY.

Fresno County has an area of 5977 square miles, or nearly three times that of the State of Delaware. It is bounded on the east by the summit of the Sierra Nevada Mountains, along which line there are numerous peaks exceeding 13,000 feet in elevation. The western boundary of the county is marked by the Diablo Range. It is traversed by several electric power lines, two transcontinental railroad systems and six oil pipe lines. Its total mineral production for 1919, the last year for which complete figures are available, amounted to $21,643,898. The products in order of their value were petroleum, natural gas, miscellaneous stone, brick, granite, magnesite, gold and silver. In addition occurrences of many other minerals are known which have not as yet been commercially developed.

A detailed description of the mineral resources of Fresno County is contained in the Fourteenth Report of the State Mineralogist, printed in 1916, to which the reader is referred for more complete information than that presented in the following brief notes.

ASBESTOS.

Asbestos has never been produced in this section of the state to date, although deposits have long been known to exist in the foothills of the Sierra Nevada boundary north and east of Sanger. Early in 1920 the Pioneer claim, upon which this mineral had been discovered, was located by S. M. Mingus, Arthur Lewis and D. M. Caley. This claim is situated about three-fourths of a mile west from the Archer quicksilver mine, 28 miles northwest of Coalinga, in the White Creek district.

BRICK AND CLAY.

Craycroft Brick Company. F. J. Craycroft, president; office 407 Griffith-McKenzie Building, Fresno. The plant of this company is located at Crayold Siding, 3 miles west of Fresno. This plant, which was built in 1911, has a daily capacity of from 50,000 to 60,000 brick. Considerable amounts of clay are shipped in from a deposit five miles south of Merced and mixed with the local clay which is obtained from a superficial valley deposit about five feet thick. It is loosened by scrapers and trammed to the mill where it is ground and passed through a stiff mud machine. Ten to forty men are employed at various times during the year, according to the market demands. The present outlook of the business is very good.

Prescott Brick and Lumber Company. Successors to Fresno Brick and Tile Company. E. M. Prescott, manager; Rowell Building, Fresno. This company formerly operated a plant at Mars Siding, about 1 mile southeast of the city limits. At the present time no brick is being manufactured locally, the product handled being obtained from the S. P. Brick Company at Exeter, in Tulare County.

CHROMITE.

During the war a great deal of prospecting for chromite was carried on in Fresno County and many valuable deposits were uncovered. One of the principal belts of this material occurs near Sentinal in township

11 S., R. 23 E., running in a northwest and southeast direction. During 1920 this branch of the mineral industry was dormant. Complete details relative to deposits have been printed in Bulletin No. 76, entitled "Manganese and Chromium in California."

COAL.

Fair sized deposits of coal, upon which some development work has been done in the past, are located near Coalinga and in Priest Valley, near the junction of Fresno with San Benito and Monterey counties. No production has been done on these coal beds since 1896. The impending shortage of oil, however, has revived interest in our coal resources and it is quite possible that renewed activity will be noted here in the near future.

COPPER.

The southern extremity of the foothill copper belt of the Sierra Nevada reaches for some distance into Fresno County. A great many mines and prospects have been worked along this belt in the past, although absolutely no activity was noted during the past year. Full details relative to this subject are contained in the Fourteenth Report of the State Mineralogist. At the time the property of the Fresno Copper Mines near El Prado was visited (May, 1920), the 400-ton smelter was being junked.

GOLD.

Gold mines and prospects are widely disributed throughout the eastern portion of Fresno County. On account of economic conditions, which have seriously retarded this branch of the mineral industry throughout the State, these mines were practically all idle during the year just closed. The only production of this metal noted was that of the Grant Rock and Gravel Company, at Friant, which produced sand and gravel, primarily for use in concrete and other construction work. The material dug from their gravel pit is washed and passed over Hungarian riffles and considerable gold is recovered as a by-product. A complete description of this company's operations is given under the heading of "Stone Industry."

MAGNESITE.

Magnesite is of frequent occurrence in the serpentine areas of California. The principal deposits of the state are located in the Coast Range Mountains, but large quantities are also found in the foothills of the Sierras, particularly in Fresno and Tulare counties. There was great activity in the production of this mineral during the war, but with the drop in prices a great deal of the former development work was brought to a standstill. With the closing of the calcining plant operated by Sinclair Brothers at Piedra in May, 1920, it is believed that production for Fresno County ceased entirely.

PETROLEUM.

The entire oil producing area of Fresno County is centered in the Coalinga field, where activities were first commenced in 1890. In the early days of this industry Fresno was the leading county of the state and it now takes second place only to Kern, both in point of annual

yield and in total amount produced to date. Details relative to this subject will not be entered into here, as they are available at great length in other publications, both of the State Mining Bureau and the U. S. Geological Survey. During the past year renewed efforts have been made to develop oil and gas, both in the western and the central portions of the county, but so far without success.

QUICKSILVER.

There has been no activity during the past year in quicksilver mining in this portion of the state. For complete details as to development and possibilities, see Bulletin No. 78, entitled "Quicksilver Resources of California," published in 1918.

STONE INDUSTRY.

Academy Granite Company. F. M. Blanchard, Academy, owner. This quarry is in section 13, T. 12 S., R. 22 E., 11 miles northeast of Clovis, on the Southern Pacific Railroad. The stone is locally known as "black granite." The color permits of a fine contrast of polished and unpolished surface, which makes it excellent for monumental and decorative purposes. It is medium grained and is harder than many of the lighter granites produced nearby. Formerly dressing and polishing of this stone was done at the quarry, but since November, 1918, the entire production has been shipped in the rough state to the Raymond Granite Company at Raymond, Madera County, where it has been finished. The business outlook is very promising. Since the Fourteenth Report of the State Mineralogist was written, operations at this quarry have uncovered a granite ledge twenty to thirty feet thick, striking in a northerly and southerly direction. From this ledge the rock obtained is of even better quality than that produced from the surface boulders.

California Road and Street Improvement Company. Roosevelt and Divisadero streets, Fresno. This company is still active, but the gravel bed formerly operated three miles southwest of Friant has been abandoned.

Doyle and Ghilotti Company. Successors to Gill and Doyle. This company operates a small granite quarry 11 miles northeast of Clovis. At the cutting sheds at Clovis pneumatic tools are employed, electricity furnishing the power. The product is retailed by the Fresno Marble and Granite Works, 2325 I street, Fresno, where cutting yards are also maintained.

Fresno Rock Products Company. C. W. Wood, president, F. R. Brisley, secretary; office, 400 Bank of Italy Building, Fresno. Plant at Woodrock on the Atchison, Topeka and Santa Fe Railroad. This company operates a rock crusher of 500 tons daily capacity, utilizing surface gravel and boulders principally, which are handled by a Hadsel type drag line excavator. Electric power is used. Twelve men employed.

Grant Rock and Gravel Company. Successors to San Joaquin Rock and Gravel Company; A. C. McMillan, secretary and manager, 328 Cory Building, Fresno; plant at Friant; H. W. Jones, superintendent.

Gravel pit. This pit formerly was circular in form, covering some 13 acres of ground. The gravel deposit is from 25′ to 35′ in depth, con-

sisting of gravel ranging from 5″ in diameter down to sand, is well graded, loose and very clean. Over the surface is a deposit of soil commonly known as strippings, reaching to a depth of 3 feet on the average.

Operations are now being carried on with 2½-yard Atlantic shovel and varying from the circular pit to a fantail shape wherein the track can be laid in a straight line from the hopper to the end of the pit.

The property covers some 400 acres of which the pit excavation to date covers about 16 acres. The material is trammed with a 40-ton Climax locomotive from the shovel to the mill hoppers into three and four 12-yard Western side-dump cars. A 35-h.p. motor with direct connected pump takes the water from the pit sump back to the washing plant for the purpose of draining the pit in wet weather and supplying an additional amount of water for washing purposes.

Mill. The mill consists primarily of two 40″ x 18′ scalping screens with 2½″ round perforations. All the material passing through these screens is carried by a 28″ conveyor direct to the washing plant. The rejections from 2½″ to 3½″ in diameter pass to a 36″ horizontal Symons disc crusher. Anything larger than 3½″, which is only about 2% of the total material, passes to a 24 x 13 Farrell jaw crusher, then a conveyor carries the material from both these crushers to another cylindrical screen 40″ x 8′ with 1½″ rd. pfd., the rejections of which are returned to the original scalping screens. All the material is first dumped into four concrete hoppers and fed by four M. and G. reciprocating pan feeders to a 30″ belt conveyor and thence to the original scalping screens.

The crushed material from the crusher passing through the secondary screen goes to a 36″ Symons crusher closely set, hence to a bucket elevator and then to a small screen which divides the crushed rock into 1″ to ⅜″ and from ⅜″ to dust. This is the crushed rock production for Waranite topping and pipe work.

Washing plant. From the mill scalping screens all material passing the 2½″ round perforations falls to a 28″ conveyor, 200′ centers, and is carried to the top of the washing plant. At this point water is supplied by a 6″ pump from the pit and a 7″ pump from the San Joaquin River, 1000 gallons in all. The river water is used as sprays, one in each conical screen. The material is carried first to two conical revolving screens having a 1½″ rd. pfd. All rejections is for highway and large foundations. The next conical screen has 1″ rd. pfd., the next conical screen has ¾″ rd. pfd., the next conical screen has ½″ rd. pfd., and the final conical screen has ¼″ rd. pfd. All material passing through this last screen goes to a large sand wash wherein coarse and fine sands are obtained. In other words, a clean washed gravel is made, 2½″ to 1½″, 1½″ to 1″, 1″ to ¾″, ¾″ to ½″ and ½″ to ¼″. The pit run is well proportioned in size to evenly carry the demand as requested.

Track system. The track system is laid out in such a manner that 70 cars can be fed to the mill and loaded and passed on to the pulling track by gravity. The track is so laid out that 5000 cars of material can be placed in storage with a 20-ton Brown hoist locomotive crane.

Equipment. The plant is supplied with a blacksmith shop having a drill press, lathe, forge and small compressor. A large supply of materials is always kept on hand in the storeroom. Cottages are arranged on the banks of the river under the shade trees in sufficient

number to insure the operating of the plant with married men. There is also a boarding house in which 50 men can be fed. This is run by the company. During the rush season from 35 to 40 men are carried on the payroll.

Gold. Between the last screen on the washing plant and the sand bunker a type of Hungarian riffle has been installed over which all

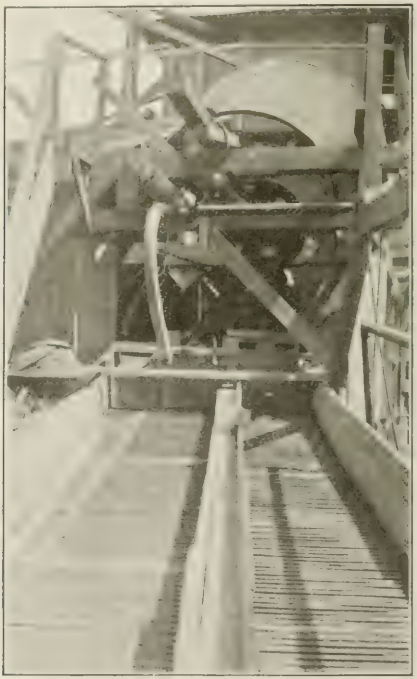


Photo No. 9. Revolving trommel and Hungarian riffles at plant of Grant Rock and Gravel Company.

of the sand must pass, in which there is a deposit of quicksilver, and from $500 to $1,500 in gold is recovered per month. The gravel on a whole runs about 1½ cents per cubic yard.

Capacity. The plant capacity is 70 cars, or 3500 tons, in nine hours. The average production this year has been about 2500 tons per day.

Kings River Quarry. Atchison, Topeka and Santa Fe Railway, owner. Leased to Sharp and Fellows, contracting company, Central Building, Los Angeles. This quarry is in section 8, T. 13, S., R. 24 E., on the Kings River, at Piedra. It was first opened in 1910 and has

been continuously operated ever since. With the exception of minor details a description contained in the Fourteenth Report holds true today.

OTHER MINERALS.

In addition to the mineral deposits mentioned in the foregoing, the records of the Bureau show that the following substances, all of potential value, but inactive in 1920, occur in the district under discussion: Feldspar, fuller's earth, gems, graphite, gypsum, infusorial earth, limestone, marble, mineral water, tungsten and volcanic ash.

GLENN COUNTY.

Glenn County lies in the Sacramento Valley on the west side of the Sacramento River. The Coast Ranges penetrate the western boundary but the greater portion of its 1400 square miles of area is composed of the nearly level valley floor. This rises gradually toward the western ranges and forms a drainage system tributary to the Sacramento River. Agriculture and stock raising are the principal resources.

The commercial mineral production of the county has been confined to brick clay, chrome, manganese, sand, gravel and crushed rock. Occurrences of coal, copper, gold, granite, marble, mineral water, natural gas, petroleum, quicksilver, slate and soapstone have also been noted and described in the Fourteenth Report of the State Mineralogist. Bulletin No. 76 describes the manganese and chrome deposits.

Table of Mineral Production.

Year	Amount	Value	Substance
1893 and previous	3,319 long tons	$49,760	Chrome
1909	140,000 tons	49,000	Macadam
1910	378,600 tons	34,020	Rubble
1911	421,775 tons	51,430	Sand and gravel
1912	543,675 tons	32,950	Sand and gravel
1913	416,640 tons	27,776	Sand and gravel
1914		30,553	Stone, miscellaneous
1915	746 lbs.	131	Copper
		46,526	Stone, miscellaneous
		10	Other minerals
1916		41,186	Stone, miscellaneous
		39,982	Other minerals
1917	879 tons	21,474	Chromite
	369 tons	9,721	Manganese
		33,260	Stone, miscellaneous
		817	Other minerals
1918	1,129 tons	57,263	Chromite
		32,436	Stone, miscellaneous
1919		58,137	Stone, miscellaneous
		1,500	Other minerals
Total value		$617,863	

During the year 1920 there was no mining activity in the county with the exception of the sand, gravel and stone industry.

SAND AND GRAVEL.

County Gravel Pits. The county opened up four new gravel pits situated as follows: SE. ¼ section 4, Glenn Ranch Survey; NE. ¼ section 12, T. 20 N., R. 3 W.; NW. ¼ section 29, T. 20 N., R. 3 W.; NE. ¼ section 6, T. 19 N., R. 3 W. The material is used on road work.

Green and Williams Pit. (Formerly **Donohoe.**) In November, 1919, Green and Williams of Orland opened a gravel pit in the bed of Stony Creek, one mile north of Orland. The state highway passes the pit and a spur track connects with the Southern Pacific main line at Wyoming.

Gravel is taken from the creek bed by a steam drag-line dredger with 1 cu. yd. bucket. Bunkers have been constructed so that the material can be loaded direct to cars. The plant is equipped with

jaw crusher, trammel screen, pump and washing outfit, and a clean crushed gravel suitable for concrete work is produced as well as "bank run" for ballast, etc. Four men are employed. Crude oil is used for fuel. The owners report a good demand for the crushed and washed product.

Stony Creek Gravel Pit (Wyo Pit), owned by the Southern Pacific Company. Operations have continued steadily throughout the year.

Willows City Pit. This property has been sold to Garnet Black of Willows. The city now obtains its gravel from the county pits.

In addition to the above, the State Highway Commission erected temporary loading and screening plants in creek beds at various points, and used the gravel on highway construction and repair work. The gravel in the creeks is all fairly clean and free from clay.

PETROLEUM.

Considerable interest has been manifested during the year in regard to oil in Glenn County. On the **O. P. Wiggins Ranch,** 13 miles west of Orland, the owner reports that he can set the ground on fire at several places. A report on the possible occurrences of petroleum in this county is contained in Bulletin No. 89.

KINGS COUNTY.

With the exception of the Kettleman and Kreyenhagen Hills, and a small portion of the Diablo Range at its southwest corner, Kings County is almost entirely a valley county. For this reason its mineral resources are not prominent.

The most notable geographical feature of this county is Tulare Lake, which in times past has had a water area of as much as 400 square miles. At the present time, however, the lake is entirely dry, and most of the land included in its former boundaries is under cultivation.

CHROMITE.

Chrome float has been found in the serpentine area at the southwest quarter of Kings County, but active development work has never yet been undertaken.

CLAY.

Two brickyards were formerly in operation near the town of Hanford. Both of these have been dismantled and abandoned, however, and no clay is being commercially utilized at the present time in the entire county.

FULLER'S EARTH.

Two deposits of Fuller's earth are described in the Fourteenth Report, one in township 24 S., R. 17 E., and the other in township 21 S., R. 17 E. When this county was visited by a representative of the Bureau in May, 1920, neither of the owners of the above deposits could be found, and apparently no development work had been carried on for some time.

GYPSUM.

It is reported that a small amount of gypsum was produced in 1913 from a deposit in section 13, T. 24 S., R. 17 E., northwest of Dudley. No further information relative to this deposit has been obtained.

MINERAL PAINT.

The occurrence of mineral paint was noted in the above-mentioned deposit of gypsum. This deposit also remains idle.

NATURAL GAS.

Considerable quantities of natural gas has been obtained from a number of artesian wells for many years near the towns of Corcoran, Angiola and Stafford. A list of the owners of these wells can be found in the Fourteenth Report. In addition to these wells, it is interesting to note that the possibility of developing commercial quantities of natural gas in this portion of the San Joaquin Valley is suggested by recent drilling conducted by the Natural Gas and Petroleum Company. Their well is in section 12, T. 23 S., R. 22 E., about five miles southwest of Angiola. The owners of the well have authorized no statement as to the amount of gas developed nor of the drilling conditions. Creditable current reports, however, indicate that gas in considerable quantities and under considerable pressure has been found. The well is close to one drilled by Dudley Brothers in 1918.

PETROLEUM.

There are two strips of possible oil-producing territory in the Kettleman and Kreyenhagen Hills, running through Kings County, between the Coalinga district on the northwest and the Lost Hills district on the southeast. A number of companies have been and are drilling this section. For a detailed description of the geology and possibilities of this district, see Bulletin No. 69, entitled "Petroleum Industry of California."

QUICKSILVER.

A number of quicksilver occurrences have been discovered in the southwestern corner of Kings County, where it adjoins Fresno and Monterey counties. Parkfield, Monterey County, is the only town in the district. These deposits have been described in detail both in the Fourteenth Report and in Bulletin No. 78.

The Bureau has recently been advised that the **Patriquin Brothers** of Parkfield have taken over the **Dawson Mine** which was formerly owned by H. Dawson of Lemoore, and that they also control the **Fairview Group,** formerly owned by G. H. French and J. A. Greenlaw of Parkfield, as well as the **Segregation** and **Summit** claims, in section 20, T. 23 S., R. 16 E., which in the earlier reports were recorded as being owned by Mr. C. A. Francis, and under bond to the Kings Quicksilver Mining Company, 520 Kings street, London, Ontario, Canada. According to newspaper reports, early in December, 1920, a new company of Canadian owners have taken over the entire holdings of the Kings Quicksilver Mining Company at Parkfield. C. C. Jones, of Toronto, is the new manager.

SAND.

A. M. Casella, Hanford, operates a small sand pit about 1 mile south of town on the Corcoran road. This material has only been produced in small quantities, all of which has been sold locally.

LAKE COUNTY.

Lake County is bounded on the north by Mendocino and Glenn; on the east by Glenn, Colusa and Yolo; on the south by Napa; and on the west by Sonoma and Mendocino. It is one of the most picturesque counties of the state and is noted for its interesting geological features and numerous mineral springs. Besides mineral water, Lake County has in the past been a noted producer of quicksilver. Other mineral occurrences include chromite, manganese, borax, clay, copper, gems, gold, gypsum, silver, sulphur, natural gas and miscellaneous stone.

Its mineral resources have been described in the Fourteenth Report of the State Mineralogist and special mention of the quicksilver mines of the county will be found in Bulletin No. 78. Bulletin No. 76 describes the manganese and chrome deposits. Changes and corrections are noted here, supplementing and bringing up to date the data already published.

CHROMITE.

None of the chrome mines described in Bulletin No. 76 were working during the present year. There is no railroad traversing Lake County and since the war chrome mining has not been a profitable venture in this county. William Taylor, of Upper Lake, has a chrome prospect on Bartlett Mountain, south of Eel River. There is no road to the property and it is undeveloped.

COPPER.

Copper Prince Mine. Idle. H. C. Betts, former owner, deceased.

MANGANESE.

Manganese was produced in Lake County in small amounts during the war period, but there has been little activity the past year. Of the deposits mentioned in Bulletin, No. 76, the most important, the Van Ranch deposit, is worked out, and the others are idle. The following properties have been developed since the publication of Bulletin No. 76, and with improved market conditions there is a possibility of further production in the near future.

Old Dough Claim. This deposit was discovered in 1919 by J. E. Rees of Middletown and one claim, the Old Dough, was located in 1920. It is situated in T. 12 N., R. 9 W., and lies at an elevation of 2700 feet. The nearest railroad station is Calistoga, 30 miles by good road, which passes within a short distance of the claim. There is a good water supply at hand. The deposit is said to be large and most of it low grade. A few high grade bunches occur. It is undeveloped, but the owner expects to do some work before the end of the year.

Phillips Manganese Mine. This mine is located near the top of a high ridge on the Phillips ranch about 1½ miles south of Laurel Dell. A high grade lens of manganese was opened up here and it was one of the first producers in Lake County, about 100 tons having been shipped out before mining ceased. All the ore was packed out on mule-back, as there was nothing but a trail to the mine. Considerable ore of good grade was left piled on the dump. There is an open cut about 60 feet long which intersects several narrow veins and cuts the main

lens at a depth of 30 feet. The general strike of the ore body is nearly north-south and it dips about 60° westerly with the slope of the hill. Good ore is exposed in the bottom and at various points on the sides. Ore so far produced is said to have averaged better than 50% manganese and less than 8% silica. The Suydan Company of San Francisco have taken a lease on this property; Wm. Fales, superintendent. At the time of visit, five men were employed building a sled road from the mine to the road near Laurel Dell. From here it can be taken by auto trucks to the railroad at Ukiah for $5 per ton. Production is expected to begin as soon as the sled road is completed.

Smythe Manganese Prospect. T. A. Smythe of Middletown has a lease on 160 acres of the Ormsby Ranch on which there is a deposit of manganese ore. The property is on a branch of Dry Creek, about 3 miles west of Middletown in township 10 N., R. 7 W. A good road runs within ½ mile of the deposit. The deposit was discovered in 1918. It outcrops high up on the abrupt side of a hill, the elevation being about 1800 feet. There is scrub oak and pine on the hills.

One vein, or lens, of good grade has been exposed and proven on the surface for 30 to 40 feet. It has a width of 2½ to 3 feet and strikes nearly north-south, dipping into the hill at an angle of 45°. The country rock is sandstone and jasper. Two or three tons had been taken out at the time of visit in doing prospecting work, but it was not sufficient to indicate the extent of the ore body.

MINERAL WATER.

Anderson Springs. Now owned by Miss Rose Anderson. Extensive improvements are contemplated at this well known resort.

Bartlett Springs. Owned by the Bartlett Springs Company; C. C. McMahan, president; H. J. Mathews, manager at the springs. Stages run from Williams on the east side and from Hopland on the west side. Additions and improvements have been made from year to year. Water bottled at the springs is passed through a Berkfeld filter. Block tin lined crowns are used instead of the former crimped caps. Artificially carbonated Bartlett water, formerly bottled in San Francisco, is no longer on the market. Five ton auto trucks have replaced the twelve-mule teams formerly used to haul the bottled water to Williams.

Bonanza Springs. Under lease to James F. Mast. The "Magnesia" spring (a well) went dry during the present season.

Bynum Spring. Bottling has been discontinued at this spring.

Castle Hot Springs. Owned by the Crescent Investment Company, Oakland, California; M. P. Morgan, manager at the springs.

Harbin Hot Springs. Owned by the Mathews Estate and under lease to N. S. Booth. A second steam bath has been added and another hot sulphur spring was opened up in 1918.

Highland Springs. Now reached by stage from Hopland. The water is being tested for radio activity, but no report had been received at the time of visit.

Howard Springs. Owned by M. J. and Wm. J. Laymance of Oakland, California; Chas. E. Stark, lessee.

Newman Spring. This property is not leased at the present time.

Saratoga Springs. E. K. Keil, owner. This property was taken over January 8, 1920. A cement plunge has been added and other improvements furnish accommodations for guests.

The extremely dry season has had little appreciable effect upon the flow of mineral springs, according to reports from owners, but many of the resorts have had difficulty in getting a normal supply of fresh water, due to diminished flow of fresh water springs and wells.

NATURAL GAS.

Natural gas which rises through the water of Thurston Lake is utilized for lighting and cooking purposes at the Lodge of R. D. Foye of San Francisco, owner of the property. Thurston Lake is a small body of water without an outlet situated about four miles west of Lower Lake, near the southern end of Clear Lake. Five gas springs near the shore line have been capped. The gas is collected and led by pipe to the gasometer above the lake, near the lodge. This holder is six feet in diameter and seven feet high. The five springs supply gas for from fifty to sixty lights using Welsbach mantles and for three kitchen ranges. It also is used to operate a 2 horse power engine which drives a pump for raising water from the lake to the lodge buildings.

In ordinary years all five springs are under water, but during the summer of 1920 only one cap was over the water, the other four being on the shore close to the water's edge. Twenty-nine other gas springs have been counted in the lake. These are easily recognized as the gas bubbles up through the water, especially when the surface is quiet. The lake has an average depth of twenty feet, but in the vicinity of the gas springs, which are roughly arranged in a circular form, it is about forty feet deep. Volcanic rocks and pumice occur along the shore and it is thought that very fine pumiceous material and volcanic dust kept in agitation in the lake water by the action of the gas gives the water its distinctly muddy look. The water is soft and good to drink, having a taste resembling rain water. In the kitchen ranges the gas burns with a clear blue flame. It is said to rate 921 B. t. u.

PETROLEUM.

The occurrence of natural gas at Kelseyville, and at Thurston Lake as noted above, together with the occurrence of small amounts of paraffine oil in some of the quicksilver mines, has led to speculation in regard to the possibilities of oil production in the county. Bulletin No. 89, now in preparation, covers this subject in detail.

QUICKSILVER.

Exploitation of quicksilver deposits in Lake county began in the early sixties and it has been one of the largest producers of this metal in the State. The history, geological occurrence, development and metallurgical treatment of the ores at the different mines in this county are given in detail in Bulletin No. 78. The notes here given

touch only on operations and new developments during the current year.

Abbott Mine. The property has been acquired by the Alpha Quicksilver Company, a Nevada corporation, offices 303-304 Clay Peters Building, Reno, Nevada. Mine address Wilbur Springs, Colusa County, California. It is in process of financing and reopening.

Anderson Prospects. See Big Chief.

Baker Mine. Idle.

Big Chief. This property, belonging to the Anderson family of Anderson Springs, has been taken under lease by R. B. Crowell, Middletown. A total area of 100 acres is covered by the lease. During 1918 ore from this mine was retorted at the Big Injun, but most of the Big Injun equipment has now been removed to the Big Chief property. The mine is situated on the rugged hills above Anderson Springs at an elevation of 2300 feet. There are some fir and oak. Country rock is sandstone and serpentine. Cinnabar occurs in veins associated with the serpentine. A heavy black gouge is usually present along the walls. The strike of the principal vein is southwest and the dip 45°. It has a maximum width of 30 feet. A shaft reaches a depth of 40 feet on the vein and there are two adits. The upper adit was in 73 feet at the time of visit and will, when extended, cut the vein at a depth of 375 feet. Hand drilling is employed. The ground is wet and difficult to hold. Considerable ore was exposed in the various tunnels but the workings were badly covered. It was idle at the time of visit pending the arrival of necessary equipment for ventilating as the hot and gaseous atmosphere hindered efficient work. Two 18″ D-retorts composed the reduction equipment.

Big Injun Mine. This property closed down in 1918 on account of a bad cave-in and shortage of labor. A little work was done in 1919 on the dump with a concentrating table and a small amount of mercury produced. Most of the reduction plant has now been removed to the Big Chief.

Bullion Mine. The equipment at this mine was destroyed by fire in 1917 and it has been idle since.

Chicago Mine. Idle. It is stated that the concrete furnace referred to in Bulletin No. 78 was never tried out.

Great Western Mine. Idle. Worked out.

Helen Mine. The Helen mine has been active throughout the year, operations being carried on at a reduced scale however. Mining is prosecuted during the winter months and the furnace run in the summer only. Twelve men were employed at the time of visit. The owner reports labor scarce. A minimum wage of $4 is paid.

Lucitta Mine. Idle.

Mirabel Mine. Idle.

Red Elephant Prospect. This property is now known as the **Red Elephant Quicksilver Mine.** It is owned by the Red Elephant Quicksilver Mining Company, Joseph Smith, president, C. F. Tremper, secretary; home office, San Francisco; W. G. Tremper, superintendent at mine; postoffice, Lower Lake, California. The property includes the Red Comet, Red Elephant, Royal Annex and Blue Wing Claims (all unpatented), also the Rex Quicksilver Mining claim and a tunnel site and mill site locations. The country rock is mainly serpentine and there is little vegetation except brush. Elevation 2400 feet (bar.). Sufficient water for domestic use is obtained from springs. A road has been built to the property and development work was started in the latter part of 1918. The working shaft is now down 125 feet. Levels have been started at 55 foot and 108 foot depths. A cross cut on the upper level is in 103′ and on the 108′ level a drift has been run 137 feet. Ore was encountered in the upper level, 38 feet from the shaft and continues to the face. It carries cinnabar and is reported to average about 1%. Hand drilling is used.

The mine is equipped with a 6-horse-power gasoline engine and hoist, cars and track, camp buildings and substantial head frame and shaft house. Three men were employed up to June 15, when operations were temporarily suspended on account of impossibility of getting in lumber and supplies. One man was keeping the workings unwatered and in shape for starting work again at the time of visit.

Red Rock and Silver Rock Claims. Idle.

Sulphur Bank Mine. This property was closed down early in 1919. It was locally stated that the revolving furnace, mentioned in Bulletin No. 78, as being in process of erection, did not work satisfactorily with the Sulphur Bank ore.

Thorne Mine. Idle.

Utopia Mine. Idle.

Wall Street Mine. The owner has continued to work alone at this mine, producing an occasional flask of quicksilver.

White Elephant. Idle.

G. L. Hildebrand Property. Eugene Wilkinson of Middletown is reported to be doing development work on a quicksilver prospect on the Hildebrand ranch just south of the Lucitta Mine on the slope of Mount Konocti (or Uncle Sam).

Hutchinson Ranch. Good showings of cinnabar ore reported to occur on patented land on the Hutchinson Ranch southeast of Lower Lake.

MADERA COUNTY.

The western half of Madera County lies in the San Joaquin Valley, while the eastern border line runs along the summit of the divide of the Sierra Nevada Mountains, and includes a number of peaks exceeding 12,000 feet in altitude. A general description of the geology of the county may be found on page 105 of the Fourteenth Report of the State Mineralogist.

ASBESTOS.

Amphibole asbestos occurs at the **Savannah Mine** near Grub Gulch, and at the **Baker Mine** near Coarse Gold. It is said that the former occurrence has been traced over a distance of about three miles in length. No development work has been done on either deposit.

BUILDING MATERIAL.

For many years **Mr. J. A. Dyer,** Madera, operated a brick yard at the southern edge of town in which a considerable number of men were employed. The clay from which the bricks were manufactured occurs in a deposit covering sixteen acres. About six acres have been worked out. No brick have been manufactured since 1918, and the property is now for sale.

COPPER.

The foot-hill copper belt extends in a southeasterly direction through Madera County, and on into Fresno County. During the copper excitement in the 60's, a number of properties were developed in this region, many of which have been described in the Fourteenth as well as in earlier reports of the Bureau. During the past year there has been no activity in this regard, although in 1919 the **Daulton Mine,** Mr. L. M. Bradford, Madera, owner, shipped two cars of 7% copper ore to the Tacoma smelter. Considerable amounts of a similar grade of ore are said to be blocked out in the mine, but the operating and transportation costs are so high that the property has been forced to close down.

The **Apex Copper Mine,** Mr. Geo. Bever, Berenda post office, is located about three miles northeast of the Daulton. After a little prospecting work had been done, a small flotation plant was built on this property in 1919, but unfortunately development work subsequently carried on failed to produce ore, either in sufficient quality or quantity to make the venture profitable. It is now idle.

GOLD.

The **Texas Flat Gold Mine,** situated in section 6, T. 8 S., R. 21 E., 1 mile northwest of Forest Grove, is the only gold mine in Madera County which has operated during the past year. The property, which has been under bond to the Texas Flat Mining and Development Company, reverted to the Kroromick Mining Company in April, 1920, H. A. Krohn of Coarse Gold, general manager. During the past summer the work of sinking a shaft on the vein has progressed satisfactorily. Six men are employed.

Full details relative to the many other gold mines and prospects in Madera County will be found in the Fourteenth Report, page 113. Many of these properties show considerable promise; some of them have been large producers in the past, but under present adverse conditions gold mining here as well as in all other parts of the state has suffered severely.

IRON.

Immense iron deposits are known to exist in the Sierra Nevada region of northeastern Madera County. No development has been undertaken on any of these deposits during the past several years, although their potential value is very great. Details relative to this subject, as well as a special article by F. B. Weeks on the Minaret Iron Deposits, will be found on pages 128 and 129 of the Fourteenth Report.

OTHER MINERALS.

The above-mentioned report also describes in detail properties from which have been produced lead, molybdenite, nickel, silver, soapstone, granite, sand and gravel, tungsten, volcanic ash and zinc. Practically all these branches of the mineral industry were dormant during the year 1920. Even the immense granite quarries near Raymond have only been operating part of the time. The Primmer Artificial Stone Company, mentioned on page 141 of the Fourteenth Report, is now owned by Adell and Cartwright of Madera. This firm manufactures cement pipe only, and uses sand and gravel obtained from the Fresno River north of Madera. The Santa Fe Gravel Company, which formerly operated a gravel pit on the San Joaquin River, one mile north of Herndon, has dismantled the plant and ceased operations.

MARIN COUNTY.

With the exception of San Francisco, Marin is the smallest county in California, having a land area of only 529 square miles. Its topography is quite rugged and picturesque. This county is not especially prolific in minerals, although among its resources are clay, gems, manganese, mineral water, soapstone and miscellaneous stone.

The only commercial production reported for many years has been that of brick, crushed rock and mineral water. During the past year the output of these substances was valued at about a quarter of a million dollars.

No field work was carried on in Marin County during 1920, but a detailed description of its mineral resources and individual deposits is contained in the Fourteenth Report of the State Mineralogist.

MARIPOSA COUNTY.

By W. O. Castello.

Mariposa County lies in the central eastern part of the state and extends from the eastern edge of the San Joaquin Valley into the high mountain region of the Sierra Nevada. It is noted for having within its boundaries the world-famed Yosemite Valley, and the Mariposa Grove of Big Trees.

The county has an area of 1463 square miles, and an estimated population of 4000. Tuolumne County lies to the north, Madera to the south and east, and Merced to the west.

MINERAL PRODUCTION.

Although regarded as one of the strictly mining counties of the state, it stood in 1919 only thirtieth in the list of counties, in regard to value of its mineral output.

In 1919 the total value of the commercial minerals produced in the county was $410,535, as compared with $352,504 in 1918.

Commercial production for 1919 was as follows:

Copper, 24,897 pounds	$4,627 00
Gold	400,000 00
Silver	5,500 00
Stone, miscellaneous	400 00
Other minerals	8 00
	$410,535 00

Besides the minerals mentioned above, there are known to be deposits of asbestos, barytes, gems, marble, slate, soapstone, and platinum.

HISTORY.

The southern extremity of the famous Mother Lode lies within the county, and for many years Mariposa shared with its neighbors to the north, the activities and prosperity of the early mining days of California. Along its streams placer mining was extensively carried on, and the richness of some of these deposits was not eclipsed anywhere in the state.

While small fortunes were being made in placer workings, attention was being turned to the development of quartz claims along the Mother Lode, and many properties were opened which have since made enviable records as producers.

About fifteen miles of the lode was at that time, and is still, included in the Mariposa Grant, a tract of some 44,000 acres originally granted to Col. John C. Fremont. Many mines were opened on the Grant which have since produced millions of dollars.

In the early sixties several large copper mines were developed along the Foothill Copper Belt, which resulted in the first smelting operations in the state.

During the early days, the present town of Mariposa was a city of several thousand inhabitants, and Mount Bullion (formerly called Princeton), Bear Valley, Mormon Bar, Hornitos, Coulterville, and other places were thriving centers. There were towns of several hundred people at places, where, at the present time, only slight evidence of

former occupation can be seen. In Hunter Valley the old copper mines, Barretta and La Victoria, together with gold placers and a few quartz mines, supported a village of 300 or 400 people.

At Whitlock, Hites Cove, and other points a few old buildings, now fallen to ruin, here and there a brick or stone foundation, and a few scattered pieces of old machinery, are mute evidence of former prosperity. Gold mining in the county has suffered a relapse since the "boom days."

There were in October, 1919, only four mines in the county which could truly be said to be operating on a producing basis—the Ruth Pierce, Virginia, Mountain King and the Original Mining and Milling Company's property at Clearing House. This is a lamentable fact when one considers that there are in the neighborhood of 200 mines, more or less developed, in Mariposa County, not counting mere prospects.

And many of the 200 mines, now idle, have proven themselves to be properties of merit, have large production to their credit, and are worthy of at least an investigation by capital.

There are, it is true, several properties, in various parts of the county, now in course of development. In almost every case, this work is being done by people with limited means.

There are several reasons why capital has been discouraged from investing in Mariposa County during recent years. The principal one is, no doubt, the great area of mineral land owned by large companies. As previously mentioned the Mariposa Grant covers 44,000 acres, extending from the Merced River at Bagby, on the north, to a point four miles south of Mariposa on the south. This property is now owned by the Mariposa Commercial and Mining Company, E. H. Benjamin, 522 Nevada Bank Building, San Francisco, president; H. G. Stevenson, secretary. It is understood the principal owner was the late Hennin Jennings of New York. Years ago many mines on the Grant were extensively operated, but of recent years they have been idle, except for the operations of a few leasers.

The ore was, for the most part, low grade, wood for fuel became scarce, the expense of operating increased, so that development work gradually ceased, and when the best quality ore was worked out, the mines closed. It is a question whether or not these mines could be made to pay under present day conditions.

Messrs. A. S. Bigelow and G. M. Hyans of Boston, formerly of the Merced Gold Mining Company, now dissolved, own a great area of mineral land near Coulterville. There are, in all, 25 quartz claims, 7 mill sites, two 160-acre homesteads, and 160 acres of patented timber land nine miles above Coulterville, total about 1000 acres.

Some 20 years ago operations were on a very large scale. There were four principal producing mines, the Mary Harrison, Louise, Malvina, and Potosi. The ore was treated in a 40-stamp mill at the Potosi, and was hauled from the other mines by a steam locomotive and train of large ore cars over 3½ miles of narrow gauge track. A large concrete bridge was built to carry the track across Maxwell Creek at Coulterville. Steam power was used, with wood for fuel. The equipment, still in place, consists of several 60 h.p. steam boilers, steam engines, compressors, Corliss hoists with flat cables, and completely equipped machine shop, with the 40-stamp mill.

Here also wood for fuel became scarce, and with such equipment, operating costs were so high that the fairly low grade ore could not be worked at a profit.

The owners will not sell any single part of the equipment, but the entire property is for sale.

The Bondurant property, located about 10 miles northeast of Coulterville, also consists of almost 1000 acres of mineral land.

Outside of the companies mentioned there are many properties which have been extensively developed, but which have been idle for many years. The reason for this in a great many cases appears to be lack of funds for further development work, after low grade ore had been encountered.

In several cases properties have been leased, and thousands of dollars expended on surface equipment before opening up a satisfactory ore body. Funds which should have been spent in development were invested in equipment which could not be utilized. In other cases, mines have been brought close to the point of production, but operations have had to cease for lack of funds.

In many cases, owners have apparently given up hope of ever interesting capital in their properties, and buildings and machinery are going to ruin. In other cases prospectors and people without means are tenaciously holding on to mines which they have partly developed in the hope of some day interesting worthy people.

If, in some way, sufficient capital could be interested, and induced to place some of the best old properties again on a producing basis, Mariposa County would, no doubt, assume a more favorable place in the list of real mining counties in the state, along with its neighbors to the north, Tuolumne, Calaveras, and Amador counties.

TOPOGRAPHY.

The topography of the county is given in detail on the following topography sheets of the U. S. Geological Survey: Sonora, Yosemite, Yosemite National Park, and Yosemite Valley Special. These sheets may be obtained, at small cost, by writing to the U. S. Geological Survey, Washington, D. C., and they are for sale at many stationery and book stores.

The topography varies, from the valley floor in the extreme southwest corner of the county, through the rolling foothills of the central portion, to the high Sierras on the eastern border, where the elevation is over 10,000 feet. In this eastern portion lies the world-famed Yosemite Valley, unmatched for scenic beauty anywhere in the world. The crystal clear Merced River, fed by the melting glaciers on the higher peaks, flows through this beautiful valley, forming unmatched water falls, rapids, and lakes. Sheer granite walls rise 3000 feet on either side.

The greater part of the county is exceedingly rugged, and cut into many deep canyons and high ridges by winding streams.

There are many small and beautiful valleys, even in the higher country, where some farming and fruit and stock raising is carried on, but, on the whole, there is very little good agricultural land in the county. In the lower foothill area, in Hunter Valley, and the southwesterly portion of the county is grazing land suitable for stock raising, and some farming land.

Besides the Yosemite Valley, the county is also famous for the Mariposa Grove of Big Trees, which contains some of the largest redwoods in the world.

The Bower Cave, situated 12 miles east of Coulterville, on the road to the Yosemite Valley, is also a natural wonder. It has been carved by percolating waters, from a limestone belt, which extends through that district, and is about 1000 feet in circumference. There is a beautiful fresh water lake in the bottom, 60 feet deep, 85 feet wide, and 130 feet long. The colorings on the limestone walls and in the lake at different times of day are magnificent. Many grotesque and life-like figures have been made by Nature in the walls. A resort is maintained at the cave.

GEOLOGY.

The geology of a large portion of the county, including the Mother Lode region from the vicinity of Mount Bullion to a considerable distance beyond the northern boundary of the county, is given in detail in the Sonora Folio number 41, of the U. S. Geological Survey. This folio also gives the topography, as well as a general description of the geology of the gold belt.

The eastern part of the county, the region of the Yosemite Valley and the High Sierra, is made up entirely of granite. There has been no mining in this region.

The contact between this granite mass, and the broad belt of Calaveras slates to the west, is a very irregular line, extending in a general northwest and southeast direction.

This belt of Calaveras slates is over ten miles wide, containing lenses of limestone and quartzite, and the scattered gold quartz vein of the east belt.

In general the geology of the western part of the county consists of parallel belts of slates, amphibolite schist, porphyrite, and serpentine, trending in a northwesterly-southeasterly direction, and including igneous intrusions.

The Mother Lode extends from Penon Blanco, near the northern boundary of the county, through the western edge of Coulterville, crosses the Merced River a little to the north and west of Bagby, continues a little west of Bear Valley, Mount Bullion, and Mariposa, and comes to an end at the edge of Granite intrusion, a few miles southwest of Mariposa. A so-called West Belt lies about a mile to the west, and embraces the Potosi and Malvinia mines, at Coulterville, and a few other mines farther south. There are many scattered and isolated veins in both the east and the west.

The Mother Lode in Mariposa County is characterized by the great width of vein and massive outcrop. In the vicinity of Coulterville the vein is 15 feet to 20 feet or more wide, and the outcrop can be distinctly seen for miles across the county, along the crest of a series of outstanding hills. It reaches a climax at Penon Blanco, where the outcrop and workings at that mine form a landmark for miles around.

At Coulterville, Maxwell Creek cuts through the outcrop, leaving prominent massive quartz bluffs on both sides.

Further south on the Grant property the lode continues its exceptional width but the outcrop is not so prominent.

The quartz veins occur, for the most part, on the contact between the Mariposa slates and the amphibolite schist, or on the contact between either the slates or the schist and the serpentine; but many veins lie entirely within these formations.

DRAINAGE.

The Merced River, with its tributaries, forms the principal drainage system of the county. The main river after leaving Yosemite Valley flows southwesterly through the central portion of the county, turning northwesterly a few miles east of Bagby, and at Pleasant Valley turning and flowing almost due south, in the northwestern portion of the county.

The South Fork of the Merced drains the steep and rugged southeasterly portion of the county, while the North Fork drains the northwesterly portion.

The Mariposa River with its tributaries, together with the North Fork of the Chowchilla, drain the southerly portion of the county.

TRANSPORTATION.

The only railroad in the county is the Yosemite Valley Railroad, which extends from Merced to El Portal, at the entrance to Yosemite Valley. It follows closely the course of the Merced River, and the ride is a scenic one, the road being primarily built to accommodate tourist travel to the Yosemite Valley. However, it also provides many shipping points and post offices for the central portion of the county. During the summer season two trains per day are operated, but for the rest of the year only one train per day is run. A logging train is operated by the Merced Lumber Company between its large sawmill at Merced Falls and the logging camp at El Portal.

Automobile stage lines operate from Merced to Yosemite, by way of Mariposa, Miami and Wawona, during the summer season, and from Merced to Mariposa during most of the year. Other stage and mail routes are operated throughout the county, between Mariposa and Coulterville, by way of Mount Bullion, Bear Valley, and Bagby; from Coulterville to Pleasant Valley; from Coulterville to Kinsley and Yosemite by way of the Bower Cave; from Mariposa to Jerseydale; and other shorter lines.

There are no concrete highways in the county, and the roads, at least in the upper portion of the county are rough and steep. The automobile roads into Yosemite Valley have been a disgrace to the state, but this is soon to be remedied by the construction of a State Highway from Merced into the valley. This road will follow the existing highway from Merced to Mariposa. From Mariposa a new road will be built, extending northerly, through the mountains to Bricelburg on the Merced River, thence following the south bank of the river into Yosemite.

A portion of this road has already been surveyed, from El Portal to a point west of Clearing House. This portion was surveyed first, so as not to interfere later with a new flume line soon to be constructed for a power house by the Original Mining and Milling Company, at Clearing House.

The roads in the lower portion of the county are, for the most part, very good, excepting in the winter time, when they are heavy and pretty well cut up.

SUPPLY POINTS.

Mariposa and Coulterville are the two largest towns in the county, and the two principal points from which provisions and supplies may be obtained. There are also stores located at Hornitos, Mount Bullion, Mormon Bar, Bagby, Boot Jack, El Portal, Yosemite Valley and Fish Camp. Accommodation and meals may be obtained at Mariposa, Coulterville, Bagby, Mountain King, Clearing House, Miami, Wawona, Fish Camp, Bower Cave, Jerseydale, Maschio's Ranch in Hunter Valley and at the several resorts in Yosemite Valley.

POWER.

The Mountain King and Original Mines have modern hydro-electric power plants of their own on the Merced River. The power house of the Mariposa Grant, at Bagby, has for many years supplied electricity for power and lighting purposes to quite a large territory south of the river, including the towns of Mount Bullion and Mariposa. The plant consists of a flume 400 feet long and 16 feet wide by 6 feet deep, which carries water under a 34-foot head to three Pelton wheels, which are 27, 30 and 40 inches in diameter, respectively. Two Westinghouse dynamos are capable of developing 600 h.p.

The power line of the Pacific Gas and Electric Company comes from Tuolumne County to the Penon Blanco mine, and thence to Coulterville and the adjacent territory. The San Joaquin Light and Power Corporation have a power plant at Merced Falls in Merced County, and one of their lines extends to Hornitos, the Mount Gains mine and on to Coulterville.

MINING DISTRICTS.

The mining districts, as here considered, apply to the principal mining sections of the county, as they exist today, and while, in most cases, it is believed they correspond to the mining districts as they may have been organized or established in the early days, it is not intended that they be here regarded in that sense.

BAGBY DISTRICT.

This district includes the several mines located on both sides of the Merced River for several miles northwest of Bagby, as well as those in Flyaway Gulch, three to four miles north of Bagby.

Bagby is a station on the Yosemite Valley Railroad, on the bank of the Merced River, about midway between El Portal and Merced Falls. It lies on the main highway between Mariposa and Coulterville. On the older maps it is called Benton Mills. The hydro-electric power plant of the Mariposa Commercial and Mining Company (Mariposa Grant) was built there in 1901; and a five-stamp mill owned by the same company is still in place, on the south bank of the river. The town consists of a hotel, store, post office, and railroad station.

Geology.

A belt of serpentine spreads out to the northward from an apex at Bagby. This belt gains a width of about two miles and then narrows

to a point again, coming to an end about two miles south of Coulterville. To the west of the serpentine is a belt of Mariposa slate, about a mile in width and trending a little west of north. In contact with the slate on the west is a broad belt, several miles wide, of porphyrite and amphibolite schist. Just east of Bagby, the serpentine to the north, and the Mariposa slate to the south, are both in contact with the broad belt of Calaveras slate. Farther to the north the serpentine is in contact with a belt of porphyrite on the east. The quartz veins are located, for the most part, on the contact between the serpentine and the slate, or between the slate and porphyry.

Topography.

The topography is quite rugged, the ridges both to the northeast and southwest of the Merced River, rising to an elevation of 2000 feet above the level of that stream. There is some small timber, oak and pine, but no great abundance. Small amount of water from springs and from the mines.

Mines.

The principal mines along the river northwest of Bagby are: Crown Peak, Crown Lead, Red Bank, Anderson, Lovely Rogers, situated on the ridge east of the river; and Stud Horse Flat group, on the ridge west of the river. In the Flyaway Gulch section are located the Blue Jay and Cunco Brothers mines, with several other claims, undeveloped.

COULTERVILLE DISTRICT.

The Coulterville district embraces quite a large area in the vicinity of the town of Coulterville, in the northwestern part of the county. It extends from Penon Blanco near the northern boundary of the county to several miles south of Coulterville, and from about three miles west of the town to six or eight miles east, to the North Fork of the Merced River.

Coulterville is situated about nine miles northwest of Bagby and twelve miles northeast of Pleasant Valley, both the latter being stations on the Yosemite Valley Railroad. It is quite a highway center, being on one of the main routes to the Yosemite Valley. Automobile mail and stage routes are maintained between Pleasant Valley, Coulterville and Kinsley.

Topography.

The surface varies from rolling hills in the vicinity of Coulterville to greater ruggedness a few miles east. The elevation rises from 1676 feet at Coulterville to over 3500 feet, to the north and east.

Maxwell Creek flows through Coulterville and joins the Merced River at Horseshoe Bend. Black Creek flows from the north of Penon Blanco and joins Maxwell Creek about two miles southwest of Coulterville. There are several other small creeks and many springs. The North Fork Merced River on the eastern edge of the district flows in a general southerly direction through a deep cañon with precipitous sides. Timber is rather scarce in the lower western part of the district but there is an abundance in the higher easterly portion.

Geology.

The eastern part of the district is made up entirely of Calaveras slate. In contact with this on the west is a belt of porphyry and amphibolite schist averaging about 2½ miles wide and trending in a northwesterly and southeasterly direction. This belt extends from ½ mile west of Coulterville to about 2 miles east, and contains some granodiorite intrusions on the eastern border. To the west of the schist is a belt of Mariposa slate about a mile wide. Between the slate and the schist are two lenses of serpentine; one extending from north of Coulterville, past Penon Blanco, and into Tuolumne County; the other beginning about two miles south of the town and extending to Bagby. To the west of the Mariposa slate lies a broad belt, five miles wide, of porphyry. The striking features of the geology in this region are the parallel nature of the formations, and the uniform width of the belts. The general trend is about N. 35° E.

The quartz veins, for the most part, lie entirely within the slate, but some of them lie on the contact between the slate and porphyry, or between the slate and serpentine.

The principal mines are the Potosi, Malvina, Louise and Mary Harrison, all owned by A. S. Bigelow and G. M. Hyans of Boston; the Virginia, Bondurant, Champion, Quail, Red Cloud, Tyro and Louisiana.

Some of these properties were worked extensively in the early 50's, but most of them have been idle for many years. The Virginia has been in constant operation for the last several years, while the Quail has been extensively developed and will probably be on a producing basis soon. The Bondurant and Champion have been operated at intervals during the past several years.

COLORADO DISTRICT.

Situated in the central and southeasterly part of township 4 S., R. 18 E., M.D.M., about eight miles north of Mariposa and four miles south of the Merced River and the Yosemite Valley Railroad, Saxon Creek and Briceburg stations on the railroad, are both reached by short trails. The wagon road from Mariposa is steep and rough.

The topography is rough and the elevation varies from 2400 feet to 3600 feet. Timber is not abundant, but generally there is enough for mine timbering purposes. Water for milling operations is derived from springs, from the mines, and from Saxon Creek and Bear Creek. There is an abundant supply in the winter, but it is rather scarce in the summer.

The country rock is Calaveras slate with some porphyry. The veins occur either entirely in the slate or on the contacts between the slate and porphyry. The general strike of the vein is N. and S. or NW. and SE. and the dip is mostly to the E. They vary from 2′ to 6′ in width. The principal mines are the Colorado Champion, Feliciana, Sierra Rica, Schroeder Group, Recorder, Mocking Bird and Little Bear.

Some of the mines in this district were located in the early 50's, but quite a few have been located since 1890. There has not been much activity in recent years, some of the properties being worked only in the winter. There is also some placer mining carried on in this district during the winter months when the water is plentiful.

HORNITOS DISTRICT.

Located in the western central part of the county, north and east of Hornitos, about 10 miles east of Merced Falls on the Yosemite Valley Railroad. The surface is low rolling hills, elevation from 1000 feet to 2500 feet. Hornitos Creek, Burns Creek, and El Dorado Creek flow southwesterly and drain the district. There is very little timber.

Geology.

A belt of metamorphic Mariposa slate, from three to five miles wide, lies east of Hornitos. The contact between this slate and the belt of porphyry to the west extends northwesterly and southeasterly through the western part of the town of Hornitos. To the east of the slate is another broad belt, three miles wide, of porphyry. There are several intrusions of diabase and granodiorite in the slate. The veins occur in the slate, and in the contact between the slate and the diabase granodiorite a porphyry. The most notable mines are the Mount Gaines, Ruth Pierce, No. 1, No. 5, No. 9, and Silver Lead. The Ruth Pierce is the only one in the district that has been operating on a producing basis, in recent years. The Mount Gaines was operated on a large scale years ago. It was closed down in 1910. There is a 20-stamp mill on this property. The Silver Lead was being developed (October, 1919), and the No. 9 was ready to start if litigation could be settled.

HITE COVE DISTRICT.

This is a comparatively small district, situated on the South Fork Merced River, in the southeastern part of township 3 S., R. 19 E. It is 4 miles by trail from South Fork, a siding on the Yosemite Valley Railroad, at the junction of the South Fork with the main Merced River. A shorter trail leads from Clearing House, over the ridge south of the river. A wagon road extends from Jerseydale, northward, down into the North Fork canyon, but this is very steep, and practically impassable by automobile. The topography is very rugged, the South Fork, winding through a deep canyon with steep sides, and the elevation rising from 1600 feet at the river to over 5000 feet. There is some timber but not an abundance.

The country rock is Calaveras slate, but there are some granitic intrusions. The most important property is the old Hite mine on the north bank of the river. It was located in 1863 and was a large producer for many years. It has been idle since 1882. Other mines are: Emma, Bunker Hill (Old Squirrel). There has been no production in this district for a great many years.

HUNTER VALLEY DISTRICT.

Hunter Valley lies in the northwestern part of Mariposa County, twelve to fifteen miles north of Hornitos. It is a narrow valley, four or five miles long, extending in a northwesterly and southeasterly direction, and separated from the Merced River on the northeast by a ridge which rises to an elevation of 3000 feet. The mountains to the south and west are lower. The elevation of the valley itself is from 1500 to 1800 feet, and the surface is rolling, with considerable good farming and grazing land. The residents are mostly Italians, who follow cattle raising and farming for a living. Accommodations may be had at

Maschio's Ranch in the central part of the valley. A good road extends from Hornitos, which is the nearest town, post office, and supply point. A good road also leads into the valley from Bear Valley, which is on the main highway from Mariposa to Bagby and Coulterville. Bagby is reached by trail. Jasper station, on the Yosemite Valley Railroad, is two miles from the north end of the valley, but there is no road.

Cotton Creek and Temperance Creek with their branches form the drainage system for the district. Both flow westerly and join the Merced River. There is considerable small oak and pine timber. The main power line of the San Joaquin Light and Power Company passes through Jasper station on the Merced River.

Geology.

The country rock is porphyrite (altered lavas, having the composition of andesite) and which extends for about six miles through the valley. There are also small intrusions of diorite and granodiorite. The district has produced both copper and gold, but no mines have been in operation for several years.

There are about 1500 acres of patented land in the valley, and some fifteen or more full sized mineral locations.

The old copper mines, La Victoria and Barretta, now Beaudry, were operated in the early 60's and some of the ore was smelted there in a crude smelter. The district was extensively placered for gold, many rich pockets being found, and several gold mines were developed, among which may be mentioned the Oaks and Reese, Horse Shoe, School House, Iron Duke, Castagnetto, Beaudry (Barretta) and Lafayette. A small town existed in the early days, of which no trace now remains.

The high grade copper ore, near the surface, was worked out, and no one has undertaken to work through the lean zone to see what lies at depth. Apparently this too large an undertaking and risk for small capital, and the district has been so long neglected that it is a hard matter to interest large capital.

The gold veins occur along what is known as the "Blue Lead," a well defined lode, which lies approximately parallel to the Mother Lode and dips 60° to 80° northeast. Many smaller veins, or stringers, run into this main lead at right angles, and it is generally on or near these cross veins that the values occur. The Oaks and Reese, the most important gold mines in the district, was a large producer years ago. Several other properties have been developed to considerable extent and some have made considerable production. In the eastern part of the valley there are many irregular cross veins, running in all directions. Some of these have been prospected to a shallow depth by old shafts and tunnels and open cuts.

KINSLEY DISTRICT.

The Kinsley district lies in the north central part of the county, about six miles north of the Merced River and eighteen miles by wagon road east of Coulterville. An automobile stage and mail route runs from Coulterville, which is the nearest town and supply point. The district is drained by Bull Creek and the North Fork of the Merced River. The topography is very steep and rugged, the elevation varying from 1800 feet to 4000 feet. Bull Creek flows westerly past Kinsley

and joins the North Fork of the Merced in a deep canyon. On the steep banks of these streams are situated the Carrie Todd, Bandarita, Marble Springs (Compromise), Contention, Cranberry, Garibaldi and other old and abandoned properties. The Carrie Todd and Marble Springs were the only ones being developed in the latter part of 1919.

The district lies entirely within the belt of Calaveras slate. There are small intrusions of granodiorite. Most of the quartz veins lie entirely within the slate, but some are on the contact between the slate and the diorite.

The older properties were located in the early days, and most of them have been idle and deserted for thirty or forty years. Some of them have made considerable production. In the early part of 1920 a 10-stamp mill was being erected at the Carrie Todd, and development work was going on at the Marble Springs.

MARIPOSA DISTRICT.

In this district are included the several scattered and more or less isolated mines, situated east and south of the town of Mariposa, namely, the Mariposa and Stockton Creek Mines, owned by the Mariposa Commercial and Mining Company, and the Silver, Malone or Bear Creek, Vanderbilt or Mount Buckingham Group, and the Prothero Brothers mine, south of Bootjack.

The topography of the district is quite rugged, but most of the mines are reached by fairly good roads from Mariposa, via Mounar Bar, Bootjack, and the Jerseydale road, or by road northeast from Mariposa.

The nearest railway stations are Raymond, Madera County, and Bagby on the Yosemite Valley Railroad.

The elevation ranges from 2500 to 4500 feet. Stockton Creek, Snow Creek, and the North Fork Chowchilla River drain the district. Water is very scarce in the summer time in the higher portions. Timber is plentiful but not abundant.

Geology.

The greater part of the district lies in the granite area. The Calaveras slate lies in irregular contact with the granite on the north, and on the west a long strip of Mariposa slate extends into the granite from Mariposa southerly into Madera County. The eastern contact between this long, narrow belt of Mariposa slate and the granite lies about three miles east of the town of Mariposa, extends southerly close to Bootjack, and continues a little east of south.

The veins lie in the granite, in the slate, or on the contact between the two.

Some of the mines were worked in the early days. In the early part of 1920 the Silver mine and the Prothero Brothers mine were being developed. None of the others were in operation. The Mount Buckingham group is one of the largest low grade properties in the county. It has not been worked since 1914.

WHITLOCK DISTRICT.

This district is situated in the central part of the county, in sections 29, 30, 31, 32 and 33 of T. 4 S., R. 18 E., from 6 to 9 miles north of Mariposa. Briceburg, on the Yosemite Valley Railroad and the Merced

River, is situated to the north, and reached by 2½ miles of wagon road and 5 miles of trail. A good road, steep in places, extends from Mariposa, which is the nearest town, post office and supply point.

The topography is quite steep and rugged, the elevation varying from 2500 feet to over 4000 feet. Water supply is derived from Whitlock Creek, and from many springs. Small timber is quite plentiful.

The greater part of the district lies within a belt of porphyry, the Calaveras slate being in contact with the porphyry, just to the north.

Nearly all the veins occur between porphyry walls but occasionally one of the walls is slate.

Some of the claims were located in the early 50's, and a few years later several properties were in operation, which supported a small town at Whitlock. The town has now disappeared, however, and very few of the properties have been in operation on a producing basis of recent years. Many of the claims have been relocated several times. Among the most important gold mines are: Sunshine Group, Spread Eagle, Spencer, Our Chance, Mohawk, Miners Hope (formerly Farmers Hope), London, Herman, Geary, Garden, Diltz, Bull Dog, and Ah War (placer).

JERSEYDALE–SWEETWATER DISTRICT.

This district is located in the central and southeasterly part of township 4 S., R. 19 E., principally in sections 20 to 27, inclusive. It is about 18 miles by good wagon road northeast of Mariposa, the nearest town and supply point. An automobile mail and passenger stage runs between Mariposa and Jerseydale during most of the year. There is a postoffice and boarding house at Jerseydale. A wagon road, which is very steep and practically impassable by automobiles, leads northward into Hite Cove, on the South Fork Merced River, and a trail leads thence to the Yosemite Valley Railroad on the bank of the Merced River.

The topography is quite rugged, the elevation varying from 3500 to 4500 feet.

The district lies on quite a prominent drainage divide. Sweetwater Creek and Feliciana Creek flow northward to the main Merced River, Snyder Creek flows northeasterly to the South Fork Merced. Skelton Creek flows southerly and then northeasterly to the South Fork. Snow Creek flows southerly and several branches of Bear Creek flow westerly.

Timber is quite plentiful in most parts of the district.

Geology.

The contact between the granite to the east and south, and the Calaveras slate to the west and north, runs irregularly through the districts. There are also small areas of porphyry.

The quartz veins occur, for the most part, in the granite. Some are on the contact between the granite and the slate, or between the granite and the porphyry.

The principal mines are: Comet, Monte Christo group, Blue Bell, Louisa, Sweetwater, and Early. The old Sweetwater mine was reopened and placed on a producing basis in the latter part of 1919. The Early mine was worked in 1918, but has been idle since. None of the other properties have been worked for years. The Comet is well equipped

with 10-stamp mill, saw mill, assay office, etc. Some of the properties were located as early as 1858 or 1860, and have had quite varied histories since then.

MOUNT BULLION–BEAR VALLEY DISTRICT.

This district includes the properties of the Mariposa Grant (Mariposa Commercial and Mining Company) described on page 124.

Mount Bullion, formerly called Princeton, is 5 miles, by good road, northwest of Mariposa, and twelve miles southeast of Bagby on the Yosemite Valley Railroad. A good road also leads westerly to Hornitos. The town consists of store, school, post office, the Princeton mine, and thirty to forty dwellings.

Bear Valley, midway between Mount Bullion and Bagby, is practically deserted now. It was quite a thriving town in early days. On the road between Mount Bullion and Bear Valley may be seen the ruins of the first mint in California. Fifty-dollar slugs were coined there.

Topography.

From Mariposa to Mount Bullion the road extends through rolling country at an elevation of about 2200 feet. North of Mount Bullion a valley, nearly two miles wide and four miles long, extends northwesterly and southeasterly, at an elevation of about 1800 feet. A ridge, terminating in Bullion Mountain, elevation 4215 feet, rises to the northeast. Bear Creek flows through the valley, from north of the town of Bear Valley.

The country south from Bagby is very rugged, the road winding down a precipitous mountain side to the Merced River.

Geology.

A belt of Mariposa slate, two miles wide at the south, but narrowing to one mile in width at Bear Valley and Bagby, extends northwesterly through the center of the district. In contact with the slate on both the east and the west are broad belts of porphyry.

Narrow strips of serpentine lie between the slate and porphyry on the east. Near Bagby the Calaveras slate comes in on the east, cutting out the porphyry, and a very narrow belt of serpentine separates it from the Mariposa slate.

The larger quartz veins lie in the slate or on the contact between the slate and the porphyry. The more important mines are: Princeton, Pine Tree, Mount Ophir, Queen Specimen, Josephine, Texas, Guadaloupe, Mexican, Alice, Elizabeth, and Long Mary. The veins are generally of great width, but low grade. Of recent years several of the properties have been worked to some extent by lessees.

GREEN MOUNTAIN DISTRICT.

This district embraces the copper mines in the southern part of the county along what is known as the Foothill Copper Belt. There are no gold mines in the district, although the copper ores often carry large gold values.

The mines were located and operated in the early sixties, and thousands of tons of ore were mined and shipped, the industry supporting a considerable population. Some of the earliest attempts at copper

smelting in the state were carried on. The most important properties were: the Green Mountain Group, Lone Tree, Pocahontas, Great Northern, Cavan, and White Rock. With the exception of the Green Mountain group the mines have been idle for many years.

Good roads extend through the rolling foothill district, from Mariposa to Raymond, in Madera County, via Bridgeport, Leion, Ben Hur, Green Mountain, and Donavan.

The country is scarcely settled, there being little good farming land. Over most of the district the surface is barren, with only a few oaks here and there.

The drainage is all southwesterly, the principal streams being Mariposa and Chowchilla Rivers, Deadman's Creek, Dutchman's Creek, and Owen's Creek.

Raymond, Madera County, is the nearest railroad station.

Geology.

The district lies within the large granite mass, which comes in to the west, just south of Mariposa. The granite is bordered on both the east and west by the Mariposa slate.

The ores near the surface are copper, oxides, and carbonates, but at greater depth, sulphides are encountered.

Mineral Production of Mariposa County, 1880–1919.

Year	Barite	Copper		Gold	Silver	Stone	Lead	Other minerals	Total
1880				$150,017	$1,300				$151,317
1881				200,000	1,200				201,200
1882				250,000	4,000				254,000
1883				220,000	3,000				223,000
1884				180,000					18,039
1885				149,177	100				149,277
1886				197,600					197,676
1887				187,105	96				187,201
1888				175,000	250				175,250
1889				145,819	210				146,029
1890				124,265	22				124,287
1891				$4,414					$4,414
1892				$1,011	67				$1,078
1893				164,116	307				164,423
1894				153,708	39				153,747
1895				216,022	7				216,029
1896				335,637	180				335,817
1897				451,427	660				452,087
1898				336,418	993				337,411
1899				502,820	2,207			110 sq. slate, $900	505,636
1900				157,643	13,853				171,516
1901		191,622#	$30,180	514,928	4,787		77,000#		542,975
							$3,680		
1902		164,700	11,946	631,478	3,880				647,298
1903		61,627	6,808	542,335	3,353				552,516
1904		11,500	1,403	429,771	2,839				434,676
1905		12,541	1,956	386,380	5,231			(1) $25	393,592
1906				364,364	3,377				369,771
1907				405,198	4,500		1,142#		110,958
							$60		
1908		20,124	2,958	439,862	1,732	$30,500			484,172
1909				383,405	2,729	62,430		Unapportioned, $8,431	47,655
	830T								
1910	$4,850			317,580	2,364	21,501			346,215
1911		14,611	1,830	172,592	1,320				175,752
1912		284,587	46,957	109,541	6,786				214,284
1913		116,031	64,485	171,034	7,436			3,130	246,079
	2,000								

1914	$3,000	277,472	36,904	132,000	500	15,366	---	(2) 100 cu. ft., 100	187,870
1915	---	38,630	6,760	385,577	2,175	17,214	---	600	412,356
							1,857#		
1916	---	162,318	39,930	401,718	2,630	39,372	$128	4,143	487,971
1917	---	53,381	14,583	313,296	3,221	7,646	1,075#	13,399	
							$92		352,237
1918	---	30,294	7,483	337,682	5,083	400	---	(3) 1,856	352,504
1919	---	24,879	4,627	253,392	4,139	400	---	8	410,535
	2,800T $7,800	1,713,347#	$278,837	2,800T	1,713,347#	$278,837	---	$32,292	$12,042,245

(1) Platinum.

(2) Marble.

(3) Chromite and lead.

ASBESTOS.

Asbestos of the amphibole variety has been found at several places in the county in the amphibolite and serpentine areas. It is impure and the quantity is not sufficient for commercial production. A specimen is on exhibition at the Mariposa Chamber of Commerce by P. W. Judkins, from the southern part of the county. There are said to be a few occurrences in serpentine areas between Bagby and Coulterville.

BARYTES.

The El Portal Mining Company, office at American National Bank Building, San Francisco, owns a deposit of barytes on the north bank of the Merced River, about 1 mile west of El Portal. There is a quarry on the hillside above the river, and a surface tram down to a storage bin beside the tracks of the Yosemite Valley Railroad. The deposit is mostly barium sulphate, but within the last few years considerable witherite (barium carbonate) has been produced.

COPPER.

In the western part of Mariposa County the foothill copper belt extends for about forty miles, from the old Barretta and La Victoria mines in Hunter Valley, to the Green Mountain group, situated seven miles north of Raymond, Madera County. Some of these deposits attracted attention in the earliest years of the industry, and resulted in the building of what is believed to have been the first smelter in California, the ruins of which may still be seen along the roadside a few miles north of the Green Mountain mines. It was built of blocks of slate, in a crude way, but some copper ore was smelted there.

In the sixties the copper mines supported a considerable population in Mariposa County, and thousands of tons of ore were mined and shipped. Of recent years there has been very little activity in the industry, and most of the old properties are deserted, the buildings fallen to ruin, equipment gone, and workings caved. The surface high grade ore has been pretty well worked out, and no one has undertaken to develop a new ore body at greater depth. It is too large a job for small operators, and probably not large enough to warrant the investment of big capital. In the latter part of 1919 ore was being shipped from the Green Mountain mines to a leaching plant at Raymond, and at the La Victoria mine, in Hunter Valley, ore from the dump was being sorted and shipped.

Barretta Mine. Located in sections 30 and 32, T. 35, R. 16 E., M. D. M., in the western part of the Hunter Valley district. This mine was worked in the sixties. There is a shaft about 200 feet deep, and a tunnel. Owned by Joseph Barretta.

Mr. C. H. Burt, Mountain View, has a bond on the property. An analysis of the ore from this mine, made by A. H. Ward, San Francisco, was as follows:

Gold, .04 oz.	$0.82	per ton
Copper	13.32%	
Iron	30.24%	
Zinc	2.00%	
Sulphur	28.51%	
Insoluble	22.70%	
	96.77%	

Green Mountain Group. This group consists of eight mineral claims and 26 acres of patented agricultural land, situated in section 3, T. 8 S., R. 18 E., M. D. M., about 8 miles by wagon road north of Raymond, Madera County. Owned by the Legioneer Gold Mining Company, O. R. Sydney and Mr. Smedburg. Two of the claims are patented, the Copper Queen and Buena Vista, while the six other claims, Copper Chief, Buster Brown, Cuban Nigger, Flotsam, Jetsam, and Amador, are unpatented.

The workings are on the top and sides of an unwooded hill. The topography is low rolling hills, and the country rock is schist. Dikes of diorite and granite cut the schist. The ore consists of oxides and carbonates. The vein is in the nature of a replacement in the schist, and has no distinct strike, as it has been followed in the form of a semicircle. The dip is about 76 feet from the horizontal. The developments consist of a 180-foot shaft, and over 4000 feet of underground workings, with many stopes.

The property has been leased several times, and it is impossible to give any accurate figures as to production. In 1914 leasers are said to have shipped 52 cars of ore, which averaged $1000 per car. Assays showed 2 oz. in silver, but no gold value.

About the middle of 1919 the United Chemicals Company of San Francisco, completed the construction of a leaching and precipitating plant at Raymond. This company is now (1919) operating, using the Green Mountain ore, which is hauled to Raymond in motor trucks.

The average ore leached contains about 6% copper. Some of the ore runs as high as 12%, so that considerable low grade ore is used, being mixed with the higher grade to make a 6% product.

Although the plant is located in Madera County, a short description of the process will be given here. The ore is first leached with water, in a wooden tank about 12 feet in diameter and 3 feet deep. The solution then goes to 14 electrolitic cells where the copper is precipitated on scrap iron. This copper is then treated with H_2SO_4 for the production of chemically pure copper sulphate ($CuSO_4$).

The products are: so-called chemically pure copper (copper oxide); copper sulphate, or bluestone, and copperas ($FeSO_4.7H_2O$). The copper oxide is a finely granular metallic copper colored product.

The property includes an electric generating plant, an acetylene cutter and welder for making the scrap iron plates for the precipitating cells, and store house, to which the tracks of the Southern Pacific Railroad (Raymond branch) have been extended.

Mr. O. R. Sydney is superintendent at the mines, and M. S. Fairbanks is in charge of the plant at Raymond. It is planned to later put in a plant at the mine, as it is believed the mine water will give better leaching results than the water at Raymond.

Pocahontas Copper Mine. (See Mariposa County, Report 1915, page 147.) Some ore was shipped by leasers in 1914 but no work has been done in the last few years.

San Jose Copper Group. (See Mariposa County, Report 1915, page 147.)

La Victoria. In sections 4, 9 and 10, T. 4 S., R 16 E., M. D. M. Owned by the Coppertown Mining and Smelting Company, Herbert

Long, East Oakland, principal owner. In Hunter Valley, 12 miles by wagon road from Hornitos.

Development consists of a 200-foot shaft, tunnel 400 feet long, several open cuts and shafts, some of which are about 75 feet deep. The ore consists of chalcopyrite, azurite, malachite and cuprite, and carries some gold. The formation is diorite and porphory.

Years ago it is said about 2000 tons of ore were shipped by way of Stockton, and 2000 tons were worked on the ground by roasting and leaching.

Mr. C. W. Wilson, 207 Hobart Building, San Francisco, had a bond on the property. When visited in October, 1919, W. C. Kroh and C. A. Felts had a working bond, and were sorting high grade carbonate ore from the dump. They had about fifty tons ready to ship, which was to be sent to a smelter at Tacoma, Washington. The freight rate from Merced Falls to Tacoma is $10 per ton, trucking charges from the mine to Merced Falls $6 per ton, and smelting charges $3.50 per ton; total $19.50, so that a high grade ore would have to be handled to return a profit.

(From "Mineral Resources West of the Rocky Mountains, 1867, by J. Ross Brown, page 151; furnace, page 163):

"The La Victoire mine, in Hunter's Valley, is a most valuable property, being second in importance to scarcely any copper mine in the state. It is located in a section of the country which has not been affected by those disturbing causes which have broken up the lodes in all the other sections. It also possesses the very great advantage of having an immense body of very good ore above the level of the surrounding country, which enables the company to extract it without the use of expensive hoisting and pumping machinery. The lode runs through a hill several hundred feet in length, and nearly 300 feet high, cropping out on the very summit of it, and traceable, unbroken, through its entire length, at an average width of nearly five feet. The proprietors, who are mostly Frenchmen, have sunk shafts on the lode, at both ends of the base of this hill to the depth of nearly 200 feet, without discovering any material difference in its appearance, the only important change being that while the lode dips to the east at an angle of 45°, at 25 feet below the surface at the base of the hill, at 100 feet lower it dips at an agle of 68°, but as it increases nearly a foot in thickness at the point where the dip changes, it is evident that the change has not been the effect of dislocation. A great deal of very rich ore has been taken out of this mine, much of it containing sufficient gold to pay for working it for that metal alone.

It may be proper in this connection to state that the copper bars made in this county, by the furnaces described above, contain a very large per cent of gold. Some of it assayed by Kellogg and Hueston of San Francisco was found to contain as high as $450 to the ton. Much of this copper contains $50 in gold to the ton; none of it less than $20.

GOLD QUARTZ.

Adelaide Quartz Mine. Located in sections 22 and 23, T. 35, R 16 E., M. D. M., 1½ miles from Kittridge Station on the Yosemite Valley Railroad on the Merced River. A good wagon road leads from Kittridge to the mine. Owned by the estate of Mary P. MacCrellish; W. P.

Edwards of Alameda, manager. There is one patented claim, the Adelaide, 300 ft. by 3000 ft., elevation 2000 ft., no timber. The surface is fairly rough, and the country rock is slate and serpentine. There is no water supply except what comes from the mine. The vein is on the contact between serpentine footwall and slate hanging wall, and ranges from 6 feet to 10 feet in width. The ore is free milling quartz. The mine has not been worked for many years. It was bonded some years ago, the bond expiring July 1, 1914.

There is an incline shaft 150 feet deep which is partly caved and has water in the bottom. About 2500 feet of underground development work was performed, consisting in part of a tunnel which gave 300 feet of backs.

Electric power may be obtained from the power plant at Kittridge. There was formerly considerable equipment on the property, but this has been taken away.

Ah Wai Drift Mine. Consists of one unpatented placer claim in section 32, T. 4 S., R. 18 E., in the Whitlock district, about 5 miles by wagon road northwest of Mariposa, and 5 miles by trail from Saxon Creek Station on the Yosemite Valley Railroad. Elevation 1600 feet. Enough timber for mining. Formerly owned by John Hand and W. P. Weston of Mariposa, but sold a short while ago to Mr. Dickison of Mountain King. The claim was located in the 50s. The deposit is bench gravel, on a rough slate bedrock, and varies from fine, free wash to large boulders. Average about 10 feet in thickness, with pay gravel 1 to 4 feet in thickness and 40′ to 50′ wide. Water is obtained from Saxon Creek by a ditch 2 miles long, and there is a small reservoir for storage. There is a tunnel over 2000 feet long run on the bedrock. Gold is caught by means of sluice boxes, Hungarian riffles and quicksilver. The claim is worked every winter as supply of water will permit. There is a cabin, blacksmith shop, ore cars, track, drills, and tools.

Alarid Prospect. Mr. Alarid in 1916 and 1917 had a lease on property owned by the Mariposa Commercial and Mining Company (Grant), and located about 2½ miles northwest of Mariposa, presumably on the Mariposa vein. Several hundred dollars worth of ore was taken from a shaft 20 feet deep and a drift 100 feet long. Equipment consisted of windlass and bucket. The lease expired in 1918. The vein was 2½ feet wide, strike E. and W. and dip 60° S. The ore was free milling, and averaged $15 per ton.

Alice Quartz Mine. In section 16, T. 5 S., R 17 E., M. D. M., about 4 miles west of Mount Bullion and 14 miles from Merced Falls on the Yosemite Valley Railroad. Owned by the Mariposa Commercial and Mining Company, 501–502 Nevada Bank Building, San Francisco, E. H. Benjamin, president. There are two claims, which were located in the 50's. The country is fairly rough, elevation 1720 feet. Vein is in slate, both hanging and footwall, and averages 3′ in width. The strike is NW. and SE., and the dip almost vertical.

Development consists of a 200′ shaft, with a total of 360′ of drifts on 3 levels. The mine has not been worked since 1902, and there is no equipment on the property. The development work was done principally by leasers. The ore averaged about $12 per ton.

Anderson Quartz Mine. Owned by the estate of Mary P. MacCrellish; W. P. Edwards, Alameda, manager. Located in section 23, T. 3 S., R. 16 E., M.D.M., 1¼ miles by wagon road north from Kittridge on the Yosemite Valley Railroad, and 5 miles by road south of Coulterville. One patented claim, the Anderson, 300′ by 3000′. The quartz ledge is on the contact between serpentine footwall and slate hanging wall and varies from 4′ to 12′ in width. It strikes NW. and dips 65° to the NE. Development consists of 300′ incline shaft, with 3 levels, and 120′ tunnel on the vein. The mine has not been worked for the last several years. There is a blacksmith shop, bunk house, boarding house, and engine house on the property. Electric power obtained from the power house at Kittridge. Elevation 2000′. No water except from the mine.

Anderson. (Ferguson.) Located at Clearing House, on the north side of the Merced River, 7 miles west of El Portal, section 21, T. 3 S., R. 19 E., M.D.M. Owned by Mrs S. A. Hall and Anna K. Sherwood, under title of the Ferguson Consolidated Gold Mines. This is an old mine, located probably 50 years ago, and has not been worked for many years. There are extensive underground developments, consisting of five tunnels at different levels on the hillside, connected by drifts and raises, and considerable ore was stoped out. Some of the workings are now caved in. The main tunnel is about 100 feet above the level of the Merced River. The vein strikes NE. and SW. and dips to the W. There is an old compressor, which is partly buried by a slide at the mouth of the main tunnel. It is claimed this old property has considerable production to its credit.

Artru Quartz Mine. Owned by H. Artru, and consists of a fraction of a claim, 450 feet long, located in section 27, T. 4 S., R. 18 E., M. D. M., in the Colorado district. It is 3½ miles by trail from Saxon Creek Station on the Yosemite Valley Railroad, and about 6 miles by wagon road from Mariposa. The elevation is 2700 feet, very little timber, no water in the summer, and fairly rough country. The ore body is a porphyry dike averaging 20 feet in width, between slate hanging wall and footwall. It strikes NW. and SE. and dips about 70° SW. The gold occurs in pockets and is, in part, crystallized. The mine has not been worked for the past seven or eight years. Development consists of a 75-foot shaft, 450 feet of drift, four cross-cut tunnels each about 140 feet long, and several raises.

Austin Group. Four claims formerly owned by the Austin Group Mining and Milling Company. H. C. Austin, 56 Bacon Building, Oakland. Recently (October, 1919) reported sold to some New York people. Located at Whitlock in sections 29 and 32, T. 4 S., R. 18 E., about 6 miles northwest of Mariposa. Elevation 3300 feet, one claim well timbered, plenty of water in winter, but little in summer.

The quartz vein varies from six inches to four inches in width between porphyry walls.

Development consists of two incline shafts, each about 120 feet deep, a 700 foot crosscut, 150 feet of drifts, and stopes to the surface.

Equipment consists of a 10-stamp mill, plates, Pendar concentrator, compressor, blacksmith shop, bunk house boarding house and charge house. The mine has not been worked for six or seven years.

Bank of California Quartz Claim. Owned by G. E. Dunbar of 515 Southwest street, Kalamazoo, Michigan. There are two unpatented claims, located in section 27, T. 4 S., R. 18 E., M. D. M. In the Colorado district, about six miles by wagon road north from Mariposa. The vein is quartz between porphyry and slate walls, and averages 2½ feet in width. The mine has not been worked for several years. There were two shafts which are now caved and partly filled.

Barretta Gold Quartz. (Beaudry.) Located in Hunter Valley, in section 32, T. 3 S., R. 16 E., M. D. M., about fifteen miles north of Hornitos. Now owned by Mrs. Beaudry. Property consists of two claims and 360 acres of agricultural land. Located about 1868. The elevation is about 1400 feet, surface rough. A branch of Temperance Creek runs through the property but water is not plentiful. Timber is rather scarce. The claims are on the so-called "Blue Lead" which extends in a northwesterly and southeasterly direction through the valley for five or six miles. The vein averages about four feet in thickness, strikes northwest and southeast and dips about 80° northeast. The hanging wall is chert and the footwall porphyrite.

Development consists of a number of shafts and open cuts, from a few feet to eighty feet deep, also a short tunnel. No equipment on the property.

Bear Creek Mine. (See Malone Mine.)

Benton Mill. Located on the Merced River at Bagby, and owned by the Mariposa Commercial and Mining Company. Ore from the Pine Tree, Josephine and other mines owned by the company on the Grant, was formerly hauled to this mill. It has not been in operation for years. Equipment consists of a Dodge crusher, 5 stamps, 5′ x 20′, amalgamation plate, 2 Union tables.

Blue Bell Quartz Mine. (Jumbo.) Owned by Hiram W. Bronsom of Mariposa, and located in section 9, T. 4 S., R. 20 E., about 4 miles by trail east of Jerseydale and 10 miles by trail from El Portal. Elevation 2400 feet, topography rough. The property consists of two unpatented claims located in 1906, the Blue Bell and the Blue Bell Ext. The quartz vein lies between a porphyry footwall, and both slate and granite hanging wall, and averages 5 feet in width. Its strike is north-west and south-east and its dip is 72′ northeast. The development consists of a 145′ crosscut tunnel and 80′ of drifts. No equipment, except a blacksmith shop. Mine has not been worked for several years.

Bogan and Baitaille. (B. B.) This is a "pocket mine," owned by Fred Niebold, and located by him in 1849. It consists of one fraction claim, 12½ acres, located in the Colorado district, in section 26, T. 4 S., R. 18 E., M. D. M., about 7 miles by wagon road north from Mariposa, and 4 miles by trail from Saxon Creek Station on the Yosemite Valley Railroad. Elevation 2950 feet, topography rough. There are two veins, one contact and one gash, the former being between a porphyry footwall and a slate hanging wall, and averaging 2½′ in width. Development consists of four adit levels, from 60′ to 300′ long, with several raises and stopes. Specimen rock was mined and worked in a mortor by

means of a spring pole. No equipment excepting a blacksmith shop and few tools.

Bondurant Quartz Mine. This property consists of about 1000 acres located in sections 24, 25 and 36, T. 2 S., R. 17 E., M. D. M., about 12 miles northeast of Coulterville and on the North Fork of the Merced River. There are 100 acres of patented mineral land, 740 acres of patented timber land, two tunnel locations and one mill location. Owned by A. L. Adams, 302 Center street, Bridgeport, Connecticut. The claims were originally located in 1855, and worked for several years, the ore being milled in an arrastra. In 1870 an eight-stamp mill was built, and in 1887 a new ten-stamp mill was constructed. This was run for about five years, when it was closed down, and remained closed for some 23 years. In 1914, five men were working doing development work. There has been no activity in the last few years. Lack of water, long distance to tram the ore, and hard quartz, were the difficulties. There are several quartz ledges, varying from four to fifteen feet in width, and all of them between slate walls. The general strike is northwest and southeast and the dip is about thirty-five feet northeast. There are three principal producing veins, called the Bondurant, Reynolds and Louisiana. The ore is hard white quartz, carrying gold, silver, lead and zinc. Development consists of a 412 foot incline shaft, another 125 foot shaft, about 1000 feet of drifts, 945 foot crosscut tunnel on the river level, 225 foot crosscut on adit level, 150 foot raise and several stopes. It is planned, when operations are renewed, to construct a mill on the North Fork of the Merced River and work the mine through the long river level tunnel. This is expected to cut the vein when driven 200 feet further, and will give 1000 feet of backs on the dip of the vein.

Present reduction equipment consists of a ten stamp mill, two 4′ x 16′ plates, 2 Union concentrating tables, rock breaker, 2 Challenge feeders, 35-h.p. steam engines, 60-h.p. boiler and several pumps. At the hoist there is a double 8 x 12 link motion, hoisting engine and a 14 x 42 tubular horizontal boiler. The topography is rolling, fairly rough, elevation 3000 feet, and timber plentiful. Several mill buildings, two blacksmith shops, bunk house, etc. The ore is said to average around $8 per ton.

Booth Quartz Claim. (See Mariposa County Report 1915 page 151.)

Bouvier (Carson.) Located in Hunter Valley in sections 3 and 4, T. 4 S., R. 16 E., M. D. M., 12 miles north of Hornitos. Old shaft 125 feet deep, with several other shallow prospect shafts. An old five-stamp mill was operated here in 1868, but it burned down, and the property has not been worked since. Consists of 483 acres of agricultural land, and several mineral claims. Temperance Creek flows through the property. The shaft is located on a cross vein, about 150 feet west of the main ledge so-called "Blue Lead." The Blue Lead varies from two feet to twenty feet in width and the cross veins from two to four feet. The hanging wall is chert and the footwall porphyrite.

Bowman Quartz Claim. (See Mariposa County Report, 1915, page 151.) Not worked for years.

Bryan Mine. (See Silver Mine.)

Buena Vista. (See Busch.) Formerly owned by L. F. W. Busch, of Mariposa, now owned by Mrs. L. C. Brice. Located in section 21, T. 4 S., R. 18 E., M. D. M., in the Colorado district about 7 miles north of Mariposa. No equipment, and has not been worked for some time.

Buffalo. (See San Domingo.)

Cader Idra. (See Emma Quartz Mine.)

Bull Dog Quartz Claim. Owned by Theodore Kokel, and located in the Whitlock district in section 31, T. 4 S., R. 18 E., M. D. M., 6 miles northwest of Mariposa. The claim was located in 1894. The vein is from 2 feet to 4 feet in width, between porphyry walls. There is a shaft about 40 feet deep and a windlass and bucket. Only assessment is done each year.

Bull Pup Quartz Claim. Owned by Jack Czerney of Merced, located in the Whitlock district in section 31, T. 4 S., R. 18 E., M. D. M. Located in 1894. There is a 65-foot incline shaft and 100-foot drift on the vein. Vein is from 2 feet to 4 feet in width, between porphyry walls, strikes northwest and southeast and dips 80 feet northeast. Not worked for several years.

Bullion Hill. Located in the Hornitos District, 5 miles north of Hornitos. It was reported (April, 1920) that a small mill was being installed on this property.

Bunker Hill Quartz Claim. (Squirrel Mine.) Owned by Harry Taylor. Located near Hiter Cove, on the North Fork of the Merced River, about 6 miles west of El Portal. It is said to have had the first quartz mill in the state in 1851, with wooden stamps. The mine was discovered by quartz brought to the surface from a squirrel hole, and was called the Squirrel Mine. Formerly owned by Charles Lewis. Considerable old development work was done. There has been some recent activity, and it is reported that the owner is considering putting in a Gibson mill.

Busch Quartz Mine. T. F. W. Busch of Mariposa formerly owned three claims in section 21, T. 4 S., R. 18 E., M. D. M., in the Colorado district about 7 miles north of Mariposa. Two of the claims were sold, but Mr. Busch still owns the Talc claim, which was located in 1904. The quartz ledge is between slate walls and is about nine feet in width. It has not been worked for years. (See Washington No. 1 and Buena Vista.)

Carrie Todd Mine. Located in the Bull Creek or Kinsley district in sections 7 and 9, T. 3 S., R. 18 E., M. D. M., 2 miles west of Kinsley. It is near the top of the precipitous east bank of North Fork of the Merced River. Owned by Mrs. Hannah Douglas of Denver, and was located almost twenty years ago. Four claims, Carrie Todd (patented), West extension of Carrie Todd, Thanksgiving and Eugene (unpatented).

The vein is from 2′ to 4′ in width, between slate walls, strikes E. and W. and dips 75° N. There are three tunnels, the upper one 208 feet long, a second shorter one with a winze connecting it with the main tunnel below, which is several hundred feet long.

The ore carries considerable sulphides, including pyrite, sphalerite and galena, and is free milling.

There is a 3-stamp mill at the mine, built with great difficulty on the steep mountain side, a Joshua Hendy 2-stamp mill, and a separate one-stamp, with plater, Dodge crusher, Pindas concentrator, a 25-h.p. gasoline engine, compressor, and a second 75-h.p. gasoline engine, taken from an old tractor.

The mine was bonded in 1919 by Milton Fraser of Kinsley and Mr. Sain of Coulterville. Mr. Sain has since given up his bond. Extensive developments are planned by Fraser, namely a 10-stamp mill on the bank of the North Fork, with a 2500-foot tramway from the mine, a large compressor, etc. A ditch line has been surveyed for water power to run the mill. Part of the mill machinery was, in October, 1919, on the ridge awaiting difficult transportation down to the river.

Castagnetto Mine. Located in Hunter Valley, in section 15, T. 4 S., R. 16 E., M. D. M., about 10 miles north of Hornitos. About 4 miles by trail to Bagby. Owned by the Castagnetto Estate. Leased a few years ago to Chas. Burt and Dr. Dodge, who did some work, but their lease expired in 1916 and it has not been worked since. There is an incline shaft 150 feet deep, with drifts 100 feet E. and 60 feet W. on the 70-foot level.

The vein is between porphyry walls and is about 18 inches wide. It strikes NW. and SE. and dips SW. There is considerable ore on the dump which it is claimed will run $10 per ton.

The mouth of the shaft is on a hillside about 100 feet above Cotton Creek, which stream, together with the mine water, would furnish enough for a small mill.

Champion Mine. Consists of one unpatented claim owned by G. E. Dunbar of Mariposa, and located in the Colorado district, in section 27, T. 4 S., R. 18 E., M. D. M., 6 miles north of Mariopsa, and 23 miles from Bagby. There are two quartz veins which average 4 feet in width, and which lie between a porphyry footwall and a slate hanging wall. They strike E. and W. and one dips 70° S. and the other is almost vertical. Development consists of a shaft 96 feet deep, with two levels, one at 60 feet and one at 90 feet. There is a drift 50 feet west on the 60-foot level, and one 78 feet east; and one 60 feet west on the 90-foot level. There are shallow prospect shafts for 1300 feet on the surface.

There is no equipment at the mine, and assessment work only has been done for several years. There is very little water, except what is in the mine, and the timber is not plentiful. Elevation is about 2800 feet.

Champion Mine. Owned by Mrs. Wagner, Mrs. N. C. Kay and Mrs. M. A. Mentzer, and located 2 miles north of Coulterville, in section 28, T. 2 S., R. 16 E., M. D. M. Nearest railroad station is Pleasant Valley on the Yosemite Valley Railroad, which is 12 miles distant. It is on the bank of Black Creek at an elevation of 1650 feet. The quartz vein is from 6′ to 12′ in width and lies between slate walls. It strikes N. 17° E. and dips 45° SE. The ore is free milling quartz, containing galena, sphalerite and tetrahedrite.

Development consists of an incline shaft 250 feet deep, a second shaft 200 feet deep connected with the first drifts, and there are several stopes.

When visited in October, 1919, there was a fully equipped 10-stamp mill on the property, with hoist, etc. It has since been reported that the National Gold Mines Company of Los Angeles purchased the machinery and is to remove it to another property. Several years ago, C. I. Mentzer, of Coulterville, and others leased the property, and milled several thousand dollars worth of ore which averaged around $45 per ton. The ore was milled in the Potosi mill. Soon afterwards a Los Angeles company leased the mine and put up the mill, which was very poorly constructed. Both the Pacific Gas and Electric and the San Joaquin Light and Power Company's lines cross the property.

Cherokee. (See Lovely Rogers.)

Cohen Quartz Claim. (See Mariposa County Report 1915, page 153.)

Colorado Quartz Mine. Consists of three claims, the Colorado Quartz, patented, the Colorado Extension, and the Colorado No. 2, unpatented, owned by P. W. Weston and J. L. Dearborn of Mariposa. Located in section 27, T. 4 S., R. 18 E., M. D. M., in the Colorado district, about 7 miles north of Mariposa and 22 miles by wagon road from Bagby, on the Yosemite Valley Railroad. Saxon Creek Station on the Yosemite Valley Railroad is 3½ miles northwest by trail. The elevation is 3000 feet and the topography fairly rough and steep. Timber is plentiful and sufficient water for milling is obtained from Long Gulch.

The vein is a true fissure vein between slate walls and will average 2½ feet in width. At the bottom of the shaft it is 7 feet wide, and in the lower level it is 2½ feet wide and has been exposed for a distance of over 200 feet. It strikes NW. and SE. and dips from 60° to 80° NE.

The development consists of an adit level 500 feet long, a 140-foot raise and a 125-foot shaft. There are two levels below the tunnel, one at 30 feet and one at 100 feet, on both of which 200-foot drifts have been run along the vein. There is a stope 120 feet long and 25 feet high.

There is a 10-stamp mill, two 5′ x 10′ plates, crusher, Challenge feeders, 2 Gates concentrating tables and 2 vanners. Also a 2-drill Rex compressor and 2 machine drills.

Power is furnished by 2 Fairbanks-Morse gas engines, one 15-h.p. and 12½-h.p., also 3 Doaks gas engines, one 30-h.p. and two 5-h.p. There is a blacksmith shop, assay office, bunk house, change house, and other buildings.

About 2500 tons of ore have been milled, which averaged $10 or $11 per ton. Some development rock went $8 per ton. The ore is a banded quartz and is free milling. The mine has not been operating since late in 1918, at which time Mitchell and Ward had a lease and bond on the property.

Comet Gold Mine. Formerly owned by the Comet Gold Mining and Milling Company of Kansas City, now owned by W. A. Moses, 428 South Oxford street, Los Angeles. Located in the Jerseydale district, in section 22, T. 4 S., R. 19 E., M. D. M., about 15 miles northeast of Mariposa. Elevation 3600 feet and topography rough and steep. Timber is plentiful, and there is a good supply of water from Keefer Creek, near by. There are three claims, none of them patented, located

in 1875 by Daniel Heaton. Bonded to a Mr. Grayson in 1896. Worked from 1911 until March, 1913. Again worked from August, 1914, until first part of 1915. In 1917 a Mr. Campbell of Fresno had an option on the property and worked for several months, but did not mill any ore. In the first part of 1918 Mitchell and Cooper worked on an option for about 3 months and took out several hundred tons of ore but never milled it. When visited in October, 1919, there was 700 or 800 tons of ore in the ore chute. The mine has not been worked since 1918.

There are two veins on the contact between a granite and quartzite footwall, and a slate hanging wall. The granite footwall changes to quartzite in the back of the tunnel. The vein matter is free milling quartz and varies from 2′ to 4′ in width, averaging about 2½ feet. It strikes NW. and SE. and dips about 85° NE. There are some small faults and dikes.

Development consists of two tunnels, the lower one 750 feet long and the upper one 285 feet. There is a 100′ crosscut in the lower level and a 40′ raise. From the upper level there is a raise 168′ to the surface, and a winze 45′ deep. No stopes.

The equipment consists of a 10-stamp mill in good condition, 1250-pound stamps, Blake rock crusher, Challenge feeders, 2 plates, 4′ x 12′, 2 Deister tables and steam engine. There is an ore chute 300 feet long from upper tunnel to the bin at the lower tunnel.

There is also a sawmill on the property, equipped with a 45-h.p. steam engine, 60-h.p. boiler, circular saw and other equipment. The steam is piped from the boiler, a distance of 300 feet, in a 4″ pipe to the mill. The ore is said to average $8 per ton and will plate $4 per ton. About 2½% sulphides.

The entire property, mine, mill and all equipment, was for sale at a price around $5,000. The machinery, excepting engines, was for sale at a price around $2,500. F. M. Shelton is agent and caretaker at the property.

Compromise. (See Marble Springs Mine.)

Cranberry Quartz Mine. Consists of one patented claim, owned by A. H. Ward, 53 Stevenson street, San Francisco, and located in section 15, T. 3 S., R. 19 E., M. D. M., about 2 miles northeast of Clearing House on the Yosemite Valley Railroad, and 6 miles from El Portal. A trail leads from the Merced River northward, to the mine.

Elevation about 3000 feet, topography rough. The claim was located in 1863 and patented in 1873. There is one fissure vein between slate walls, which varies from 3′ to 6′ in width, strikes NW. and SE. and dips 70° NE.

Development consists of a shaft 110 feet deep, a tunnel 1240 feet, along the vein, a 300-foot winze and a 460-foot raise. No stopes. There is no reduction equipment.

The claim has not been worked for 25 years. The owner holds an old water right on the Merced River for 1500 inches for a fall of 70 feet. (See Rutherford Quartz Mine.)

Crown Lead Gold Mine. One patented claim, the Crown Lead, owned by the estate of Mary P. MacCerellish; W. P. Edwards, manager, Alameda. Located in sections 26 and 36, T. 3 S., R. 16 E., M. D. M.,

on the east bank of the Merced River at Kittridge Station on Yosemite Valley Railroad about 3 miles below (northwest from) Bagby.

The elevation is 2000 feet, topography very rough and steep. No timber and no water except from the mine.

The quartz vein is on the contact between slate hanging wall and serpentine footwall, and is 10 feet in width, striking NW. and SE. and dipping 65° NE.

Development consists of a 50-foot incline shaft and a 75-foot tunnel, both of which have caved. There is no equipment at the property, and it has not been worked for many years. It was bonded several years ago to the Crown Lead Gold Mining, Milling and Transportation Company, of New York, but the bond lapsed in July, 1914.

Crown Peak Quartz Mine. Consists of one patented claim, the Crown Peak, owned by the estate of Mary P. MacCrellish; W. P. Edwards, manager, Alameda. Located in section 36, T. 3 S., R. 16 S., M. D. M., 2 miles by trail from Kittridge Station on the Yosemite Valley Railroad, and just south of the Crown Lead. It is on the crest of the steep ridge which rises from the east bank of the Merced River, at an elevation of over 2000 feet. There is no timber and no water. There are two quartz veins on the contact between a serpentine footwall and slate hanging wall. They vary from 6′ to 8′ in width, and strike NW. and SE., with a dip of 65° to the NE.

Developed by a 45-foot incline shaft and a 50-foot open cut.

No equipment at the property and it has not been worked for 40 years.

Diana Group. Consisted of four claims, Diana Nos. 1, 3, 4 and 5, located in section 24, T. 2 S., R. 17 E., and sections 30 and 31, T. 2 S., R. 18 E., M. D. M., and formerly owned by Diana Mining Company of San Francisco. Some of the land relocated and now included in the Bondurant group. (See Bondurant.)

Diltz Quartz Mine. Located in section 29, T. 4 S., R. 18 E., M. D. M., in the Whitlock district, 6 miles northwest of Mariposa. Owned by Mrs. Jennie Diven. Elevation 2850 feet, topography fairly rough. Timber plentiful and water from springs. Two claims, the Diltz, patented, and W. Y. O. D., unpatented, total 29½ acres. Located in the 60's by Diltz, then passed to Diltz estate, to Hugh Devaney, to Devaney estate, to S. J. Harris, by purchase, then to Diven.

The quartz vein is on the contact between a porphyry footwall and a slate hanging wall, and averages about 20 inches in width, 10 inches of "ribbon quartz" and 10 inches of "bull quartz." It strikes NE. and SW. and dips 45° SE.

In October, 1919, two men were working, driving a tunnel to tap the ledge. The tunnel was then 300 feet long. Excessive cost of supplies was holding back development. Other development consists of a short drift, a crosscut about 60 feet long, and a winze in which water was struck, preventing further progress.

Equipment consists of a 6″ x 6″ double-cylinder air compressor, 20-h.p. gasoline engine, a small skip and a blacksmith shop.

The property was under bond in 1914 to C. A. Schlageter and T. L. Diven, as the Mariposa Mines and Development Company, who did some development work and shipped some ore. No ore has been taken out since 1914. The ore is said to average $8 per ton, some running $20 per ton.

Doss and Thorne Mine. Owned by L. A. Ginaca and C. Ginaca, 213 Rialto Building, San Francisco. Located in section 28, T. 5 S., R. 16 E., about 3 miles southeast of Hornitos. One full claim, the Doss, and one fraction, the Thorne. The quartz vein is thirty feet wide between diorite schist walls, and strikes northeast and southwest. The ore is white quartz, carrying a very high per cent of sulphides, with two feet of practically solid sulphide on the footwall. The ore is said to assay from $12 to $20 per ton. There is a 400-foot shaft and an adit level 475 feet long, with crosscuts every fifty feet. One level in the shaft at 200 feet, with 300 feet of drifts. No equipment on the property and no production to date. Expect to produce soon. (April, 1920.)

Duncan Mine. Situated about 1 mile southeast of Hornitos, in sections 16 and 21, T. 5 S., R. 16 E. This is a "pocket" mine, located in the porphyrite and amphibolite schist, and has been owned for many years by George B. Turner. It is operated occasionally by leasers. In March, 1920, it was reported that a pocket of gold, valued at over $1,000, was uncovered by Dave Oneto and Mr. Tura, of Jackson, Amador County, who were operating it.

Early Quartz Mine. Consists of one unpatented claim owned by Eli Revel and the estate of August Revel, and located in the Sweetwater district in section 27, T. 4 S., R. 19 E., M. D. M., about 16 miles by wagon road northeast of Mariposa. Elevation 3700 feet, topography very rough and steep.

The quartz vein is between granite walls and varies from three to five feet in width, strikes N. 25° and dips 60° SE.

Development consists of a tunnel 800 feet long, above which the ore has been stoped out to a height of 100 to 500 feet, for the entire length. There is a forty-foot crosscut tunnel. The mine has had a varied history during the last few years. It was first leased by J. C. Yancy, then by Mrs. McIntyre, and then by Mr. Robinson. A company headed by Robinson installed considerable machinery, but most of it has recently been removed by the Schaw-Batcher Company and the Chicago Pneumatic Tool Company for nonpayment of bills.

The Robinson Company ceased operations in January, 1918, but about thirty men were left to work the mine for their wages. They worked the property until December, 1918. It is understood that Robinson sold his interest to a Mr. L. I. Sussman of 112 Market street, San Francisco. Early is now (April, 1920) suing for possession.

El Carmen. (See Mexican.)

Elizabeth Quartz Mine. Owned by the Mariposa Commercial and Mining Company, E. H. Benjamine, president, 522 Nevada Bank Building, San Francisco. Located in section 5, T. 5 S., R. 17 E., on the Mariposa Grant, 16 miles by wagon road from Merced Falls on the Yosemite Valley Railroad and 7 miles west of Mount Bullion.

Elevation 1500 feet, topography fairly rough, some oak timber, and water supply from Corbett Creek. The vein is on the contact between a slate footwall and porphyry hanging wall, averages six feet in width, with a maximum width of twenty feet. It strikes northwest and southeast and dips 50° E.

Development consists of a shaft 100 feet deep, about 100 feet of drifts, and a stope 100 feet high by five feet square.

Equipment consists of a 40-h.p. boiler, hoist, blacksmith shop, ore car, tracks, etc.

The property has not been worked since 1911. Before that time it was worked by leasers, who hauled the ore to the Princeton Mill at Mount Bullion. The average value of the ore is said to have been $19 per ton.

Emma Quartz Mine. Formerly known as the **Cader Idra.** Owned by Marcus Shinskie, and located in section 36, T. 3 S., R. 19 E., M. D. M., on the South Fork of the Merced River in the Hite Cove district. El Portal is about 6 miles northeast. Originally located about 1870, but later abandoned, and one claim, the Emma, relocated in January, 1914, by Marcus Shinskie.

Elevation 3500 feet, topography very rough, not much timber, and only water enough for domestic ore in the summer, but plenty in the winter.

There are two veins, one a free milling, ribbon gold quartz, and the other a silver-bearing quartz. The veins are between slate walls, strike NW. and SE. and dip 75° NE. They vary greatly in width, as they swell and pinch.

Development consists of a tunnel driven 90 feet on the vein, two other tunnels now caved, and several raises and stopes. Last few tons of ore milled is said to have carried very high values. The silver ore is base and hard to work.

No equipment on the property and only assessment work has been done in the last few years.

Farmers Hope. (See Miners Hope.)

Feliciano Quartz Mine. One patented claim, the Feliciana, owned by Mrs. J. B. Campbell of Fresno. Located in sections 12 and 13, T. 4 S., R. 18 E., M. D. M., in the Colorado district, about 10 miles by wagon road north of Mariposa, and four miles by trail southeast of Briceburg on the Yosemite Valley Railroad.

Elevation 3600 feet, topography rough, plenty of timber, and water from the mine and from springs.

There is one quartz vein, between slate walls, which varies from 2½′ to 3½′ in width; strikes NW. and SE. and dips 75° SW. Development consists of a tunnel 700 feet long, with a drift 350 feet south, and 250 feet north, along the vein, a 400-foot crosscut tunnel, and two winzes. Ore has been stoped out to the surface, a height of 650 feet for a length of about 700 feet.

The property has been idle for thirty years. During the last three or four years it has been under lease to J. B. Coyle of Fresno, who has worked it at intervals. He has been endeavoring to sink a shaft, but the water makes operation difficult. Equipment consists of a gasoline engine and a Straub rotary mill. There was formerly a 10-stamp mill on the property, but this has been taken away.

Ferguson. (See Anderson.)

Fournier Lease. Will Fournier and T. B. Fournier (brothers) early in 1915 obtained a lease on a prospect near the Princeton Mine, at Mount Bullion, owned by the Mariposa Commercial and Mining Company (Mariposa Grant). It is situated about 1000′ from the main Princeton

vein on the hanging wall side, and has been developed by a shaft 100 feet deep, 500 feet of drifts, and several small raises, crosscuts, and stopes. The property was worked quite steadily by the Fournier Brothers, until early in 1918, when one of them died. It was afterwards worked by Fournier and Marre. The unusual occurrence and high grade of the ore here are exceedingly interesting.

Rich pockets of ore were encountered, 40 or 50 pounds to the pocket, which ran from $8 to $20 per pound. The pockets seemed to collect around short stringers of pyrite, on a slate core, which projected from the slate wall into the vein. These stringers were from one inch to 6 or 8 inches long, from $\frac{1}{2}$″ to 1″ wide and generally flat. One of these stringers is on exhibition at the museum of the State Mining Bureau.

The pockets were not encountered at regular intervals, nor were they very close together. Total production has been in the neighborhood of $10,000. Last production of record was in August, 1919, $745.

Equipment consists of 10-h.p. motor, pump and hand mortar.

Garden Placer Mine. Owned by Will D. Weston, and located in the Whitlock district, in section 32, T. 4 S., R. 18 E., M. D. M., 6 miles northwest of Mariposa and 5 miles by trail to Saxon Creek station on the Yosemite Valley Railroad. The claim is patented and is worked only in the winter time when the water is plentiful, about three months each year. The deposit is bench gravel, 4 to 10 feet thick, with pay gravel from 14 inches to 4 feet thick.

Worked by means of Pole and Hungarian riffles, with a grade of 7″ to 12′ boxes, quicksilver in the riffles.

Geneva. Owned by Mrs. C. A. Queriolo, 892 Isabella street, Oakland, on patented agricultural land in Hunter Valley, in section 10, T. 4 S., R. 16 E., 12 miles north of Hornitos.

Developed by a 60-foot shaft which has now caved. There is a small hoist and compressor. The property was worked a little some time ago.

Geary Mine. Owned by Mr. Potter of San Francisco. Located in section 30, T. 4 S., R. 18 E., M. D. M., in the Whitlock district, 6 miles northeast of Mariposa, and 5 miles by trail south of Saxon Creek station on the Yosemite Valley Railroad.

Elevation 2800 feet, topography fairly rough, very little timber, and water only from the mine. There is one vein on the contact between a slate footwall and a porphyry hanging wall. It averages 3 feet in width, strikes NW. and SE. and dips 80° NE.

There is an incline shaft 100 feet deep, also about 325 feet of drifts. No equipment. The mine has not been worked for years. It is said to be one of the most promising in the district.

Golden Gate Group. Owned by Chas. A. Schlageter of Mariposa. Located in sections 18 and 19, T. 4 S., R. 17 E., M. D. M., 1 mile northwest of Bear Valley and 7 miles by wagon road south of Bagby on the Yosemite Valley Railroad.

Two quartz veins on the contact between mariposite footwall and slate hanging wall. The veins vary from 3 to 6 feet in width, strike NW. and SE., and are almost vertical.

Development consists of a shaft 210 feet deep, an adit level 250 feet long, a 250-foot crosscut, and a 20-foot raise.

There is a blacksmith shop and a shed over the shaft, also small skip, wood track, etc.

The ore is said to assay from $7 to $20 per ton. Some ore on the dump.

Grant. (See Mariposa Grant.)

Gray Eagle. (Blue Jay.) Consists of two claims, the Gray Eagle, located in 1894, and the Stella, in 1912, owned by J. S. Gazolo. Situated in section 30, T. 3 S., R. 17 E., M. D. M., in the Flyaway district, about 4 miles by wagon road north of Bagby. Elevation 1700 feet, topography fairly rough, water only from the mine.

There are two veins on the contact between a serpentine footwall and porphyry and slate hanging wall. The vein strikes NW. and SE., and dips about 52° NE.

Developed by a shaft 133 feet deep, and adit level 200 feet long, 155 foot drift on the second level, 300 foot crosscut on the adit level, one stope 60′ x 20′ x 40′ high, and a second stope 60′ x 12′ x 35′ high.

The property was bonded in 1914 to some Los Angeles people, but little work was done.

Green's Gulch Quartz Mine. Owned by the Mariposa Commercial and Mining Company (Mariposa Grant). One patented claim located in sections 12 and 13, T. 5 S., R. 17 E., M. D. M., near Mt. Bullion and 12 miles by wagon road from Bagby.

There is one quartz vein averaging 3 feet in width, between slate walls. Strike NW. and SE. and dip about 50° NE.

Development consists of a 300 foot shaft, with 3 levels, a 550 foot adit level, 510 foot drift on 1st level, 360 foot drift on 2nd level. There is a 200 foot crosscut, about 250 feet of raises, and a stope 200 feet long, 200 feet high and 3 feet wide.

Equipment consists of hoist, bucket, 2 machine drills, 2 pumps, and an air receiver. Compressed air is furnished from the Princeton mine.

The mine has been worked principally by leasers, but has not been in operation since January 1915. The ore is said to average about $11 per ton. Total production has been about 10,500 tons valued at nearly $120,000.

Grimshaw. (See Ruth Pierce.)

Guadalupe Quartz Mine. Consists of one patented claim, owned by the Mariposa Commercial and Mining Company, and located near the south line of the Mariposa Grant, in section 32, T. 5 S., R. 18 E., 4 miles south of Mount Bullion, and 17 miles southeast of Bagby on the Yosemite Valley Railroad.

The quartz vein is 18″ wide in granite, strikes NW. and SE., and dips E. about 25°. There is a 250 foot tunnel and some other underground workings.

The mine has not been worked by the company for many years, but leasers have at various times worked it. It has been idle since the latter part of 1914.

There is no equipment at the property.

Guest Quartz Mine. (See Mariposa County Report, 1915, page 57.)

Hasloe Quartz Mine. Owned by F. C. Morgan of San Francisco, and located in section 1, T. 3 S., R. 17 E., M. D. M., about 12 miles by wagon road east of Coulterville.

There is one quartz vein, from 1′ to 3′ in width between slate walls. It strikes E. and W. and dips about 30° N.

Developed by a 300′ incline shaft. This property has been idle for nearly 40 years.

Herman Quartz Mine. Formerly consisted of two claims owned by George Herman of Mariposa. The claims were allowed to become delinquent and one of them has been relocated by a Mr. Ives. Located in section 29, T. 4 S., R. 18 E., in the Whitlock district 6 miles northwest of Mariposa.

Two veins in porphyry, each averaging about 10′ in width. Developed by a tunnel, and a 110′ drift on one vein and a 100′ drift on the second. Has not been worked for some time.

Hite Gold Mine. Situated at Hite Cove on the South Fork of the Merced River, in section 27, T. 3 S., R. 19 E. Clearing House, on the Yosemite Valley Railroad, is 4 miles northwest by trail, and there is also a siding, called South Fork, at the Junction of the South Fork with the main Merced River. El Portal is about 6 miles northeast. The property consists of fifteen quartz claims, three of which are patented, and one placer claim owned by J. S. Spilman, 244 Kearny street, San Francisco, who is also secretary and treasurer of the Mountain King Mining Company. The claims were located about 1863 and during the next 20 years there was considerable activity in the district, a town of several hundred people being located there. The mines were closed down in 1882 and very little work has been done since. Water was pumped out in 1896 and again in 1901, and some development work done, but no production has been made since the early days.

The Hite mine is credited with a production of close to $3,000,000, most of which was taken from near the surface

There are two veins which average 4 feet in width between diorite walls, general strike a little N. of W., and dip about 75° NE. The quartz is free milling and averages 1½% sulphides.

The underground workings are quite extensive but some of them are now caved and inaccessible. There is a shaft 330′ deep with 3 levels, and there are also 9 adit levels, with several winzes and raises and a stope 800′ high.

There is a completely equipped 10 stamp mill and a cyanide plant all in poor condition from disuse, and the buildings are falling to ruin. The mill consists of 10 stamps, 2 Challenge feeders, 2 plates, 4′ x 16′, and 3 tables. There is an air compressor, air hoist, several machine drills, pump, etc. Also a flume 500 feet long, and ditchline, to take the water from the South Fork for power.

C. Arkell is caretaker at the property.

In Yosemite National Park.

Horse Shoe Mine. Located in Hunter Valley, in section 23, T. 4 S., R. 16 E., 10 miles north of Hornitos. About five miles by trail to Bagby. Elevation about 1800 feet, on a steep hillside, with pine and oak timber, water in Cotton Creek 100 feet or more below the shaft. The country rock is porphyrite.

There is an old shaft, said to be several hundred feet deep, which is now caved. There was a mill on the property, years ago, but no equipment now remains. Considerable ore still on the dump. This mine was worked to some extent many years ago.

Josephine Quartz Mine. Consists of one patented claim, the Josephine, owned by the Mariposa Commercial and Mining Company, E. H. Benjamin, president, 522 Nevada Bank Building, San Francisco. Located on the Mariposa Grant in section 16, T. 4 S., R. 17 E., 3 miles southeast of Bagby. One of the largest mines belonging to the company. Elevation 2100′, topography rough, not much timber, and water from Bear Creek. There is one quartz vein, which averages 6′ in width, between slate walls. It strikes NW. and SE. and dips about 55° NE.

Underground developments are quite extensive, consisting of a 500′ shaft with 4 levels. There are 1600′ of drifts on the first level, 100′ on the second, 600′ on the third, and 220′ on the fourth. There are also 710 feet of crosscuts, 400 feet of raises, and a stope 500′ x 200′ x 4′.

Equipment consists of a compressor, 2 drills, mine cars, 2000′ of track, 30-h.p. motor, blacksmith shop and other buildings. Electric power from the company's power house at Bagby. The mine has been worked mostly by leasers, and is credited with a total production of close to $1,000,000. Has not been worked for the last few years.

Frank Maguire of Mount Bullion, superintendent.

Bibl.: Mineral Resources West of Rocky Mountains, J. Ross Brown, 1867, p. 42.

Jumbo. (See Blue Belle.)

Kane Quartz Mine. Consists of one unpatented claim, formerly called the Mayflower, owned by C. N. Kane of Mariposa, and located in section 2, T. 5 S., R. 19 E., about 12 miles northeast of Mariposa. Elevation 4000 feet, topography very rough, plenty of timber and water from Snow Creek. There are two tunnels, one 60′ and the other 140′ long. No equipment. Not worked during last few years.

Kenedy-Milburn-Allerd Claim. Three unpatented claims owned by C. L. Kenedy, W. H. Milburn and Lawrence Allerd of Mariposa. Located on the South Fork of Chowchilla River, 2 miles east of Indian Peak, ½ mile south of Nelson's Cove, and 12 miles northeast of Raymond, Madera County.

The vein is about 9′ wide and strikes NE. and SW. Developed only by 40′ adit level. The claims were located in May 1914 and only assessment work has been done.

Lafayette Mine. (Formerly called the **Ghirardelli.)** Owned by Dr. C. A. Queriolo, 892 Isabella street, Oakland, on patented agricultural land in Hunter Valley, in section 15, T. 4 S., R. 16 E., about 12 miles north of Hornitos.

The country rock is porphyrite and the vein is on the Hunter Valley so-called Blue Lead.

The mine was operated in 1866-67 and has been idle since then. The shaft was sunk to a depth of 150 feet, or about water level. It is claimed the vein at the bottom of the shaft averaged two feet in width and flated $25 per ton, no concentrates being saved. There was a 4-stamp mill then on the property, but that was taken away years ago. All that remains to be seen is the old shaft, now partially filled.

Landrum Quartz Mine. Consists of three unpatented claims, owned by Simeon Landrum, and located in sections 34 and 35, T. 4 S., R. 18 E., in the Colorado district, about 5 miles north of Mariposa. Six miles by trail north to Briceburg on the Merced River. Elevation 2900′, topography fairly rough, timber plentiful, and water from Saxon Creek and springs.

There are 3 veins averaging 2′ in width, between a limestone and talc footwall and a porphyry hanging wall. The general strike is NW. and SE., and the dip 45° SW.

Development consists of a 90′ shaft and over 800 feet of drifts. Equipment consists of a 2-h.p. gas engine, windlass and bucket. There are two cabins and a blacksmith shop. It was intended to install a stamp mill and the buildings were erected, but the machinery is not yet in place. No recent operation.

Little Bear Quartz Mine. (Formerly known as the **Pete Gordon.**) Consists of one unpatented claim, owned by Charles J. Hayes of Mariposa and located in section 19, T. 4 S., R 19 E., between Sweetwater and Colorado. Elevation 3000′, topography rough, not much timber, plenty of water from Little Bear Creek.

There are three veins, the main one averaging 2′ in width and reaching a maximum of 6 feet. The veins are on the contact between a slate footwall and granite hanging wall, have a general strike of NW. and SE. and dip 45° NE. The ore is a free milling quartz.

Development consists of a 175′ adit level on one side of the creek, and a 30′ adit on the other side, and a 12′ winze.

Only assessment work is done, as Mr. Hayes devotes his time to ranching. He would bond the property to anyone with capital to develop it.

Live Oak Quartz Mine. Owned by George Trede, and located in section 16, T. 4 S., R. 18 E., ½ mile by trail south from Saxon Creek Station on the Yosemite Valley Railroad. Elevation about 1800′, topography rough, plenty of water from Bear Creek and from springs. Three unpatented claims, Live Oak, Live Oak Extension and the Ochre. There are two veins, averaging 20″ and 8″ wide respectively, on the contact between a greenstone footwall and a slate hanging wall. The strike is N. and S. and the dip 45° E. The ore is free milling quartz.

Development consists of four shafts, 20′, 30′, 40′ and 50′ deep, respectively; a 200′ crosscut and about 100′ of drifts.

Equipment consists of a 2-stamp mill, an old 16-foot arrastra, Pelton water wheel with a ditch line one-half mile long, gravity tramway, blacksmith shop, boarding house, and bunk house.

Work is generally carried on in the winter time when sufficient water, for power, is to be had. There has been nothing done in the last two years.

London Quartz Mine. Formerly called the **Young America.** Owned by O. H. Leonard, and located in section 30, T. 4 S., R. 18 E., in the Whitlock district, about 7 miles north of Mariposa and 5 miles by trail south from Saxon Creek station on the Yosemite Valley Railroad. Elevation 2670 feet, topography fairly rough, practically no timber and no water. One unpatented claim located in 1912 by Albert and L. E. Austin who owned the property for several years.

There is one quartz vein averaging 22″ in width between porphyry walls. It strikes NW. and SE. and dips 70° NE. The ore is base, carry-

ing copper and iron, with the gold values. There has been very little development, only a 30′ shaft and a short drift. No recent work has been done.

Long Mary Quartz Mine. Owned by the Mariposa Commercial and Mining Company, E. H. Benjamin, president, 502 Nevada Bank Building, San Francisco. Located on the Mariposa Grant, in section 17, T. 5 S., R. 17 E., about 4 miles west of Mount Bullion, and 14 miles by wagon road from Merced Falls on the Yosemite Valley Railroad.

Elevation about 1500 feet, topography rough, not much timber, water from Corbett Creek.

There is one quartz vein, averaging 2 feet in width between slate walls. Strikes NW. and SE., and dip 60° SW.

Underground developments are quite extensive, consisting of a shaft 413′ deep, a 263′ adit level tunnel, 360′ of drifts on 200 foot level, 383′ on 300 foot level, 315′ on 350 foot level, and 163′ on the 400 foot level, also over 900 feet of raises, and a stope 400′ high and 350′ long.

Equipment consists of a 5-stamp mill, 1000 pound stamps, rock crusher, Challenge feeder, plate 56″ x 10″, two Union tables, also a hoist, a 10″ x 12″ compressor, capacity 225 cubic feet per minute, two transformers, 150-h.p. each. The company has a branch power line 4 miles long, from the mine to the Bagby power line. There is a blacksmith shop, boarding house, and other buildings. The mine was worked to some extent in 1914 and 1915.

The ore is said to average around $12 per ton, the mine is credited with a total production of close to 10,000 tons.

Louis Quartz Mine. Owned by the Mariposa Commercial and Mining Company, E. H. Benjamin, president, 502 Nevada Bank Building, San Francisco. Located on the Mariposa Grant in section 11, T. 5 S., R. 17 E., 1½ miles northwest of Mount Bullion, and 12 miles by wagon road south of Bagby on the Yosemite Valley Railroad. Elevation about 2150′, topography rough, no timber and no water. There are two veins, averaging 4 feet in width, between slate walls. The strike is NW. and SE., and the dip about 50° NE. The ore is free milling quartz.

There is a 400′ shaft with two levels; 500′ of drifts on upper level and 424′ on the lower level. Also a 350′ adit level, a 115′ crosscut, 150′ of raises, and a stope 180′ x 80′.

Production has been about 1240 tons valued at $27,690, or slightly over $22 per ton.

With the exception of a few tons of ore occasionally taken out by leasers, the mine has not been worked since 1902. There has been no production since 1912.

Louisa Quartz Mine. Owned by Eli Revel and the estate of August Revel. Located in the Sweetwater district, in section 27, T. 4 S., R. 19 E., about 16 miles by wagon road northeast of Mariposa, and 7 miles by trail south of South Fork Siding on the Yosemite Valley Railroad. The topography is very rough, timber plentiful, and water enough from the mine for milling operations.

One unpatented claim, located in 1900. There is one quartz vein averaging 4′ in width, between granite walls. The strike is E. and W. and the dip about 80° S.

There is very little development, there being one tunnel 50′ long, another 60′ long and a small open cut. No equipment, and only assessment work is done.

Louise Quartz Mine. Owned by A. S. Bigelow and G. M. Hyans of Boston; formerly the Merced Gold Mining Company; C. I. Mentzer, of Coulterville, is superintendent. The mine is located at the edge of the town of Coulterville, in section 3, T. 3 S., R. 16 E. Pleasant Valley is the nearest railroad shipping point, about 12 miles southwest, on the Yosemite Valley Railroad. Elevation about 1700 feet, considerable timber, water from Maxwell Creek which runs through the property. The quartz vein in this district shows as a massive outcrop, 20 feet or more wide which can be traced for miles across the country along the crest of a series of rolling hills. Where Maxwell Creek cuts through the ledge at the western edge of Coulterville, a bold massive quartz outcrop is left on either side. When visited in October, 1919, the outcrop on the Louise property, on the north side of the creek, had shortly before been sampled by some Los Angeles engineers.

The mine has not been worked for many years but there is considerable underground development, consisting of a vertical shaft 375 feet deep, with three levels. There are 275′ of drifts on the 100′ level, 75′ on the 200′ level, 500′ on the 300′ level, 775′ of crosscuts, 150′ air shaft, and 600′ of winze on the vein.

There is no equipment at the mine, the ore having been formerly milled in the Potosi mill owned by the same company. The ore was hauled by means of a steam locomotive on a narrow guage track, with large ore cars. (See Merced Gold Company, and also Introduction.)

Louisiana Mine. Located in section 25, T. 2 S., R. 17 E., about 12 miles northeast of Coulterville, adjoining the Bondurant. It has not been worked for many years. Formerly owned by C. P. Treat, now under option to A. T. Adams, owner of the Bondurant. The vein is in slate and varies from 1′ to 5′ wide. It strikes N. 60″ W. and dips 45° NE. Incline shaft 275′ deep and a tunnel 150′ long.

Lovely Rogers Quartz Mine. (Cherokee.) One patented claim, the Lovely Rogers, and one unpatented claim, the Mount Quin, owned by Arthur Shimer, and located in section 11, T. 3 S., R. 17 E., about 9 miles east of Coulterville and 15 miles northeast of Bagby on the Yosemite Valley Railroad. The elevation is 2400 feet, topography rough, very little water and little timber. There are 3 veins varying from 1½′ to 2′ in width between slate walls. The general strike is E. and W. and the dip 70° N.

There is a shaft 100 feet deep, and three adits, 400 feet, 300 feet and 250 feet long respectively. Also a 70 foot crosscut, a winze 80 feet deep, and a stope 200 feet long and 80 feet high.

No equipment. There formerly was a mill but it was moved to the Bondurant. Nothing has been done for the last several years.

Malone Mine. Formerly known as the **Bear Creek Gold Mine.** Located in section 5, T. 5 S., R. 19 E., about 7 miles northeast of Mariposa, and 6 miles by trail southeast of Briceburg on the Yosemite Valley Railroad. Under lease to Will Johnson. The property consists of five claims, all patented. Elevation 2600 feet, topography fairly level, plenty of water for the 20 stamp mill, from springs and mine. There

are six separate veins, averaging one foot in width, but reaching a maximum of 4 feet in width. All the veins are in granite, strike approximately N. and S. and dip 33° W. All have been proven for a distance of 1320 feet on the surface.

Development consists of a shaft 150 feet deep, an adit with a 600 foot crosscut tunnel, and a stope 300 feet long, 90 feet high, and 3½ feet wide.

There is a 10 stamp mill, five 1000 pound stamps, and five 650 pound stamps, Golden State rock crusher, Challenge feeders, and 2 plates 54″ by 84″.

Steam power is used with wood for fuel. There is an 80-h.p. boiler, also 20-h.p. mill engine, and 25-h.p. engine for the hoist.

Water is piped 2000 feet from a spring to a 4000-gallon concrete tank at the mill. There is a dwelling house, boarding house, bunk house and blacksmith shop.

Formerly worked to some extent by Thomas Gordon and associates. Now (October 1919) being worked by Will Johnson, who has been operating it for the last several months taking out **$10 to $12 ore.**

Malvina Quartz Mine. Owned by A. S. Bigelow and G. M. Hyans of Boston, formerly the Merced Gold Mining Company, now dissolved. C. I. Mentzer, of Coulterville, superintendent. Located in section 4, T. 3 S., R. 16 E., 1 mile west of Coulterville.

The mine was worked extensively in early days, the ore being hauled through the Potosi tunnel in ore cars pulled by mules, to the Potosi mill, owned by the same company.

Development consists of one vertical shaft 1000 feet deep, another incline shaft 875 feet deep, 1275 feet of drifts on the Potosi tunnel level, 400 feet of drifts on the 44 foot level, 387 feet on the 600 foot level, 225 feet on the 900 foot level, and 1225 feet of crosscuts.

There is a large Corliss, flat cable hoist and head frame, blacksmith shop, change house, office, etc.

The ore was low grade, averaging around $4 per ton, and with the equipment, could not be worked at a profit.

The property has been idle for many years. (See Merced Gold Mining Company; also Introduction.)

Mammoth. (See Quail.)

Marble Springs Mine (Compromise). Owned by J. A. Flink and R. C. Haywood, under the title of the Marble Springs Gold Mining Company. Located in the Kinsley district, in sections 30 and 31, T. 2 S., R. 18 E., about 14 miles by wagon road, east of Coulterville.

This old property is said to have had the first stamp mill in the state, consisting of wooden stamps. The property was idle for nearly 40 years, but during the last few years has been worked, off and on, first by Mr. Fillmore and associates, and later by J. A. Flink. The latter was working the mine in the latter part of 1919, employing several men, and crushing in a 30-ton Gibson mill, run by a gas engine.

There is one vein, varying from 2′ to 5′ in width, between a slate footwall and a diorite hanging wall. It strikes NE. and SW. and dips 47° SE.

There is a 350 foot incline shaft, with three levels, and about 1000 feet of drifts.

Elevation 2800 feet, topography very rough.

Mariposa Commercial and Mining Company. (See Mariposa Grant.)

Mariposa Grant. Owned by the Mariposa Commercial and Mining Company, 522 Nevada Bank Building, San Francisco; E. H. Benjamin, president; H. G. Stevenson, secretary; Frank Maguire, superintendent, at Mount Bullion. Property consists of 44,000 acres, extending along the Mother Lode, from the Merced River at Bagby to about 4 miles south of the town of Mariposa, and including the towns of Mount Bullion and Bear Valley. There are in all about sixty mines, or veins, from which some production has been made. The most important of these, the mines which have been extensively developed, are as follows: Alice, Green Gulch, Long Mary, Mariposa, Mount Ophir, Pine Tree, Josephine, Princeton, Queen Specimen, Stockton Creek, Texas and Turner. (See under the above names in text.)

There is a 40-stamp mill at the Princeton mine and an old 5-stamp mill at Bagby. A power house on the Merced River at Bagby supplies power to the different properties, and light to the towns and residences. The properties have not been operated for many years, except by a few leasers.

Mariposa Quartz Mine. Owned by the Mariposa Commercial and Mining Company (Mariposa Grant), E. H. Benjamin, president, 522 Nevada Bank Building, San Francisco. This is one of the most important of the Grant properties, and was formerly one of the largest producers in the county. Situated at the town of Mariposa in section 23, T. 5 S., R. 18 E. Elevation 1900 feet, topography rolling, little timber, and water from Mariposa Creek and Stockton Creek. Located in the early 50's, and patented in 1857. The mine is credited with a production of close to $700,000 for the thirteen years, 1900 to 1913, the greatest production being made from 1901 to 1905. It was also a large producer before 1900.

There are two quartz veins, called the North Fork and the West Fork respectively, which will average 5 feet in width. General strike in NW. and SE. and the dip from 60° to 70° S. Both walls are diabase.

There is a 1550 feet incline shaft, with 8 levels. Drifts as follows: on 275 foot level, 390′ E. and 400′ W., on 475 foot level, 400′ E. and 637′ W., on 625 foot level, 700′ E. and 600′ W., on 800 foot level, 322′ E. and 410′ W., on 970 foot level, 396′ E. and 412′ W., on 1200 foot level, 250′ E. and 400′ W., on 1400 foot level, 60′ E. and 50′ W., on 1550 foot level, 200′ E. and 130′ W.

The ore is all stoped out from the 800 foot level to the surface.

The mine has not been worked since 1915, and much of the equipment has been removed, and the underground workings have caved.

There is a 5-stamp mill with feeders and plates. A large mill was destroyed by fire, several years ago.

Electric power was used, supplied by the company's power house at Bagby.

Total operating cost in 1915 was approximately $4 per ton.

F. C. Maguire, of Mount Bullion, superintendent of Grant properties.

Mary Harrison Mine. Owned by A. S. Bigelow and G. M. Hyans of Boston, formerly the Merced Gold Mining Company, C. I. Mentzer, of Coulterville, superintendent. Located in sections 10 and 11, T. 3 S., R. 16 E., 1 mile south of Coulterville. This is one of the four large mines

owned by the parties named. (See Introduction.) Elevation 1930 feet, topography rough, water from Maxwell Creek and Black Creek.

There are two quartz veins, averaging about 7 feet in width, between slate walls. Strike NW. and SE. and dip about 50° NE.

There is a vertical shaft 1200 feet deep with 12 levels, and a total of nearly 5000 feet of drifts; also an incline shaft 800 feet deep, and many stopes, crosscuts and raises.

The equipment consists of four 60-h.p. steam boilers, large steam hoist with flat cable, compressor, rock crusher and bins, well equipped office building, and store house filled with all kinds of machinery parts and hardware. The ore was crushed and hauled over a narrow guage track, by steam locomotive and large ore cars, to the Potosi mill owned by the same people. The ore is said to have averaged from $7 to $12 per ton.

The mine has not been worked for fifteen years or more.

The entire property embracing 4 mines and all equipment, is for sale at a price around $75,000. (See Merced Gold Mining Company; also Introduction.)

Mexican Mine. (Formerly known as the **El Carmen.**) Owned by Frank H. Catherwood, and located in section 36, T. 3 S., R. 19 E., near the Hite Cove district, and about 6 miles from Jerseydale. This is an old mine and has not been worked for perhaps twenty years. The elevation is close to 4000 feet, topography rough, not much timber, plenty of water, in the winter, but little in the summer.

There are two quartz veins, varying from 2′ to 6′ in width between slate walls. Strike NW. and dip about 80° SE. The ore is "ribbon rock" and carries free gold. There is an incline shaft 150 feet deep and a total of 625 feet of drifts. No equipment.

Mebold Quartz Mine. Consists of one unpatented claim, owned by Fred Mebold of Jerseydale, and located on Sweetwater Creek, northwest of the Sweetwater mine. The vein is two feet wide in granite walls. There is a 50-foot crosscut tunnel and a few feet of drifts. Has not been worked for several years.

Merced River Quartz Mines. (Horse Shoe Bend Mines.) Consist of 13 unpatented claims owned by R. A. Keller, James Burns and Company, James Burns, president. Located in sections 15, 16 and 22, T. 3 S., R. 16 E., 3 miles south of Coulterville and one-half mile from Mast Station at Horse Shoe Bend on the Yosemite Valley Railroad. There are 4 veins varying from 1′ to 4′ in width between a slate footwall and a serpentine hanging wall. The strike is NW. and SE. and the dip 50° NE.

Development consists of a shaft 100 feet deep, with two levels and 210 feet of drifts; another shaft 90 feet deep and crosscut 230 feet long.

There was a 10-stamp mill on the ground, which was never erected, also two rock crushers, and a 25-h.p. gas engine. There is a boarding house, bunk house and dwelling. Not operated for years.

Merced Gold Mining Company. Now dissolved. Property owned by A. S. Bigelow, and G. M. Hyams of Boston. (See introduction and individual mines mentioned.)

Consists of 25 quartz claims, all but one patented, 7 mill sites, two 160-acre homesteads, and 160 acres of patented timber land.

Mineral land located in sections 3 and 4 and 10 and 11, T. 3 S., R. 16 E., and sections 32, 33 and 34, T. 2 S., R. 16 E., near Coulterville.

In the so-called West Belt are located the following claims: Boston, Mahoney, Glendive, G. Douglass, Miles, D. Cook, Helena, Potosi, Ninety-four, Dillon, Malvina, Bozeman, Regina, Malvina No. 2, Butte (fraction); and the following mill sites: Malvina, Miles, Helena and Glendive.

In the Main Belt are located: the Margaret, Louisa, Balance, Venture, Mary Harrison, Sheridan, Chateau, Dalia, Ely, and Bigelow (unpatented), and the mill sites: Balance, Dalia, and Mary Harrison.

An electric power line runs within ¼ mile of the property.

Miners Hope Quartz Mine. Formerly the **Farmers Hope.** First owned by G. L. Kennedy, with several other claims. All went delinquent and the Miners Hope was relocated by Nick Mullins on January 1, 1916. Situated in the Whitlock district, in section 29, T. 4 S., R. 18 E., about 7 miles northwest of Mariposa. Saxon Creek Station on the Yosemite Valley Railroad is about 6 miles northeast by trail. Elevation about 3300 feet, topography mountainous, plenty of timber for mining and plenty of water from springs and from the mine. The vein averages 2½ feet in width, between a mariposite footwall and a porphyry hanging wall, strikes NW. and SE. and dips 85° NE.

Developed by 135-foot shaft, several hundred feet of drifts, and a 385-foot crosscut.

There is a 5-stamp mill, 850-pound stamps, 4′ x 10′ plate, rock crusher, one Frue vanner, 10-h.p. engine, and 12-h.p. boiler. The property has not been worked for several years.

Mocking Bird Quartz Mine. One patented claim owned by J. A. and C. J. Schroeder, of Mariposa. Patented in 1904. This is an extension of the Colorado vein, and is located in section 27, T. 4 S., R. 18 E., in the Colorado district, about 6 miles north of Mariposa. Saxon Creek Station on the Yosemite Valley Railroad is 4 miles north by trail. Elevation 2700 feet, topography rough, timber plentiful, and water enough for mill from springs. There is one vein, averaging 3 feet in width, on the contact between a porphyry footwall and a slate hanging wall. It strikes NW. and SE. and is nearly vertical. The ore is free-milling quartz. A talc-porphyry dike intersects the vein and seems to take the values from the original vein. There is a 100-foot shaft with drifts, and a tunnel several hundred feet long.

The mine was under lease for quite a while to Weston Brothers, who ran several hundred feet of tunnel and took out considerable ore.

Mohawk Mine. Formerly the **North Whitlock Extension,** which was owned by G. L. Kennedy, but was relocated in January, 1916, by Nick Mullins, under the name of Mohawk. Situated in the Whitlock district, in section 29, T. 4 S., R. 18 E., 6 miles northwest of Mariposa and 6 miles southwest of Saxon Creek Station on the Yosemite Valley Railroad. Elevation 3300 feet, topography rough, timber plentiful, and water from springs along Whitlock Creek.

There are two veins, varying from a few inches up to two feet in width, between a porphyry hanging wall and a greenstone footwall. Strike N. and S. and dip almost vertical.

Development consists of a 100-foot shaft with drifts and stopes. There is a Davis hoist, in a corrugated iron building.

Some ore was taken out and milled in the Ducell 5-stamp mill. Not worked recently.

Monte Christo Group. Consists of four unpatented claims owned by F. M. Skelton, Jerseydale, and L. C. Worthington, 1503 G street, Bakersfield, and located in section 20, T. 4 S., R. 20 E., about 4 miles east of Jerseydale.

Elevation 3400 feet, topography rough, timber plentiful, and water from Devil Gulch. Total of 80 acres consisting of Monte Christo, Morning Star, Headlight, and Mazie claims, located in 1913 and 1914.

There are two parallel veins, 600 feet apart, which average 7 feet in width, as far as opened up. They occur on the contact between a porphyry footwall and a granite hanging wall; general strike NW. and SE., and dip about 72° NE. The ore is base, containing some arsenic and antimony.

Development consists of a 65-foot incline shaft, a tunnel several hundred feet long, and several trenches.

Equipment consists of a 12-h.p. gas engine, Rix air compressor, and one Wonder power drill. There is also a blacksmith shop, cabin, windlass and bucket. Worked for several months during 1915, but not since. If costs permit the property will be worked in 1920. Ore is said to assay between $16 and $18 per ton.

Mountain Belle Quartz Mine. One patented claim owned by J. D. Crichton of San Francisco, and located in section 25, T. 5 S., R. 17 E., in the Guadalupe district 6 miles west of Mariposa, and 14 miles southeast of Bagby on the Yosemite Valley Railroad. Elevation 2200 feet, topography rolling, no timber, and very little water.

There is one vein averaging 3 feet in width between quartz porphyry walls. It strikes NW. and SE. and dips 30° SW.

There is an incline shaft 174 feet deep, with two levels, and about 100 feet of drifts.

Equipment consists of a 5-stamp mill, 4 ft. by 10 ft. plate, one Union concentrator, Blake crusher, 15-h.p. gasoline engine, 10-h.p. hoist, and Cornish pump.

The vein runs onto the Mariposa Grant property at both ends. The ore is said to run about $21 per ton. The mine was under poor management, and nothing has been done since 1908. Equipment still on the property.

Mount Buckingham Group. Consists of eight quartz claims, two mill sites and 169 acres of patented timber land, a total of 339 acres. Located in 1850 by Wm. Buckingham. Now owned by J. L. Diven, of Whitlock, and Mrs. C. A. Morgan. Situated in sections 1, 2, 11 and 12, T. 5 S., R. 19 E., about 12 miles northeast of Mariposa. Elevation 4600 feet, surface very rough, and sugar pine, water from Snow Creek.

There are five veins, called the Vanderbilt, Golden Slipper, Crown Point, Apex, and Sunnyside. They vary from 2 feet to 10 feet in thickness, between a slate hanging wall and a granite footwall. The general strike is NW. and SE., and the dip from 70° to 85° SW.

Development consists of a 500-foot crosscut tunnel, a 250-foot raise and several stopes and winzes.

There was formerly a 10-stamp mill, which was destroyed by fire many years ago. Only equipment consists of mine cars, tools, etc.

This is one of the largest, low-grade properties in the county. The different veins are said to assay from $4 to $15 per ton.

Mount Gaines Mine. Consists of sixteen mining claims, 200 acres of patented land, and 160 acres of mineral rights, owned by G. W. Crotts and Sirona E. Crotts, under the title of the Mount Gaines Gold Mining Company. Situated in section 35, T. 4 S., R. 16 E., 7 miles northeast of Hornitos and 14 miles from Merced Falls on the Yosemite Valley Railroad.

Elevation 1100 feet, surface rolling, no timber, and water from mine and springs. This is a large and well-developed property, but it has not been worked since 1910, in which year it was closed down, as it went into debt, and sold, at a sheriff's sale, to A. R. Mains, who later sold to the present owners. The mine was unwatered in 1917, but no production made.

There is a 20-stamp mill with rock crusher, Challenge feeders and eight concentrators. The plates have been removed. Capacity of mill 85 to 100 tons per day. An electric power line, of the San Joaquin Light and Power Corporation, extends to the mine from Merced Falls. There are several motors, five pumps, machine drills, etc. The compressor and hoist have been removed.

There are many buildings, consisting of a blacksmith shop, storeroom, office, cookhouse, two bunkhouses, assay office, seven cottages, four cabins, and other buildings.

Underground developments are extensive, consisting of an incline shaft 1350 feet deep, with eleven levels and a total of 7840 feet of drifts, also several stopes five feet wide and from 400 ft. to 500 ft. high.

There is one quartz vein, from four feet to thirty feet in width, between a granite footwall and a schist hanging wall. Strike northeast and southwest, dip 30°, southeast. The ore occurs in kidneys and lenses. The shaft was sunk to 1350 feet, considerable distance below the lowest level worked, and it is claimed the vein showed strong all the way. The average value of the ore milled was around $8 per ton and the concentrates ran $150 per ton. Considerable underground development work would have to be done before operations could be resumed, but it is believed the property would justify such work.

M. N. Black, foreman at the Ruth Pierce mine, is caretaker, and manager.

Mount Ophir Quartz Mine. Owned by the Mariposa Commercial and Mining Company, E. H. Benjamin, president, 522 Nevada Bank Building, San Francisco. Located in section 12, T. 5 S., R. 17 E., one mile north of the town of Mount Bullion, and ten miles by wagon road from Bagby. Elevation 1900 feet, surface rough, no timber, and very little water. There is one vein, averaging five feet in width between a serpentine footwall and a slate hanging wall. It strikes northwest and southeast and dips 60° northeast.

Development consists of three adit levels, with a total of 1500 feet of drifts, 360 feet of raises, an 80-foot crosscut, 20-foot winze, and a stope 300 feet high, 200 feet long, and 5 feet wide. No reduction equipment.

The mine was opened in the early fifties, and the ruins of what is said to have been the first mint in California may yet be seen on the property. Fifty-dollar slugs were minted.

The mine was closed by the company in 1900, but considerable work has been done by leasers since then. It has not been operated since 1914.

The average value of the ore mined was about $12 per ton.

The power line from the company's power house at Bagby passes over the property. Frank Maguire of Mount Bullion, superintendent.

Mountain King Mine. Owned by the Mountain King Mining Company, Anthony McMillan, president and managing director, office 244 Kearny street, San Francisco; Arthur Hillier, superintendent at the mine.

Located at Mountain King on the Merced River and the Yosemite Valley Railroad, in section 31, T. 3 S., R. 18 E., 6 miles east of Bagby.

The property consists of 19 quartz claims, patents to which have been recently obtained. It is one of the few mines in Mariposa County which has been in continuous operation during the last several years.

There are 4 veins, which average 5 feet in width between slate walls. General strike NW. and SE., and dip 65° NE.

Underground development is shown on the accompanying sketches, taken from a recent report by A. Hillier, superintendent.

There is a Sullivan compressor 16 x 10 x 14 run by a 100-h.p. Allis Chalmers motor; sawmill run by 15-h.p. motor; electric hoist, with 50-h.p. motor; sampler with 3-h.p. motor; electric pump and air fan in the mine, each run by 5-h.p. motor; blacksmith shop with a No. 4 Leymer drill shapever; and a hoist for raising supplies from the station on the railroad to the mill. A twin-motor, General Electric locomotive, capable of hauling eight 1-ton cars is used to haul the ore from the mine to the mill.

A 2½ "Byron Jackson" 4-stage centrifugal pump is used to pump water for milling from the river to one 8000-gallon and one 15,000-gallon tank.

The mill consists of 30 stamps, run by three 25-h.p. motors; a No. 3 McCully gyratory crusher run by a 15-h.p. motor; a 30-foot belt conveyor which swings on an arc, so as to reach all parts of the ore bin, run by a 5-h.p. motor; and 8 concentrators, 3 Johnson, 3 Union and 2 Fine, 6 in use, run by a 10-h.p. motor. All motors are Allis-Chalmers.

A completely equipped and well-designed hydro-electric power plant is located on the Merced River about one mile below the mine.

Mountain View Quartz Mine. Owned by the Mariposa Commercial and Mining Company, E. H. Benjamin, president, 522 Nevada Bank Building, San Francisco. Located in section 11, T. 5 S., R. 17 E., 2 miles northeast of Mount Bullion and 10 miles by wagon road from Bagby.

Elevation 2155 feet, surface fairly rough, no timber, and very little water, from Norwegian Gulch.

There is one vein, averaging 2½ feet thick between slate walls. Strike northwest and southeast and dip about 60° northeast.

The development consists of two adit levels with over 1000 feet of drifts and crosscuts, also several raises and stopes.

The mine has been worked practically continuously for the last ten years by leasers, the ore being milled in the Princeton mill. The ore is fairly high grade, averaging around $40 per ton. Some of it runs as high as $75 per ton.

Number One Mine. Formerly known as the **Martin Quartz Mine,** owned by the Treasure Gold Mining Company. Located in sections 34 and 35, T. 4 S., R. 16 E., about four miles northeast of Hornitos. One full claim, called the Number One, located about 1875. There is one quartz vein, which will average three feet in width, between a slate footwall and a diabase and porphyry hanging wall. It strikes northwest and southeast and dips 43° southwest.

There is a shaft 360 feet deep with three levels and about 1200 feet of drifts, and several large stopes. Equipment consists of a 10-stamp mill, Challenge feeders, two 4 ft. by 16 ft. plates, rock crusher, three concentrators, one Johnson, one Gates, and one Deister. Also electric hoist, with 20-h.p. motor and 40-h.p., 30-h.p., 5-h.p. and 3-h.p. motors. Several buildings, consisting of assay office, storehouse, bunkhouse, transformer house; and several other small buildings. The mine was operated in 1914 and 1915, but has not been worked since.

Number Five Quartz Mine. Owned by the Number Five Mining Company, J. J. Le Tourneau of Berkeley, president. Consists of two full claims and two half claims, a total of sixty acres. Situated in section 10, T. 5 S., R. 16 E., about 3 miles northeast of Hornitos. Surface rolling, elevation 1400 feet, no timber, and water from springs for milling and domestic use.

There are two quartz veins called the Number Five and the Number Two, varying from seventeen feet to thirty feet in width, between a diorite footwall and a schist hanging wall. The strike is northeast and southwest and the dip 45° northwest. There is a shaft 260 feet deep with three levels, and 110 feet of drifts.

Equipment consists of a Parker Linn ball crusher, and Parker Linn ball pulverizer with amalgamator, two five-foot by ten-foot plates, with several motors. Also electric hoist, Gardner compressor, machine drills, pumps, etc. Electricity furnished by the San Joaquin Light and Power Corporation.

Buildings consist of office, cookhouse, bunkhouse, assay office, and several other small buildings.

The above company took over the property in the middle of 1914, and equipped it, after which it was worked for some time. It has not been in operation recently. (April, 1920.)

Number Nine Quartz Mine. Located in section 10, T. 5 S., R. 16 E., about three miles northeast of Hornitos. Formerly owned by the Mose Rogers Estate, Jas. Peck, manager, Mills Building, San Francisco. The property has been in litigation for some time, a law suit being now (April, 1920) in progress between Jas. Peck, S. Webber Parker, and the Number Nine Gold Mining Company, L. A. Ginaca, president, 213 Rialto Building, San Francisco.

The Number Nine Mining Company had equipment on the ground, ready to be set up, consisting of a new electric hoist, 100-h.p. General Electric motor, Ingersoll Rand compressor, size ten inches by fourteen inches, Joshua Hendy 2-stamp mill. A 2½-h.p. gasoline engine was

running a pump, keeping the mine unwatered. Buildings consist of assay office, compressor house, boarding house, office and dwellings. It is expected that operations will commence as soon as title is settled.

The quartz vein averages five feet in width, between a slate footwall and a schist hanging wall. It strikes north 20° east and dips 45° southeast. It is characterized by massive outcrop, which is prominent for quite a distance on the surface. There is a 300-foot incline shaft.

Oaks and Reese Mine. Owned by New York people and located in Hunter Valley, in section 32, T. 3 S., R. 16 E., 14 miles north of Hornitos.

The mine has not been in operation for many years, but it was at one time a very large producer. From 1868 to 1870, during which time it was being worked, it was credited with a production of about $30,000 per month. A lawsuit over water rights, together with the ending of the rich pocket on which they were working, caused the shutdown.

There was a 28-stamp mill in operation in the early days, but it has long since been removed. Present equipment consists of hoist, head frame, pump and old boiler.

There is an incline shaft 450 feet deep and about 800 feet of drifts.

The shaft was unwatered and retimbered since it was closed down.

The shaft is located at the junction of the main vein or "blue lead," with a cross vein known as the "Potts." The main vein is about four feet wide and the Potts vein about eighteen inches. About 400 feet south of the shaft the Floyd vein joins the main vein. It averages about fifteen inches in width. The main vein strikes northwest and southeast and dips about 80° to the northeast. The hanging wall is chert and the footwall porphyrite.

Very little work has ben done on the main vein, operations being confined to the "Potts" vein.

Both the Potts and Floyd veins are said to be rich, and it is claimed the run of mine ore will average around $10 per ton.

There are several hundred tons of low-grade ore on the dump.

Old Wilcox. (See Wilcox.)

Original Quartz Mine. Owned by the Original Mining and Milling Company, E. C. Kocher, president, Merced; G. M. Egendhoff, manager, J. W. Warford, superintendent at the mine.

Located at Clearing House on the Merced River and the Yosemite Valley Railroad, about 6 miles west of El Portal, section 21, T. 3 S., R. 19 E.

Elevation 1500 feet, surface rough, very little timber, and water from the Merced River.

This is one of the few mines in the county which has been working continuously for the last several years.

There is a 10-stamp mill, with Blake rock crusher, 2 Challenge feeders, two 4-ft. by 16-ft. plates, one Deister Overstram table and one Overstram universal table.

The mill is ordinarily run by electric power generated in the company's power plant, situated a short distance above the mill, but when visited in October, 1919, the water in the river was so low that sufficient

power could not be developed, so that a 25-h.p. Fairbanks-Morse distillate engine, had just been installed to run the mill. This was operating very satisfactorily, running 3 days (continuously 3 shifts per day) on 100 gallons of distillate.

There was not enough power to run the hoist and compressor continuously so that the mill was being run on some fairly good ore (about $5 per ton) which has previously been thrown on the dump. It was estimated that there would be some 400 tons of this ore.

The property consists of four claims, 80 acres, all located in 1908. There is one vein averaging 2 feet in width, which strikes NW. and SE., and dips 75 deg. NE. An interesting fact is that the vein runs from the slate into the granite, crossing the contact without interuption.

Development consists of a 700 foot two compartment shaft with six levels. There are 670 feet of drifts on the first level, 1200 feet on the second level, 1300 feet on the third, and 1250 feet on the fourth, 660 feet on the fifth, and 629 feet on the 650 foot level. One crosscut about 200 feet, and 500 feet of raises, and many stopes. In October, 1919, it was estimated that there was 1700 tons of broken ore in the stopes.

The ore is a dark, free-milling quartz carrying about 2% sulphides. It is said to average around $10 per ton.

There is a 30-h.p. electric hoist and 12-ft. by 18-ft. Ingersoll Rand compressor, with skip, machine drill, etc. Buildings besides the mill, consists of post office, boarding house, superintendent's house, lodging house, several cottages, blacksmith shop, assay office and power house. The flume is 1900 ft. long, 6-⅔ feet wide and 4-⅓ feet high, with a ditch line above it about 1500 feet long. The flume carries 6000 inches of water to a 24-foot head. The power house consists of two under-shot Pelton wheels, one 30″ and one 20″ and a Westinghouse 133-kilowatt 100-h.p. generator. It is planned to move the power house farther down the river, on the opposite (south) side.

Orra Rica (Penon Blanco). Situated in the Coulterville district about three miles north of Coulterville near the northern boundary of the county. Owned by the Orra Rica Mines Company, A. E. Tower, San Francisco.

There are two contact veins, varying from three to six feet in width, between a slate footwall and a diorite hanging wall. Strike north 20° west and dip 65° northeast. The outcrop of the vein, and the workings on the top of a ridge, form a landmark for that part of the country.

Equipment consists of a 20-stamp mill complete, also compressor house, blacksmith shop, etc. Development consists of a tunnel over 2000 feet long, with 900 feet driven on the vein. The mine has not been in operation for the past several years, due to troubles over ownership.

Our Chance. One claim owned by Albert Austin and T. E. Austin, and located in section 29, T. 4 S., R. 18 E., in the Whitlock district, about 7 miles northwest of Mariposa.

This has been worked as a pocket mine for the last few years, the gold being panned out. There is one tunnel 150 feet long, with several drifts and a 70-foot winze. A record tunnel is 75 feet long, with a 60-foot winze. There are two anastras on the property, which were used but little.

The claim was located many years ago, and has changed hands several times.

Pine Tree Quartz Mine. One of the "Grant" properties, owned by the Mariposa Commercial and Mining Company, E. H. Benjamin, president, 522 Nevada Bank Building, San Francisco. Located about three miles north of Bear Valley and three miles southeast of Bagby, in section 9, T. 4 S., R. 17 E. Elevation 2070 feet, surface rough, not much timber, water from Bear Valley. There is one vein which averages ten feet in width, between a slate footwall and a serpentine hanging wall. It strikes northwest and southeast, and dips about 55° northeast.

Developments consist of a tunnel and a 380-foot shaft with about 5000 feet of drifts on 4 levels. Also 133 feet of crosscuts and 700 feet of raises.

The mine has been worked by leasers for the past several years, the ore being treated in the Princeton mill. Messrs Turner, Nail, and Finch have been the leasers, since 1915.

When worked by the company the ore was milled in its 5-stamp mill at Bagby. Electric power from the Bagby power house.

Bibl.: Mineral Resources West of Rocky Mountains, J. Ross Brown, 1867, p. 42.

Potosi Quartz Mine. Owned by A. S. Bigelow and G. M. Hyans of 303 Sears Building, Boston; formerly the Merced Gold Mining Company. Located two miles west of Coulterville in section 4, T. 3 S., R. 16 E., Pleasant Valley, 9 miles northwest on the Yosemite Valley Railroad, is the nearest railway station.

Elevation 1700 feet, surface rough, little timber, and water from the mine.

There is one quartz vein, varying from 1 to 20 feet in thickness, between slate walls. Strike NW. and SE. and dip 49 deg. NE.

The 40-stamp mill in which the ore from the several other mines owned by the company was treated, is located on this claim. Equipment consists of 2 rock crushers, 40 stamps, eight 4-ft. by 16-ft. plates and sixteen 4-foot Union Iron Works vanners. The mill was formerly run by a large steam engine, which is still in place, but the power line of the Pacific Gas and Electric Company, is now on the property. There is a well equipped machine shop, boiler house, with four 60-h.p. boilers, hoist, mine pumps, 8-ton steam locomotive with twelve 3-ton cars.

Assay office, transformer house, change house, cook house, office and several other small buildings.

Underground development consists of a tunnel 2500 feet long on the vein, an incline shaft 350 feet deep, 2 air shafts, crosscuts, raise, and stopes.

The mine was partly unwatered in 1912 by Kennedy and Albeck.

Property has not been worked for many years. (See Introduction, p. 87, and Merced Gold Mining Company.)

Princeton Quartz Mine. Owned by the Mariposa Commercial and Mining Company, E. H. Benjamin, president, 522 Nevada Bank Building, San Francisco. Located at Mount Bullion, in section 18, T. 5 S., R. 18 E. This is the largest and most important of the "Grant"

properties. It was first worked in 1852. Most of the ore taken from the company's mines, by leasers, during the last few years, has been treated in this mill.

Equipment consists of 40 stamps, Challenge feeders, crusher, 8 plates, 56 inches wide, by 20 feet long, and 18 Union concentrating tables. One 150-h.p. compressor, two 150-h.p. motors, one 130-h.p. motor, Snow duplex pump.

There is a machine shop, blacksmith shop, carpenter shop, assay office, saw mill, five 50-h.p. boilers, and several other buildings.

The vein averages 8 feet in width, between slate walls, strikes north 35 deg. west, and dips between 45 deg. and 60 deg. northeast.

There is an incline shaft 1660 feet deep with 8 levels, and a total of 11,418 feet of drifts. The ore has been stoped from the 1200-foot level to the surface.

The mine has not been worked for several years, but is credited with a production of considerable over $1,000,000.

The ore is low grade, averaging around $3.50 per ton. Total cost of operating in 1914 was $2.71 per ton.

Bibl.: Mineral Resources West of Rocky Mountains, by J. Ross Brown, 1867, p. 41.

Prothero Brothers Mine. Consists of eight unpatented claims, owned by Prothero Brothers, J. B. Bullock and W. F. Ingwerson, all of Visalia. Two groups, 4 claims in the upper group, Bonita, Monarch, Dandy and Last Chance; and 4 in the lower group, Big Blue with two extensions, and the Sulphretts. The claims were located about 30 years ago, and the present owners have been working at intervals, for about 5 years.

Situated about 2 miles south of Bootjack in section 3, T. 6 S., R. 19 E., on the east bank of the North Fork of the Chowchilla River.

When visited in October, 1919, the tunnel had been driven 200 feet and the vein was just opened up. Quartz stringers were showing in the granite. The country rock is granite and there is a massive iron "Gossan" outcrop on top of the ridge. The vein is probably on the contact between the granite and the slate which lies to the east.

The general strike of the outcrop on the surface is northwest and southeast and the dip about 40 deg. northeast.

Equipment consists of a 60-h.p. distillate engine and Curtis compressor. No reduction equipment.

The owners intended to have a mill test made when the vein was fully exposed.

Quail Mine (Mammoth or Sunset). Consists of seven claims, 138 acres, owned by Brinchi Brothers, of Coulterville, and located in section 16, T. 3 S., R. 17 E., 8 miles southeast of Coulterville, and 9 miles northeast of Bagby on the Yosemite Valley Railroad.

Elevation 2300 feet, surface rough, water from springs, mine, and Indian Gulch. There are 3 veins which average 4 feet in width between a porphyry footwall, and a slate hanging wall, strike northeast and southwest and dip 40 deg. southeast.

Development consists of a tunnel about 1000 feet long, one shaft 150 feet deep, and another shaft 55 feet (incline), several stopes and raises. A 10-stamp mill was destroyed by fire in 1917.

Leased in 1915, for six months to Mr. Cummings, who ran a tunnel, but failed to follow the ledge. Later Mr. Pape exposed the ledge. It was afterwards leased to John Whalen and L. E. McDonald. B. C. Greely had a contract from Whalen and McDonald to drive the tunnel. Development was going on in the latter part of 1919 by M. A. Elftman and a small Gibson mill was in operation.

The value of the ore milled was from $9 to $12 per ton.

There are 200 acres of timber land connected with the property.

Recorder Mine. Consists of one unpatented claim owned by Frank Armstrong and Isaac Miller of Briceburg, and located in section 28, T. 4 S., R. 18 E., in the Colorado district. Worked as a pocket and placer mine.

Elevation 2400 feet, surface rough, plenty of water from springs and from the mines, and some timber.

One quartz vein averaging one foot in width between prophyry walls, strike north and south, and dip about 70 deg. east.

Development consists of one adit level and several hundred feet of drifting.

No equipment, the mine being worked each winter, in a small way, as a pocket and placer mine. Only assessment work done for last two years.

Red Bank Mine. Located on the north bank of the Merced River about two miles northwest of Bagby, in section 26, T. 3 S., R. 16 E. Property consists of several claims, Daisy, Jubilee, Stevenson, and others. Interest held by H. C. Callahan and Percy Petiguer, Crocker Building, San Francisco.

Equipment consists of 25-h.p. General Electric motor and several other smaller motors, tramway across the Merced River.

There is a mill from which the stamps (five) have been removed. Three Wilfley concentrators and a grinding machine remain. Has not been operated for some time.

Country rock is slate, mariposite and serpentine. Two adit tunnels.

Red Cloud Mine. This old mine has not been worked for twenty years. Owned by Mrs. McDiarmid, and located in section 22, T. 2 S., R. 17 E., about 9 miles east of Coulterville. There is one vein varying from one to three feet in width between slate walls. Strike east and west, and dip 60° north. There is an incline shaft 200 feet deep with 500 feet of drifts. There was formerly a 12-stamp mill, but it has been removed. This old mine is said to have a production record of about $1,500,000.

Revel Quartz Mine. One claim owned by Eli Revel and the estate of August Revel. Located at Sweetwater, in section 28, T. 4 S., R. 19 E., 6 miles by trail, south of South Fork siding on the Yosemite Valley Railroad. Several veins averaging 2 feet in width between granite walls, general strike east and west, dip almost vertical. Development consists of a shaft 150 feet deep, with several hundred feet of drifts, and a stope 800 feet long and 150 feet high. No reduction equipment. The mine has not been worked for several years and the workings have caved.

Rittenhoffer. (See Tyro.)

Roma Quartz Mine. One patented claim owned by Matt Harris estate, and located in section 14, T. 4 S., R. 18 E., about 9 miles north of Mariposa. Elevation 2700 feet, surface rough, water from Bear Creek, little timber. One quartz vein, averaging two feet in width, which strikes east and west and dips 60° south. There is a tunnel 1000 feet long. Nothing has been done at the property for about 30 years.

Royal Group. (See Fourteenth Report of the State Mineralogist, page 596.)

Rutherford Quartz Mine. One patented claim owned by A. H. Ward, 53 Stevenson street, San Francisco. Located on the north bank of the Merced River, in section 22, T. 3 S., R. 19 E., 5 miles west of El Portal. The claim was located in the sixty's and patented in 1883. There is one quartz vein, averaging 4 feet in width, between a slate footwall and a granite hanging wall. Strike about north and south and dip 80° east.

Development consists of a 460-foot adit level, 80-foot raise and a stope 80 feet high and 60 feet long. No equipment. Owner has a mill site on the river. Property has not been worked for 25 years.

Ruth Pierce Quartz Mine (Grimshaw). Located in section 13, T. 5 S., R. 16 E., 4 miles by wagon road east of Hornitos. Owned by the Ruth Pierce Mining Company, subsidiary to the Tennessee Mining Company, M. C. Monday, manager, James A. McMahan, superintendent at the mine, and H. N. Black, foreman.

Formerly known as the Hornitos Gold Mining Company, who took over the property in May, 1916.

There is a completely equipped 10-stamp mill, 1050 pound stamps, Blake crusher, Challenge feeders, two 5 ft. by 16 ft. plates, and 2 Fine vanners. A 30-h.p. motor runs the mill, a 75-h.p. motor operates the compressor, and there is a 25-h.p. electric hoist. Electric power from the San Joaquin Light and Power Company.

There are three quartz veins, averaging 4 feet to 5 feet in width between slate and diorite walls, general strike east and west and dip north 65°. Underground development consists of a shaft 600 feet deep with six levels; 348 feet of drifts on the first level, 639 feet on the second, 600 feet on third, 305 feet on fourth, 1100 on fifth, 800 feet on sixth.

There is a boarding house, superintendent's house and office, bunk house, assay office, etc.

For about the last two years, one shift per day has been working milling 350 to 400 tons per month. The ore averages around $9 per ton. Tailings run $2.50 per ton. Estimated 20,000 tons in tailings pond. Topography rolling, no timber. Two claims on patented agricultural land.

San Domingo Quartz Mine, also formerly known as the **Buffalo,** owned by Wm. Zeller of Oakland. Recently (October, 1919) bonded. Located in section 13, T. 4 S., R. 18 E., in the Colorado district, about 8 miles northeast of Mariposa. Briceburn, on the Yosemite Valley Railroad, is 4½ miles northwest by trail. Elevation about 3000 feet, not much timber, very little water, surface medium rough. One full claim, 20 acres. The vein averages about two feet in width between a slate

footwall and a granite hanging wall, strikes northwest and southeast and dips 50° northeast. The quartz ore is free milling.

Development consists of a 180-foot tunnel and an air shaft 180 feet deep, with several short raises and winzes. Only assessment work has recently been done.

School House Mine. Located on patented agricultural land owned by C. Marchio, in Hunter Valley, in section 10, T. 4 S., R. 16 E., about 12 miles north of Hornitos. By trail to Bagby about 6 miles.

There is a 60-foot incline shaft with some drifting on the vein. There is a two-stamp mill on the property, with concentrator, 8-h.p. gasoline engine, grizzly and crusher; also a hoist with a 20-h.p. engine, two buckets, and a track, built on a trestle, from the mine to the mill about 200 feet.

There is a blacksmith shop, and office building. The mine was worked about three years ago, by Mr. Sutherland of Atwater, Mr. Marchio's son-in-law, but closed on account of disagreement, and has not been operated since. The vein is dark, free milling quartz and lies between porphyry walls.

Schroeder Group. Consists of four quartz claims and one placer claim, total of 100 acres owned by J. A. Schroeder, C. J. Schroeder, P. W. Judkins and C. H. Weston. Situated in the Colorado district, in section 16, T. 4 S., R. 18 E., 2 miles by trail south of Saxon Creek Station on the Yosemite Valley Railroad.

Elevation 2500 feet, surface rough, plenty of water in the winter but little in the summer, and plenty of timber.

There are several veins varying from a few inches to three feet in width between a porphyry footwall and a slate hanging wall, general strike north and south, dip about 80° east. There is also a blanket vein which lies nearly flat, and cuts the other veins.

The property is worked each winter through an open cut, 400 feet long, and 60 feet deep, the material being worked down to the blanket vein. There are also three or four hundred feet of drifts.

Equipment consists of a 5-foot Huntington mill run by a Knight water wheel. There is a boarding house, and a blacksmith shop, also several hundred feet of track.

Sierra Rica Quartz Mine. Consists of two patented claims, the Sierra Rica and King Solomon, 32 acres, owned by M. G. Wilson, and J. M. Graham of San Jose. In section 14, T. 4 S., R. 18 E., 2 miles by trail, south of Briceburg on the Yosemite Valley Railroad. Elevation 2800 feet, surface rough, water from Bear Creek, not much timber. One vein averaging 1½ feet in width, on the contact between a porphyry footwall and a slate hanging wall, strike northeast and southwest, dips 70° southeast.

There is a 300-foot tunnel and a 125-foot raise on the Sierra Rica, and a 100-foot tunnel and a 60-foot raise on the King Solomon. Some drifting.

Equipment consists of a 4-stamp mill, Challenge feeder, rock crusher, and one 4 ft. by 8 ft. plate; blacksmith shop, ore cars, boarding house, dwellings, boiler steam engine, and two miles of ditch.

The property has not been worked to any extent for several years. Three men did some prospecting and drifting in the summer of 1919.

Silver Mine (Bryan Mine). Owned by D. C. McNally of Bootjack, Mariposa County. Under lease and bond to M. L. Crafts, Tevis Crafts, C. Cahen, Geo. Cohn and Mrs. McMeekan, address Elina Hotel, 31 Roma street, San Francisco. Located in section 20, T. 5 S., R. 19 E., about 6 miles by wagon road east of Mariposa, and 2 miles northwest of Bootjack.

Very little water in the summer but plenty in the winter; plenty of oak and pine timber.

Four patented claims, Bryan Nos. 1, 2, 3, and 4. There is one quartz vein material in sugar quartz, not hard, carrying free gold, argentite, tuby silver, and native silver. It will average $5 in gold and 20 oz. of silver to the ton.

Development consists of a 230-foot shaft with two levels; on the 100-foot level, 160-foot drift east and 65 feet west; on the 200-foot level, 60-foot drift east, and 60 foot west.

The present leasers have made a great deal of preparation, and thoroughly sampled the mine, but had made no production up to late in 1919. Shortage of water during the summer, and difficulties in shipment of machinery and material due to the war, held back production.

Equipment consists of a 40-h.p. Union gas engine, 6-foot Marathon mill, 5-foot Huntington mill and two concentrating tables. There is also an old two-stamp mill and a steam hoist on the property.

Silver Lead Quartz Mine. Situated in section 34, T. 4 S., R. 16 E., about 5 miles northeast of Hornitos. Three claims, the Silver Lead with extensions, located in the sixties. W. A. Bradley and associates of Carson City took over the property about March, 1914, and put up a 5-stamp mill, with 850-pound stamps, No. 2 Gates rock crusher, Challenge feeders, 4′ x 16′ plates, two concentrators and 20-h.p. and 10-h.p. motors. Also a compressor, run by a 75-h.p. motor, air hoist, pumps and blacksmith shop. The mine was worked for about three years and then remained idle for two years. In October, 1919, it was being unwatered preparatory to starting operations again.

There is one quartz vein, about one foot in width, between diorite walls; strike northwest and southeast and dip about 42° northeast. There is a 240-foot shaft with two levels, and about 450 feet of drifts. Elevation about 1200 feet, no timber, water from the mine and a spring, surface rolling, electric power from the San Joaquin Light and Power Company.

Spencer Quartz Mine. One patented claim 10.32 acres, owned by Mrs. Jennie Diven of Mariposa. Located in section 29, T. 4 S., R. 18 E., in the Whitlock district, 7 miles northwest of Mariposa, and 6 miles by trail southwest of Briceburg on the Yosemite Valley Railroad. Elevation 2500 feet, surface rough, water from mine and from Whitlock Creek, plenty of timber for mine work.

One quartz vein averaging five feet in thickness, between a diorite footwall and slate hanging wall. Strike northwest and southeast and dip 80° northeast. Development consists of a 150-foot crosscut, 50-foot winze and a stope 350 feet long and 150 feet high. Equipment consists of ore cars, 720 feet of track, hand pump, blacksmith shop and cabin. No operation for the last several years. Work would be commenced if costs were not prohibitive. In the latter part of 1919 costs were as follows: Candles (poor quality) $5.50 per box;

powder 38c to 40c per pound; fuse $1.25 per roll; caps (XXX) $2.50 per box; coal 3c per pound.

Spread Eagle Quartz Mine. Owned by Nick Mullin of Whitlock, via Mariposa. Two claims, Spread Eagle and Empire, and a fraction, Toll Gate, total of 35 acres. Located at Whitlock in section 32, T. 4 S., R. 18 E., 6 miles northwest of Mariposa. Elevation 2880 feet, surface rough, water from springs, not much timber.

There are several veins, averaging 2 feet in width, between porphyry walls, general strike northwest and southeast and dip 40° northeast.

Development consists of a 210-foot shaft, with 2 levels, and nearly 1000 feet of drifts, on the vein, also a 1000-foot adit level, 200-foot crosscut, with several raises and stopes.

Equipment consists of 3 ore cars, 2 blacksmith shops, drills, and 2000 feet of rails.

The mine was worked to some extent in the latter part of 1918, the ore being milled in the Austin mill, 1¼ miles distant. In October, 1919, the property was under option to a New York company.

Squirrel Mine. (See Bunker Hill.)

Stockton Creek Mine. Owned by the Mariposa Commercial and Mining Company, E. H. Benjamin, president, 522 Nevada Bank Building, San Francisco. Located in section 24, T. 5 S., R. 18 E., 1 mile east of Mariposa.

There are two veins averaging about 2½ feet in width, between diabase walls strike east and west and dip about 45° south.

Development consists of a 135-foot incline shaft, with 2 levels, and 550 feet high. All equipment has been removed. The mine has not been worked for many years. It is an extension of the Mariposa vein. The ore is said to have averaged around $5.50 per ton.

Stud Horse Flat Group. Owned by John P. Carroll of Bagby; home office, 670 Elizabeth street, San Francisco. Three claims, White Oak, Marguerite, and Fairview. Located in section 35, T. 3 S., R. 16 E., 3 miles northwest of Bagby. Elevation 1500 feet, oak and pine timber, water from several springs, topography fairly flat, on a plateau overlooking the Merced River and the country to the southeast.

The main vein lies between a slate footwall and a porphyry and diorite hanging wall, and varies from 3 feet to 9 feet in width, averaging about 4 feet. Its strike is northwest and southeast, and dip 75° southeast.

There is an incline shaft 150 feet deep following the dip of the vein, with about 300 feet of drifts on the vein.

The vein material is white quartz, carrying free gold galena, and sulphides. There are several other prospect shafts and tunnels on the property.

A 3-stamp mill was destroyed by fire in 1907, after about 300 tons of ore had been milled. The machinery for a 5-stamp mill is on the property but has never been erected.

The property was bonded in 1918 to a Los Angeles company, who spent considerable money in building and equipment, before doing any development work. The company ran short of funds before any production was made. A wagon road was built from Hunter Valley

to bring in the machinery, and a 2-mile power line was built to the mine from Kittridge on the Yosemite Valley Railroad.

Equipment consists of a Fairbanks hoist, Sullivan compressor, 35-h.p. motor, 3 power drills, blacksmith shop, etc. In the latter part of 1919 the property was idle, but it was understood that the company was endeavoring to obtain capital with which to proceed.

Sunshine Group. Consists of five quartz claims, Sunnyside, Sunshine, Sunshine No. 2, Rosebud, and Johnny F. Owned by Mrs. Jennie E. Diven of Whitlock, via Mariposa, and 147 Kempton avenue, Oakland. Located in sections 19 and 20, T. 4 S., R. 16 E., 8 miles north of Mariposa.

Elevation 2800 feet, surface rough, water from springs, some timber. Three quartz veins, varying from one to three feet in width, between porphyry footwall and slate hanging wall. Strike northeast and southwest, dip 60° southeast.

Development consists of an incline shaft, 110 feet deep, with drifts 200 feet east and 100 feet west, all on the vein. There is a raise 110 feet to the surface, and a stope 140 feet long and almost to the surface.

Equipment consists of a 2-stamp mill, an old Chilian mill, blacksmith shop, gasoline hoist, 2 skips, mine car, drills, tools, etc.

The mine has not been operated to any extent since 1913. About 300 tons of ore were milled, which plated $12.50 per ton.

Sweetwater Quartz Mine. Located at Sweetwater, in sections 17 and 20, T. 4 S., R. 19 E., about 18 miles by wagon road northeast of Mariposa. Seven claims, Sweetwater, Wallace, Hopkins, Huntington, Crocker, Smith and Gage. Total 140 acres.

This is an old property and has been worked at intervals, for many years. At present (November, 1919) under bond to the Dominican Mining Syndicate, Incorporated, H. L. Schultz, box 88, Coalinga, president, and W. J. Minville, box 64, Coalinga, secretary.

There is a 10-stamp mill, which was (November, 1919) being overhauled, preparatory to beginning operations. Equipment consists of a Blake crusher, Cornish rolls, ten 1250-pound stamps, 2 plates 4′ x 16′, 2 Johnson vanners, 1 Standard and 1 Pindar concentrator; also 1 Giant compressor, 2 boilers, 40-h.p. engine, machine drills, etc.

There is a completely equipped assay office, also boarding house, blacksmith shop, office, bunkhouse, etc.

Development consists of an incline shaft 170 feet deep with a level at 123 feet. Drifts on the vein, 350 feet east and 800 feet west. A crosscut 600 feet long, also several raises, and 4 stopes of various sizes.

The quartz vein occurs, more or less, in lenses, and averages about 2½ feet in width, between granite walls. General strike northwest and southeast and dip 45° southwest. The slate formation lies just to the north and west of the mine.

Elevation 3800 feet, surface rough, plenty of timber, and water is piped 800 feet from the head of Sweetwater Creek.

M. Gamble is in charge at the mine.

Tyro (Rittenhoffer). One claim, the Rittenhoffer, located in sections 9 and 10, T. 3 S., R. 16 E., 2 miles north of Coulterville.

Elevation 2300 feet, surface rough, very little timber or water.

There is one vein averaging 2 feet in width, between slate walls, strike northwest and southeast and dip 60° northeast.

Developed by a 700-foot shaft with 6 levels, and about 1400 feet of drifts, with several raises and stopes.

Equipment consists of an old 10-stamp mill with rock crusher, Challenge feeders, two 4-ft. by 12-ft. plates, 3 Frue vanners; also Cornish pump, steam hoist, 2 boilers, blacksmith shop, caretaker house, and 2 large tanks.

The mine has not been worked for many years. It was partly unwatered in 1911.

Virginia Quartz Mine. Four claims, the Virginia (patented), Belmont, Last Chance, and Ninety-four, owned by the White Gulch Mining Company, J. F. Soule, 112 Market street, president; G. E. Gamble, superintendent at the mine. Located in sections 13 and 14, T. 3 S., R. 16 E., 3 miles south of Coulterville and 8 miles north of Bagby on the Yosemite Valley Railroad. This is one of the few mines in Mariposa County which has been operating continuously for the last several years.

Reduction equipment consists of a 10-stamp mill, 1080-pound stamps, Challenge feeders, Blake rock crusher, 2 plates 4 ft. by 16 ft., 2 concentrators, 3½-foot Hardinge ball mill, and a third plate. The tailings from the 2 concentrators go through the ball mill and then over the third plate. A 25-h.p. motor runs the hoist. Other equipment, 50-h.p. Ingersoll Rand compressor, with 50-h.p. motor, No. 5 Ingersoll drill sharpener, ore cars, tracks, pumps, blacksmith shop, office, boarding house, residences, timbershed, etc.

Development consists of a 1000-foot shaft, with adit level, about 6000 feet of drifts, several thousand feet of crosscuts, 400 feet of raises, also several winzes and many stopes.

The vein varies in width from a mere seam, to several feet, and often occurs in lenses. The footwall is serpentine and the hanging wall diabase. The strike of the vein is a little north of west, and the dip about 65° north.

The ore is free milling quartz with mariposite and sulphides. The average value of all ore milled in 1918 was $17.50 per ton. Total operating cost per ton is around $3.

Washington. One claim, 20 acres, formerly one of the Busch Group, now owned by the Pacific States Syndicate of Los Angeles. Located in the Colorado district, in section 21, T. 4 S., R. 18 E., about 7 miles by wagon road north of Mariposa.

Elevation 3000 feet, surface rough, water from mine and springs. The quartz vein lies between slate walls, and varies in width from about 16 feet at the surface to nine feet at the bottom of the shaft. General strike east and west. There is an old shaft and some underground workings.

The claim was originally located in 1904 by L. F. Busch, later sold to the syndicate named above. In the latter part of 1919 the owners had installed a hoist, pumps, drills and everything ready to start operating, but had made no production.

Washington No. 2. Situated about 4 miles northeast of Hornitos. This is an old property and has not been worked for many years, but it is said to have been a very large producer in the early days, and was

the deepest mine in that part of the country when operated. Formerly belonged to the Mose Roger's estate. There is an incline shaft 1500 feet deep. The quartz vein is said to have been twelve feet wide, between slate walls, strike north and south, dip 65° east.

White Oak and Wilcox. Owned by A. H. Ward, 53 Stevenson street, San Francisco. Located at Jenkins Hill Station on the Yosemite Valley Railroad in section 18, T. 3 S., R. 19 E. Two quartz claims, White Oak and Wilcox, four acres, and one mill site, five acres, on the north bank of the Merced River.

There is one vein averaging two feet in width, between a granite footwall, and a slate hanging wall. Strike north and south and dip about 30° east. Developed by a 450-foot adit level, and several shallow shafts, on the surface. Water from the Merced River and Jenkins Creek, and some oak timber, surface rough. It is said the second mill built in Mariposa County was on this property. It consisted of 5-stamp with wooden stems, and was swept away by the flood of 1862.

In the latter part of 1919, the property was under option, the tunnels had been cleaned out, new tracks laid, cabin and blacksmith shop built, and it was intended to completely equip and operate the mine.

Whitlock Group. Consists of three patented claims, the Whitlock, Alabama, and Westward, patented in 1897. Owned by Dr. Gallison of Oakland and Lizzie Sain. Situated in the Whitlock district, in section 32, T. 4 S., R. 18 E., 6 miles northwest of Mariposa, and 6 miles by trail south of Saxon Creek Station on the Yosemite Valley Railroad.

The elevation is about 3000 feet, not much timber, enough water to run a 20-stamp mill, surface fairly rough.

There are three quartz veins, averaging four feet in width, between so-called greenstone walls. The general strike is northwest and southeast, and the dip about 70° northeast.

Development consists of a 900-foot shaft with four levels and about 3000 feet of drifts, cross cuts etc., and an 1800-foot drain tunnel. Considerable stoping has been done.

Equipment consists of 20-stamp mill, 1000-pound stamp, rock crusher, Challenge feeders 4′ x 10′ plates, four concentrators; also blacksmith shop and tools, air compressor, three machine drills, hoist, 50-h.p. engine, three boilers, assay office, bunk house, boarding house, carpenter shop and dwellings.

The mine was closed about 1899, as it could not be made to pay, using wood for fuel at $4.25 per cord. It has not been operated since. It is stated that there is plenty of $4 ore in the mine.

PLATINUM.

In December, 1919, platinum was discovered in Devil's Gulch, near the junction of Devil Creek with the south fork of the Merced River. The claims are owned by R. O'Donald and Marcus Shimski, and are located in sections 12 and 1, T. 4 S., R. 19 E., about 5 miles by trail from Jerseydale.

The ledge varies from three to four feet in width between slate (?) walls. The mineralized vein occurs on both sides of this quartz ledge, for a width of a few inches, and the ore is said to assay $90 per ton in platinum and $44 in gold.

The ore is heavy, and carries cobalt, nickel and tin in small quantities.

The discovery shaft is now (February, 1920) down about 40 feet and the width of the vein has increased with depth.

T. A. Clark, 2961 Webster street, San Francisco, also reports a platinum discovery on his claim on Devil's Gulch.

Bibl.: Register of Mines, Mariposa County, State Min. Bur., 1903. Mines and Mineral Resources of Mariposa County, State Min. Bur. 1915. 8th Rept. State Mineralogist, 1887-1888, p. 343; 10th Rept. State Mineralogist, 1890, p. 84; 12th Rept. State Mineralogist, pp. 25, 45, 167. 17th An. Rept. U. S. Geol. Surv. Mineral Resources West of the Rocky Mountains, 1867, J. Ross Brown.

MENDOCINO COUNTY.

Mendocino county lies along the coast extending from Humboldt and Trinity Counties on the north to Sonoma on the south. On the east it is bounded by Tehama, Glenn and Lake counties.

The Franciscan formation occupies about three-fourths the area of the county, covering the entire eastern portion from north to south. Eel River and Russian River are the principal streams which drain the county. The former flows north into Humboldt county and thence to the Pacific and the latter south into Sonoma County and thence west to the Pacific. The Northwestern Pacific Railroad follows in general the valleys of these two streams, which extend through the central portion of the county from north to south. Most of the mineral deposits lie on the eastern side of the railroad. The annual mineral production of the county has usually been small but its resources include asbestos, chromite, coal, copper, graphite, magnesite, manganese, mineral water and platinum.

Most of the deposits have been described in the Fourteenth and earlier reports of the State Mineralogist. Manganese and chrome particularly in Bulletin No. 76 and the occurrence of platinum in Bulletin No. 85. Recent developments and new operations are here given.

CHROMITE.

None of the chrome mines in the county were being worked during the summer of 1920. The Red Mountain Chrome property was reported, however, to have been leased to the Suydam Company of San Francisco, who expected to start operating at an early date.

COAL.

The deposit of coal in this county which outcrops along the Eel River near the mouth of Salt Creek a few miles above Dos Rios has attracted attention for many years. The deposit is on the Flood Ranch and is described in the Tenth, Fourteenth and other reports of the State Mineralogist.

The constantly increasing cost of crude oil has again drawn attention to the coal resources of the state and surface indications point to this deposit as one of considerable possibilities. Preparations were under way in June for a thorough prospecting of the deposit by diamond drilling. A camp had been established and Mr. Val Crockett, who has the contract for drilling, was engaged in building a road to transport the rig to the property. The drill is capable of going to a 3000 foot depth and it is stated that if the property reveals the presence of sufficient quantities, a branch railroad probably operated by electric power will be built from the workings along the middle fork of the Eel River to the railroad at Dos Rios, a distance of about six miles. The haul would be down hill and would make an easy outlet.

COPPER.

Nothing was being done with any of the prospects in the county during the year. Some excellent ore is reported to have been found along the middle fork of Eel River, above Dos Rios, but as there are no trans-

portation facilities in the vicinity, nothing has been done with the property.

GOLD. (See under Platinum.)

GRAPHITE.

John L. McNab Property. There is reported to be a bedded deposit of graphite on property belonging to John L. McNab, et al., in township 13 N., R. 12 W. The nearest town is Hopland. The mineral was discovered by the ranch superintendent in 1903. An Oakland paint firm is said to have offered $160 per ton for the material at the time, but owing to litigation, etc., nothing was ever done with it.

MANGANESE.

None of the manganese properties described in Bulletin No. 76 were operating during the year with the exception of the Independent Manganese Mines.

After a production of about 5000 tons, the **Thomas Manganese Mine** was closed down although there is said to be considerable ore still remaining. Most of the manganese mines have been operated by leasers, whose object was to get the greatest tonnage and best ore out in the shortest time. Naturally little attention was paid to the physical condition of the workings with the result that once operations have ceased, it means an extra expense for a new leaser to put the property in a safe condition for further work so that even where there is known to be considerable ore remaining, it is a question whether the investment required to safely open it up is justified.

The **Wild Devil Manganese Mine** has been leased to Lew and Raymond Thorne. The road to this property is in good condition and some work was being done toward cleaning up preparatory to starting operations. The Suydam Company of San Francisco is expected to take over this lease and carry on operations.

Independent Manganese Mine. This property has made a fairly steady production of good manganese ore from 1916 to date with the exception of 1919, when it was closed down. Since the publication of the report in Bulletin No. 76, the mine has shipped about 1000 tons of ore and some second grade ore is sacked and stored at the property. Production has been handicapped by a shortage of labor and inefficient miners. As at present opened up, under normal conditions, the tonnage could be materially increased. The present lease calls for ore containing not less than 45% manganese and not more than 12% SiO_2. Several carloads have been shipped that assayed 54% Manganese and 6% SiO_2. One car sampled 96% MnO_2.

The mine was first operated in 1916 by W. H. Ochsner and Hugo Fischl, who produced about 200 tons in three months. During the last half of 1916, the Noble Electric Steel Company took out about 600 tons. J. E. Page leased it during the spring of 1917 and mined about 500 tons. The Noble Electric Steel Company again leased it in the fall of 1917 and during 1918 up to the signing of the armistice produced 700 tons. It was idle in 1919 but in April of this year, the A. G. Suydam Company obtained a lease and production has continued since that date. G. H. Busch of Potter Valley is owner and superintendent of operations. A

new ore body was recently discovered above the old glory hole and a drift has been started upon this. The lens is approximately nine feet wide by twenty feet in height. Skid rails have been laid from the mouth of the drift up the partly filled glory hole and the ore car is drawn up by horse and cable. Mining is by hand drilling. The present cost of hauling by sled from the mine to a loading platform where motor trucks take it to the railroad at Willits is $2 per ton. Mining costs are said to have increased about 50% with increased depth. The various workings have exposed a considerable tonnage, all of good grade.

Woodman Station Prospect. This property consists of one claim, the Woodman, having an area of twenty acres. It is situated in section 12, T. 22 N., R 14 W., on rounded hills, and lies at an elevation of about 1000 feet. There is some scrub oak on the property. It is three miles from a wagon road and one-half mile from the railroad. Assessment work only has been done, exposing a lens of manganese ore. The owner expects to open it up this season. It was discovered in 1917. Earl W. Long, owner, Covelo.

Manganese is reported to occur along the north branch of Pieta Creek, one mile above the forks and five miles from Pieta. There has been no production but the deposit is said to be a large one.

MINERAL PAINT.

There is a red rock, thought to be suitable for paint-making on the property of Mrs. Effie M. Heughes of Calpella. It is on patented land in section 27, T. 17 N., R. 12 W., formerly a part of the Yorcho Ranch. The total area is 380 acres. There is also reported to be manganese on the property. There is no development. A good road runs to the property, which is 14 miles northeast of Ukiah.

MINERAL WATER.

Vichy Springs. These famous springs are owned by John Rademeyer of Ukiah. They are leased with option to purchase by Frank McClure and Eugene E. Schmitz, Mills Building, San Francisco; Eugene E. Schmitz, manager. There are accommodations for 150 guests in the hotel and cottages. A concrete swimming pool and the baths are both supplied with vichy water.

Ornbaun Springs. These mineral springs are situated in section 7, T. 12 N., R 13 W., at Ornbaun, twenty-two miles northwest of Cloverdale and are owned by J. S. Ornbaun. The resort was leased in October, 1919, by Harry S. Wolverton, of San Francisco and has been open to the public during the past year. There are accomodations for fifty persons in the hotel, cottages and tents. The property is pleasantly situated on the edge of a small valley in the hills which is the source of the Garcia River and Ranchers creek. The latter is a tributary of the Navarro River. Altogether there are more than twenty springs on the place but only one has been improved. This is a cold highly carbonated soda spring. No water is bottled.

Orr's Springs. A. P. Wager and Son, owners. A concrete plunge supplied with hot sulphur water has been installed.

There is a large undeveloped soda spring in Soda Gulch, two miles from Comptche and about five miles from Mendocino City. It is utilized by camping parties.

NATURAL GAS.

Austin Muir has been using natural gas for five years from a well 200 feet deep on his place, three miles east of Willits.

PLATINUM.

Mendocino Mining and Milling Company, Incorporated. This company was organized to develop the platinum deposit near Hopland, whose history and geology is described in Bulletin No. 85. An excellent water supply for mining purposes was obtained by sinking a 12″ well near the eastern side of the property. An artesian flow was struck at a depth of 151 feet, but later the water ceased to flow and a Luitweiler Pumping Engine Company's pump, driven by electric power, was installed. This pump has supplied as much a 180 gallons a minute for five hours without materially lowering the water level, which is sufficient for all needs. Work has progressed during the past year on the mining and reduction plant and operations began in August.

The gold and platinum values are all found in the first three feet of depth, so there is no stripping required. The gold is flaky and light. Osmiridium is present in the ratio of one part platinum to 4.08 parts osmiridium. Two sample lots of thirty tons each averaged $1.81 and $1.88 per yard. Platinum figured at $130 per ounce. In sampling, one row of holes twenty-five feet apart, and one row of holes fifty feet apart, and staggered, were dug. About two cu. ft. of dirt was taken from each hole combined, and added to the dirt from two large holes in the flat on the east. This thirty-ton sample averaged $1.88 per yard in value.

The mining and reduction equipment is designed to handle 350 tons in twenty-four hours. Electric power furnished by the California Telephone and Electric Light Company, of Santa Rosa, is used. A drag line scraper will bring the material to the central hopper, whence it will be conveyed by traveling belt to the mill proper. Tailings will be stacked by another belt conveyor.

The property comprises 257 acres located in sections 21 and 28, T. 13 W., R. 11 W. Home office of company, Napa, California; W. B. MacGregor, president; Wallace Rutherford, secretary; Burton Butler, Oakland, California, manager.

QUICKSILVER.

No active property in the county.

STONE INDUSTRY.

With the exception of a small amount of crushed rock obtained at Caspar, near Fort Bragg, for temporary roadwork, there are no quarries in the county. The metamorphic rocks of Mendocino County are not suitable for road material.

CHARCOAL.

Although not a mineral product, the use of charcoal as a metallurgical fuel adds interest to the plant of the California Charcoal Company, home office, 311 California street, San Francisco. The plant is situated at Redwood Valley on the Northwestern Pacific Railroad.

It was built by the Noble Electric Steel Company, and the charcoal was originally shipped to the Heroult Electric Smelter of that company. The plant was acquired by the California Charcoal Company, who added another kiln, making four in all. It requires three weeks to make a complete cycle of the four kilns charging, burning, cooling and discharging. Madrone, oak, willow, manzanita, pine and alder are used, and one car of charcoal a week is produced. This is shipped to San Francisco at the present time. The company has another plant in Marysville.

MERCED COUNTY.

Merced County, like Stanislaus, which adjoins it to the north, lies almost entirely in the San Joaquin Valley, and the mineral industry has played a very small part in its development and growth. However, like all the other counties of the state, some mineral substances of commercial importance have been noted here, and their output since 1880, as far as it has been recorded by the Bureau, has had a total value of over one and a quarter million dollars. The bulk of this figure is accounted for in the gold production of the dredging operations on the Merced River near Snelling.

ASBESTOS.

For many years the occurrence of asbestos has been known in townships 7 and 8 S., R. 16 E., although no work has ever been done to ascertain whether or not commercial deposits might be developed.

CLAY.

High-grade pottery clay has been reported to exist in the vicinity of Merced Falls on land owned by M. Goldman of Merced. Common clay has been found elsewhere, notably near the town of Merced, where for some years a brick plant was in operation. At the present time this material is not being utilized for any purpose.

COAL.

Coal croppings are said to occur in the foothills on the east side of the county between Bear Creek and the Merced River. As far as is known, no work has been done thereon, and the deposits have not been investigated by the Bureau.

COPPER.

Copper has been found in the southwest corner of the county, but not in sufficient quantities to pay commercially. Details relative to occurrence of this metal may be found in the Fourteenth Report, as well as in Bulletin No. 50, entitled "Copper Resources of California." It has recently been reported that **Mr. George Berg** of Panoche has discovered a deposit 18 miles east of Chowchilla, croppings of which have assayed high in both gold and copper. Eight men were working on the prospect in May, 1920, and Mr. Berg was planning to install a mill at the earliest opportunity.

DIATOMACEOUS EARTH.

It has been recently reported that **J. G. Walker** of South San Francisco, and associates, located a claim in the hills west of Newman, containing what is said to be a good quality of diatomaceous earth. No development work has as yet been undertaken on this property.

GOLD.

Traces of gold can be found in the sands of practically all the streams upon the eastern side of the county. Placer mining was carried on here some years ago, to a considerable extent. There was also at one time some primitive placer mining attempted on the west

side, about 20 miles southwest of Los Banos. The only operations of this character which have been carried on for a good many years have been those of the **Yosemite Gold Dredging and Mining Company** at Snelling, on the Merced River. Description of these operations has been given at length in Bulletin No. 57, entitled "Gold Dredging in California," as well as in Bulletin No. 85, on the subject of "Platinum and Allied Metals." This company ceased operations early in 1919, and it was reported that the ground they had been exploiting is entirely worked out.

MANGANESE.

The manganese deposits located in section 13, T. 13 S., R. 9 E., which are described in detail in Bulletin No. 76, have been idle during the past year.

PETROLEUM.

Merced County has not been overlooked in the wide search for petroleum, which has been carried on in all portions of the state during the past year or more. On March 12, 1920, the Turlock Oil and Gas Company was organized, and in addition to the land in the southern part of Stanislaus County, this company has leased several hundred acres in township 6 S, R. 9 E.

The **Nevada Fresno Oil Company,** organized March 15, 1920, also controls a large acreage in northern Fresno County, and in township 12 S., R. 11 E., Merced County.

MONO COUNTY.

Mono County lies north of Inyo and extends from the summit of the Sierra Nevada on the west to the Nevada state line on the east. The greater portion of the county is a broad table land at an altitude of from 5000 to 7000 feet above sea level. Many of the mountain peaks in the western portion of the county rise to an elevation of 13,000 feet and over. The geology and mineral resources of this region have been described in detail in the Fifteenth Report of the State Mineralogist and in earlier publications of the State Mining Bureau and the U. S. Geological Survey. The following notes were taken during a week's trip made by a Bureau representative in August, 1920, and are only intended to briefly cover the activities along mining lines which were noted at that time.

GOLD AND SILVER.

American Prospecting Club. W. C. Ralston, president, 25 Broad street, New York; Sam D. Foreman, superintendent, Benton, California. This company holds a lease on the Grand Central, Midway, Hudson and Super-Six mining claims owned by W. H. Davis of Benton, including within their boundaries the extension of the Diana-Kerrick vein.

The American Prospecting Club has prospected for about 1000 feet along the outcrop of this vein and have driven a tunnel, which at a distance of about 100 feet, intersected the ore body at a point where it was seven or eight feet wide. The values, principally in silver, are high and the outlook for the success of this venture appears to be encouraging. The portal of the tunnel is 6650 feet above sea level. The vein strikes in a northerly and southerly direction and dips about 50° east. Benton, situated on the California Nevada Railroad, is located about five miles northeast of this property and the connecting roads are in good condition.

Blind Spring Hill Mining Company. Mr. L. S. Brown, president, Springfield, Massachusetts; W. H. Davis, agent, Benton, California. This company owns 26 patented claims on Blind Spring Hill, several of which are being operated by lessees. The company itself was not operating at the time the district was visited.

Borasca Mine. F. L. Young, Keeler, California, lessee; Hal Mickersell, superintendent, Benton, California. Property owned by the Blind Spring Mining Company. This mine was a large producer in the early days and has been described in detail in the State Mineralogist's report of 1888 and in other publications. At the present time four men are employed, prospecting the old workings. A small amount of high grade ore has recently been produced.

Cain Cyanide Plant. J. S. Cain, Bodie, California, owner. This plant is being constructed near the old Standard mine with the idea in view of cyaniding the dumps on that property. A crusher and two sets of rolls, percolating tanks, etc., have been installed and it is planned to commence active operations at an early date.

Charleston Group. Owned by J. P. Hammond and under lease to Orris Nay, Mono Lake, California. Four men are employed, driving a tunnel. Detailed description contained in the Fifteenth Report.

Chemung Mine. (See Masonic Mine Association.)

Comanche Consolidated Mining Company. Chas. A. Palmer, president; W. H. Mullock, secretary, 210 Douglas Building, Los Angeles, California; J. S. Adair, superintendent, Benton, California. Location of property on Blind Spring Hill, Benton mining district. This is another of the famous producers of the Benton district, which have been dormant for many years. The present company is driving a tunnel which is now in 1300 feet, and which, it is believed, will cut the vein at about 1360 feet. It is believed this will give about 300 feet of backs on the ore at a point south of the old shaft, which was not penetrated by the former operators. Five men are employed. Equipment consists of a 50-h.p. Semi-Diesel engine and compressor.

Cook-Kibble Leasing Company, Masonic, California. This company has a lease on the Chemung claim, owned by the Masonic Mines Association (which see), and located about 2½ miles southeast of the town of Masonic. Elevation approximately 8000 feet. The lease includes about 1500 feet along the lode, 300 feet of which has been subleased to H. C. Decker. The ore contains free gold, very finely divided, occurring at irregular intervals through a mineralized zone about twenty feet wide. It strikes northeast and southwest and dips almost vertical. At the time the property was visited operations were being carried on through a 130-foot vertical shaft with working levels at 60, 85 and 130 feet from the surface. The mine contains several hundred feet of drifts and a number of small stopes. Equipment includes a 6-h.p. Western hoist. The ore, which is sorted by hand, is sacked and shipped. Ore assaying less than $100 per ton is left on the dumps for further treatment. Several small shipments are said to have averaged as high as $400 per ton in gold. Two men are employed on the surface and eight underground.

Decker Lease. As mentioned under the previous heading, H. C. Decker, Masonic, California, has leased 300 feet on the Chemung vein from the Cook-Kibbel Leasing Company. This lease has been developed by a 100-foot vertical shaft, which is equipped with a 6-h.p. Western gas engine and hoist and a 3-h.p. engine of similar manufacture which operates a sinking pump. One man employed on the surface and three underground. At the time the property was visited, a station was being cut on the 100-foot level and no crosscutting or drifting had as yet been undertaken.

Diana Development Company. Uri B. Curtis, president, 630 Wesley Roberts Building, Los Angeles; Dan Greenwalt, superintendent, Benton, California. This company has acquired the old Cornucopia, Diana and Kerrick mines, situated on Blind Spring Hill, about three miles west of Benton station, at an elevation of 6750 feet. Detailed description of all these old properties has been published in the State Mineralogist's Report of 1888 and elsewhere. The company has twenty-three claims under bond, which include within their limits several parallel veins, only a few of which have been developed to any extent. The

company plans to drive a long crosscut tunnel, starting on the east side of Blind Spring Hill, which will cut at considerable depth several veins which are known to have produced large amounts of high grade silver ore.

F. M. Jones Mines Company. R. C. Cameron, consulting engineer, Berkeley, California. This property, formerly known as the Charleston mine, is located in the Bodie Mining District, at an elevation of 8500 feet. This mine is said to have been a big producer in the early days, although it has been abandoned for many years. The present company is cleaning out the old workings. Two men employed on the surface and six men underground.

King Mine. John King, Benton, California, owner. This gold mine is located about 12 miles south of Benton and has been developed by a 50-foot shaft and several drifts. It is equipped with a 3-stamp mill. Work has been intermittently carried on by Mr. King for many years and a small production is reported.

Log Cabin Group. H. H. Clark, Calexico, and Luther Brown, Los Angeles, owners; James Simpson, manager, Mono Lake, California. This property includes a vein which strikes north and south, containing free milling gold ore, and has been developed by a 230-foot tunnel. It is equipped with a 2-stamp prospecting mill. Six men employed underground.

Lyford Group. W. H. Davis, Benton, California, owner. This is a group of six claims on the east side of Blind Spring Hill, from which considerable high grade silver ore has been produced in times past. Assessment work only for 1920.

Masonic Mines Association. Chas. T. Davis, secretary, 675 O'Farrell street, San Francisco. This association owns several claims situated about 2½ miles southeast of the town of Masonic, among which are included the Chemung Mine, previously mentioned, under Cook-Kibbell Leasing Company. The property covers about 4500 feet along the length of the Chemung vein, which was discovered in 1918. This vein, or lode, strikes in a northeasterly and southwesterly direction and cuts through a granitic country rock. The association is doing some prospecting on the surface, although the principal mining operations have been carried on by leasers.

Monaldo Mining Company. R. G. Woodin, president, 15 State street, Boston, Massachusetts. This company owns several unpatented claims in the Masonic district, formerly known as the Gold Cycle and State Line mines. Idle in 1920.

Mono Mines Company. Wade Armstrong, manager, Coleville. This property, formerly known as the Golden Gate Mines, is located in Antelope Valley Mining District, section 26, T. 8 N., R. 22 E. It has been described in the Fifteenth Report of the State Mineralogist. Idle in 1920, although the new company is preparing to reopen the old workings.

Nevada Progressive Gold Mining Company. A. G. Anderson, superintendent, Sweetwater, Nevada. This property is located in the Patterson Mining District and has been known at different times as the

Silverado, Columbus, and Sweetwater Consolidated mine. It is developed by two adits, each about 400 feet long, the vertical distance between them being 120 feet. Considerable ore has been blocked out by raises. The property is equipped with a Denver Quartz mill, which has been intermittently operated with indifferent success. In August, 1920, there were two men employed in the mine on the surface, six men underground and one man in the mill.

Powell Leasing Company, Benton, California. This company is operating on the southern extension of the Borasca vein on ground owned by the Blind Spring Hill Mining Company. During the past few months a 300-foot incline shaft has been sunk on the vein, in the first 130 feet of which high grade silver ore to the value of $17,000 was shipped. The mine is equipped with a 15-h.p. gasoline hoist and a 3-h.p. blower engine. One man employed on the surface and four underground.

Silver Reef Mine. J. G. Main, Benton, owner; American Prospecting Club, Sam D. Foreman, manager, Benton, California, lessee. Located in Indian mining district. Property includes seven unpatented claims, within which one vein, striking north and south and dipping 70° northeast, is developed with a 130 foot shaft and several small drifts and stopes. The ore shipped in 1920 is said to have netted the owners about $17,000. Two men employed on the surface and four underground.

Standard Consolidated Mine. J. S. Cain, owner, Bodie, California. This famous mine, located in the Bodie district, which has been described at length in former reports of the Bureau and in various mining journals, remained dormant in 1920, with the exception of a small production, resulting from the efforts of leasers who merely used what is known in the silver mines as "chloriding" methods.

Trueman Lease. Benj. Trueman, Benton, California. This lease includes the Anderson claim, owned by the Diana Development Company, located on Blind Spring Hill. It is reported that Mr. Trueman is taking out high grade silver ore in gratifying amounts. Four men employed.

Wild Rose Mine. American Prospecting Club, lessees; Sam D. Foreman, manager, Benton. Property situated 6 miles southwest of the town of Benton. Principal occurences of ore are in a vein averaging about three feet wide, containing gold, lead and zinc values. Development work consists of two prospect shafts, one 30 feet and one 80 feet in depth, and two adits, each about 100 feet long.

MOLYBDENITE.

J. G. Cannon, Sweetwater, Nevada, is reported to have discovered a deposit of molybdenite about 6 miles from that town, across the California border. Samples inspected showed the ore to be granite, carrying about three-fourths of one percent molybdenite. No development work done.

C. L. Faudre, Masonic, California, owns a claim 10 miles south of Fales Hot Springs, containing an immense quartz ledge, portions of

which are said to carry as high as two to three percent molybdenite. A 40-foot prospect shaft has been sunk in the ore and a 208-foot cross cut tunnel has been started, which has not yet reached the ledge. Property idle in 1920.

SODA.

Messrs. Mattley and Parrott, Mono Lake, post office, have a small plant southeast of Mono Lake in which soda has been produced by evaporating the waters of the lake in iron vats. Operations have been intermittent and on a very small scale.

VOLCANIC ASH.

W. H. Davis, Benton, owns a large deposit of fine-grade light gray volcanic ash, near Benton, which was quarried in blocks and used for building purposes in the early days.

MONTEREY COUNTY.

Monterey County borders the central coast of California and is separated from Santa Cruz to the north by the Pajaro River. It adjoins San Luis Obispo to the south and San Benito, Fresno and Kings Counties on the east. Monterey's mineral resources have been little more than prospected, although within its boundaries lie mineral deposits which are of immense potential value. The geology of a large portion of this section has been mapped and described in Bulletin No. 69, of the State Mining Bureau and complete details relative to mines and mineral deposits may be obtained by reference to the Fourteenth Report of the State Mineralogist.

Mining was not particularly active in 1920, although the following notes taken during a short field trip through Monterey County in August, will give some indication of developments which have taken place since the Fourteenth Report was written.

BARITE.

A. R. Haskins, Hollister, California, shipped some barite during the year from a deposit on Fremont Peak. He holds a lease on this property which is owned by Messrs. J. and H. Bardin, Salinas. This material was hauled by truck to the railroad at San Juan.

COAL.

Some development work was carried on and a small production reported by the Stone Canyon Consolidated Coal Company, whose property is located about eighteen miles northeast of Bradley. Some investigation of undeveloped deposits was also carried on as a result of the recent interest which is being taken in the utilization of coal, owing to the threatened shortage of crude oil and the increasing prices of that fuel.

DOLOMITE.

Large deposits of dolomite have been developed in a belt lying along the base of the foothills about 6 miles east of Salinas. Regular shipments of this material have been made by Mr. H. Bardin, C. Z. Hebert, C. Patton and Robert Porter, all of Salinas and all operating at different points along the dolomite belt.

FELDSPAR.

One of the best known feldspar deposits in the state is owned by J. C. Jens, Glendora, California, and is situated 4 miles east of Chualar, with which town it is connected by a good wagon road. The deposit lies between a contact of limestone and granite. It is a massive orthoclase, varying in width up to 150 feet and can be traced for several thousand feet along the strike. A portion of this deposit has been operated by Geo. W. Elder, 799 Oak street, San Francisco.

A feldspar deposit which has not been prospected and the value of which is as yet undetermined was noted on the property of H. Bardin, Salinas, about 7½ miles east of that town.

MOLYBDENUM.

The **Vancouver Pinnacles Molybdenum Company,** T. E. Silvear, manager, Aptos, California, have been doing some work on a molyb-

denum prospect located on the Westcott Ranch, 8 miles east of Soledad. The mineral occurs in a zone which contains a series of quartz veins in granite, striking in a northerly and southerly direction. The work so far done consists of a 50-foot adit, driven on one of the veins which has an average width of about 32 inches. Samples which have been assayed are said to have run as high as 3% MoS.

SALT.

Monterey Bay Salt Company. D. C. and E. C. Vierra, owners, Moss Landing, California. Salt is extracted from the sea water at this point by solar evaporation. The water is pumped from a small lagoon into the evaporating ponds. The brine from these ponds is pumped into vats and the resulting salt is washed and sacked. Most of the production in the past has been sold to fish packers, but it is said to be of exceptional purity, and the Vierra Brothers are planning to put in machinery to make table salt in the near future. The annual production at the present time amounts to about 4,000 tons.

SAND.

Del Monte Properties Company. C. S. Olmstead, manager, Pacific Grove, California (formerly the Pacific Improvement Company). This company is producing glass sand on a large scale from two beach deposits lying between Pacific Grove and Carmel. The largest operations are carried on at the Sand Hill Plant, three miles west of Pacific Grove, near Asilomar. The material is handled by means of a drag line scraper, and it is then screened, washed and dried. The capacity of the plant is from 6 to 8 carloads per day, and this amount will be increased when various improvements, which are now being installed, are completed.

The second deposit operated by the Del Monte Properties Company is known as the Fan Shell Beach Plant, located on the 17-mile drive, about half way between Pacific Grove and Carmel. The sand at this point is raised into 150 ton bins by using a drag line scraper. It is then transported to the railroad by means of automobile trucks. Other occurrences of pure white sand, suitable for glass making, occur at various points along the beach, both north and south of the town of Monterey. Among these deposits which have been commercially utilized to some extent are a large dune near Carmel, owned by the Carmel Development Company; a smaller deposit adjoining, owned by the Carleton Land Company, of Carmel; and a deposit near Del Monte, which has not been utilized for a good many years, but from which several hundred tons of sand were shipped at one time by the California Glass Insulator Company of Long Beach. In addition to the glass sand above mentioned, an immense tonnage of building sand is annually produced by the E. B. and A. L. Stone Company, of San Francisco, from the sand dunes lying west of Lapis Siding on the Southern Pacific Railroad, along the shore of Monterey Bay.

NAPA COUNTY.

The southern end of Napa County touches San Pablo Bay. On its eastern side, it is bounded by Solano and Yolo counties, on the north by Lake, and on the west by Sonoma County. It is about fifty miles north and south by twenty-six miles in width. Mount St. Helena is in the northwest corner at the junction of Lake and Sonoma counties. The mineral resources of this area include cement, magnesite, mineral water, quicksilver, infusorial earth, limestone, copper, iron, chromite, gold and silver, mineral paint, and stone industry. The Fourteenth Report of the State Mineralogist contains a description and bibliography of the principal properties. More recently Bulletin No. 78 discusses the quicksilver mines, and the chrome and manganese mines are described in detail in Bulletin No. 76. Changes and new material here noted will supplement the above and bring them up to date.

CEMENT.

Standard Portland Cement Corporation. This company has two cement plants, one at Davenport, Santa Cruz County, and one at Napa Junction, Napa County. F. H. Davis is general superintendent of both plants. The Napa Junction plant was shut down in September, 1918, and has not been in operation since.

CHROME.

Graves Ranch Mine, located 8 miles northwest of Monticello, is said to have produced about 900 tons in 1918. The ore was shipped to the Sawyer Tanning Company, Napa.

The only mine active during the present year was the Astute Chrome mine. This deposit was discovered in July, 1918, and is owned by Young Adams and W. D. Hayes of Middletown; Young Adams, superintendent. The property consists of one claim, the Astute, situated in section 32, T. 10 N., R. 5 W., about 12 miles from Middletown along the road to Knoxville, just over the Lake County line.

Stringers in serpentine developed into a lens of good ore from which 200 tons had been shipped by truck to the Sawyer Tanning Company, at Napa up to July of this year. At that time the lens appeared to be pinching out, and it is doubtful if the production will greatly exceed the above figures. Two men were working. The road is good to within one-fourth of a mile of the mine. Ore is sledded to this point and loaded on auto trucks.

A limestone ledge was noted in section 32, near this property, and the ruins of an old lime kiln. A shipment of 18 tons of chrome was made from Calistoga by Raymond Thorne in July. It went to Sawyer Tanning Company, at Napa, but its source was not learned.

GOLD AND SILVER.

Manuel Prospect. Idle.

Palisade Mine. Attention has been drawn to this interesting old property also known as the "Grigsby" silver mine by the giving of a lease and option on 100 acres covering the extension of the veins on the Grigsby to L. A. Thomas of Calistoga. Thomas et al have sunk a new

shaft 40 feet deep from the bottom of which a crosscut, said to be entirely in quartz vein matter, has been run 24 feet, without reaching the hanging wall. The entire 24-foot width is stated to assay $12 per ton. Some excellent looking quartz, carrying silver sulphides, was seen by the writer at the shaft opening. The mine is ideally situated with timber and water on the property, and can be reached in fifteen minutes by automobile from Calistoga. The history of the property fully warrants the work done, and with the present price of silver further development seems entirely justified.

Mount Saint Helena Mine (formerly the **Silverado Mine,** Calistoga), owner Harry Patton, Calistoga. This property consists of five claims and one patented location having a total area of 120 acres. There are three parallel quartz veins carrying a little free gold, but most of the values are in the form of chlorides and sulphides. Antimony is present. The average width of the vein being developed is 6 feet with a maximum width of 25 feet. The strike is north 18° east, and it dips 75°–80°. It has been proven for 1200 feet in length. The lower tunnel exposes the vein at a depth of 397 feet below the outcrop. An open cut has been run along the vein for 200 feet, and it has been drifted on for 187 feet on the lower level. The owner estimates that these workings have blocked out $60,000 worth of ore, or 6000 tons. The mine is equipped with a 20-h.p. gas engine. Rix Compressor, cars, rail, tools, blacksmith shop, etc. Air drills are used in mining. Mining costs are $2.75 per ton. There is no reduction equipment, but the owner expects to put in a reduction plant of 20 to 25 tons daily capacity. Treatment will consist of crushing, roasting and amalgamation. Two cars of ore shipped to the Mountain Copper Company in 1918 are stated to have netted $42 per ton, but the average ore is too low grade to ship. It has to be trucked seven and one-half miles to Calistoga, the nearest railroad point. Some work was done in 1919, but it was idle in 1920, pending erection of a mill.

MANGANESE.

No manganese mining in this county during the past year.

MINERAL PAINT.

The **Carl Browne Paint Mine,** on Benali Mountain, 2 miles south of Calistoga, is now owned by W. R. Teale. The material is white. Some shipments were made to Richmond, where it was used in making porcelain ware, and some was shipped to Oakland for the manufacture of bisque doll heads several years ago, but none has been mined during the present year. There are other exposures of this material in the immediate neighborhood.

No work was done during the year at the property of the California Paint Mineral and Mining Company, owned by Mrs. Ellen M. Knoles.

MINERAL WATER.

Calistoga Hot Springs. This property is now owned by Mrs. Pacheteau. A new $34,000 bathhouse was erected early in 1920, with facilities for giving mud, steam and hot sulphur water baths. Two new geysers, or, more correctly, flowing hot water wells, have been bored and capped for use in the bathhouse. C. W. Nance, manager.

Elms Hot Springs. Owner, C. S. Piver. This resort is in Calistoga. There is one well 202 feet deep which supplies hot sulphur water of a temperature of 169°. The flow formerly rose ten feet, but only reaches seven feet at present. It is pumped for use in the showers. Mud baths are also given. The resort was opened in 1915 and there are accommodations for about sixty persons in rooms and cottages.

G. Musante of Calistoga has a bored well 185 feet deep on his property, in which the water rises eleven feet above the surface. It has a temperature of 212°.

Dr. Alder's Sanitarium. Hot water from wells is used for medicinal purposes at this property in Calistoga.

Myrtledale Hot Springs, formerly Myrtledale Farm. This resort is 1½ miles northwest of Calistoga. R. Roy Leveira, proprietor. The following analysis of the water was made at the University of California:

Total residue	44.7 grains per gallon
Sodium chloride	16.8 grains per gallon
Water of crystallization	3.5 grains per gallon
Silica	19.1 grains per gallon
Magnesium carbonate	2.2 grains per gallon
Borax	Trace
Sulphuretted hydrogen	Trace
Potassium carbonate	Trace
Potassium chloride	Trace
Sodium carbonate	Trace
Organic matter	Negative

Among other well known springs in this county, none of which were visited in 1920, may be mentioned the following: Napa Soda, Napa Vichy, Original White Sulphur, Priests, Lanue, Sequoia, St. Helena, or Walters Springs.

QUICKSILVER.

The stagnation marking the quicksilver mining industry during the past year has been reflected in the conditions found in Napa County during the present year. Of the eighteen or twenty properties described in Bulletin No. 78, the Oak Hill Mine was the only one in operation during the year.

This mine has been working on a reduced scale, pending an improvement in labor conditions, water supply and a better quicksilver market.

A new 50-ton Scott furnace was installed in 1918, containing special condenser arrangements and a drier designed by Mr. Murray Innes. The drier is at the top of the furnace and surplus heat from the fire boxes at the bottom is conducted through two outside chimneys to the upper compartment, where it passes over the ore, drying it before it reaches the furnace proper.

All work in the mine at present is confined to the two lower tunnels, where ore was being developed in three breasts and one raise. Fourteen men were employed. The elevation of these workings is 350 feet and 450 feet, respectively, below the top of the furnace, necessitating hoisting all ore this distance up an incline cable tramway. A 6-h.p. engine is used to draw the ore up. Owing to this requirement and the limited production, the furnace was shut down in March of this year and mine development only was in progress at the time of visit. Even the old

dumps, where concentration was carried on from September, 1917, to April, 1918, are above the present working, and it is stated that the management contemplates moving the entire reduction equipment down to a point below the lowest present workings in order to be able to handle the ore by gravity. Lack of water has stopped all concentration of the old dumps. J. C. Ansel is superintendent.

SACRAMENTO COUNTY.

Sacramento County lies mainly in the central valley of California, extending from the foothills of the Sierra Nevada on the east, down to the Sacramento River on the west. The highest elevation in the county is slightly less than 900 feet at a point southeast of Folsom. No field investigations of the mineral resources of this section were carried on during 1920, although they include clay, suitable for the manufacture of brick; natural gas; gold; crushed rock and granite. The most important of these is gold, which occurs in the gravels along the ancient courses of the American River.

Extensive dredging operations have been carried on in this county for the past twenty years. For details relative to individual mineral deposits and extent of mining operations in this portion of the state, see the Fifteenth Report of the State Mineralogist.

SAN BENITO COUNTY.

San Benito County is made up principally of a long narrow valley, flanked on each side by mountains of the Coast Range. It is bordered on the north by Santa Clara and Santa Cruz counties, on the east by Merced and Fresno, and on the south and west by Monterey. Transportation facilities in this section are limited. The Southern Pacific Railroad operates a branch line from Gilroy to Tres Pinos, via Hollister, the county seat. Automobile stages operate between most of the principal towns.

Owing to pressure of other work, the Bureau was unable to send a field representative to this county in 1920, although very complete data relative to its geography, geology, mines and mineral resources may be obtained by reference to the Fifteenth Report of the State Mineralogist.

Mineral production during the past year, as reported to the Bureau's Statistical Department, consisted of cement, dolomite, magnesite, mineral water, quicksilver and miscellaneous stone. In addition to the above the following substances, of great potential value, are known to exist here: antimony, asphalt, barite, bituminous rock, chromite, clay, coal, copper, diatomaceous earth, gems, gold, gypsum, iron, limestone and manganese.

San Benito County ranks among the oldest and most important quicksilver producing counties in California. It contains the New Idria Mine, which during recent years has been the largest single producer in the state.

Considerable interest has been taken in the search for petroleum in this county during the past few months. An oil geologist of the Bureau has completed a survey of the petroleum possibilities, and the result of his findings will be published in a separate report early in 1921.

SAN FRANCISCO COUNTY.

By E. Huguenin and W. O. Costello.

(Field work in 1919.)

INTRODUCTION.

San Francisco is a consolidated city and county of approximately 46½ square miles in area, occupying the northern end of the peninsula that partly encloses San Francisco Bay. San Mateo County bounds it on the south, and the Pacific Ocean on the west. It was created February 18, 1850.

The city is the most important industrial center on the Pacific Coast, having close to 2000 manufacturing institutions within the city limits, among which may be specially mentioned the Union Iron Works, one of the largest ship building yards in the country.

MINERAL RESOURCES.

San Francisco is essentially a city of hills, comprising mostly the metamorphosed sandstones, shales, and cherts of the Franciscan formation. The geology of the county, as well as of the whole bay region, is fully described in the San Francisco Folio of the U. S. Geological Survey. As is to be expected from the limited area and geological formations, but little can be said about the mineral resources, which are very restricted both as regards variety and economic value. The only mineral industry now pursued is the quarrying of the cherts and metamorphosed sandstones for macadam and concrete uses.

Table of Production of San Francisco County.

Year	Brick		Stone industry	Miscellaneous and unapportioned		
	M	Value	Value	Amount	Mineral	Value
1894			$.96,864	20 tons	Limestone	$25
1895			379,696			
1896	5,000	37,500	285,167			
1897	4,500	28,500	86,217			
1898			129,595			
1899			275,634			
1900			58,400			
1901			156,947			
1902	25,800	238,800	156,300			
1903	33,403	294,326	508,460			
1904	39,509	367,911	332,220			
1905	32 585	310,685	114,337			
1906	7,203	53,289	106,250	8,500 tons	Glass sand	10,500
1907	44,578	434,140	97,273	4,000 tons	Asphalt	60,000
1908	41,837	345,155	95,259	1,500 tons	Asphalt	15,000
1909	31,450	221,332	150,382	850 tons	Asphalt	9,800
				Unapportioned 1900-1909		
1910			108,126	1,000 tons	Asphaltum	12,000
1911			119,636			
1912			151,147			
1913			110,551			
1914			119,589			
1915			128,270			
1916			76,437			
1917			197,957			
1918			16,463			
1919			65,541			
Totals	265,850	$2,336,638	$4,233,098			$107,300

Brick	$2,336,638
Stone industry	4,233,098
Miscellaneous and unapportioned	107,300
	$6,677,036

Gold occurs in the black sands along the ocean beach at the mouth of the Laguna del Merced. The black sands are deposited in thin layers interstratified with the barren yellow sand. These deposits have been covered to a depth of several feet by the drifting beach sands. Some attempts were made to mine the black sands many years ago, with varying degrees of success. The richer portions were soon worked out, after which the beach was abandoned.

A number of small gold-bearing veins have been found associated with the metamorphic rocks, but the occurrences were too irregular and limited in extent for commercial exploitation.

Traces of cinnabar were reported found in the hills back of the old Mission Dolores, and more recently in the vicinity of Twin Peaks; however, no workable deposit has been, or is likely, to be discovered.

STONE INDUSTRY.

The metamorphosed sandstone and chert beds within the city have been quarried for many years, the materials being used for macadam and concrete work about the city. Many of the old quarries have been abandoned due to the growth of the city, and most of the crushed rock used is shipped in from the neighboring counties.

Only such quarries as are in actual operation or have been recently worked are herewith noted, the older properties having been described in previous reports of this Bureau.

Bibl.: Reports XII, pp. 389-390; XIII, pp. 625-626. Bull. 38, pp. 320-322.

Crocker Quarry. This quarry, located on Lowell street, several blocks south of Mission street, is owned by Bates and Boreland, 593 Market street, San Francisco, and Oakland Bank of Savings Building, Oakland. It was operated for several years, but was exhausted and abandoned in the latter part of 1917. Most of the machinery was taken to the Mission Quarry, on Geneva street, in which the same company has an interest.

The rock was a hard gray metamorphosed sandstone and was used for macadamizing roads in that vicinity.

Golden Gate Park Quarries. The red chert beds which outcrop prominently in Golden Gate Park were formerly quarried quite extensively for use on the roadways in the park. The rock is thin-bedded and friable and easily broken by pick and shovel. At present no quarrying is done, the rock for the park being obtained from the Morgan Quarry at Twelfth avenue and Rivera street.

Gray Brothers Quarry. This company formerly operated a quarry on Telegraph Hill, Green and Sansome streets, but this has been abandoned for some time and they are at present (June, 1919) operating a large quarry in the Mission district, at the head of Castro street at Thirtieth avenue.

The rock is a dark gray metamorphosed sandstone with lenses of serpentine. It is quarried in a semicircular open cut varying from 100 ft. to 150 ft. high and about 200 feet wide. There is an overburden of two or three feet of soil, which gives some trouble. The rock is loaded into 1½-yard cars and hauled a distance of about 200 feet to the crusher. Five tracks run from the crusher to the face of the

quarry. Three of these are level and the cars are pushed by hand or drawn by a horse. The other two tracks are about thirty feet lower at the quarry face and the cars are drawn by cable up the crusher.

The rock is crushed in a No. 6 Fraser and Challenge gyratory crusher, and is elevated to a revolving screen 12 feet long and 4 feet in diameter. This classifies the rock into No. 2, No. 3 sizes and waste. Occasionally an additional 4-foot length of screen is added, producing a No. 4 size. There is a large dump of waste rock which is not marketed, but which apears to be excellent for walks, etc.

From eighteen to twenty men are employed. The plant does not run continuously, but closes down when the demand for rock ceases. Product is sold mostly to contractors for building and street work. Pete Carney is foreman at the plant. A 48-h.p. motor runs all the plant.

Mission Quarry. This property, comprising seven acres, is on Geneva avenue about 1 mile south of Mission street. The rock is a hard gray metamorphosed sandstone and is utilized for macadam and concrete in street work by the city of San Francisco and the United Railroads. It is quarried in a large open cut whose face is over 100 feet in height. The caving system is employed in quarrying, using a huge charge of powder and blowing down the whole face. The large boulders are broken by "bull-dozing" before being sent out to the crusher. Usually sufficient rock is loosened by one charge to keep the crusher supplied for several months.

The rock is loaded into 1½-yard cars and hauled by one horse a distance of about 150 feet to a No. 6 Gates gyratory crusher, located below the track. The rock is crushed to 2-inch size and is raised by a bucket elevator to the top of the bin, where it goes over a screen 40 inches wide and 18 feet long. The oversize comes back to a No. 4 Gates gyratory crusher, located several feet above the No. 6.

A 50-h.p. motor runs the No. 6 crusher and a 35-h.p. motor operates the No. 4. At present the elevator and screen are run by a 35-h.p. motor, but this is soon to be replaced by one of 50 h.p. Electricity is supplied by the Pacific Gas and Electric Company and the United Railroads.

The bunkers have a total capacity of 1000 yds. There is an extra screen 30 inches wide and 20 feet long not running. From 12 to 17 men are employed almost all the year and the output is from 75 to 100 yards per day. The rock will average about 1¼ tons to the yard.

This quarry was formerly operated by the United Railroads, but was sold to the Mission Quarry Company in 1915, and bought by the present owners, Bates, Boreland and Ayers, in 1918. H. Bottarini is foreman at the plant.

The Morgan Quarry, formerly operated by the Morgan Improvement Company, is located at Twelfth avenue and Rivera street. It is now owned and operated by W. A. Clark, 381 Bush street, San Francisco. A fire destroyed most of the crushing plant early in 1919, but it has been rebuilt.

Yerba Buena Island Quarry. A bank of friable buff-colored sandstones and shales is occasionally quarried in an open cut on the east side of the island. The rock is used for macadamizing roads about the island, which is the property of the United States government.

SAN JOAQUIN COUNTY.

San Joaquin County has an area of approximately 926,720 acres, of which almost 800,000 are under cultivation. In spite of this fact several valuable minerals occur here, and the annual production during recent years has averaged between $400,000 and $500,000 in value. The mining activities were not investigated by the Bureau in 1920, but they have been described in detail in the Fourteenth Report of the State Mineralogist and the following notes are presented as a matter of general information.

CLAY PRODUCTS.

Large quantities of brick, pottery and other clay products are manufactured at Carnegie and at plants located on the outskirts of the city of Stockton.

GOLD.

The **American Gold Dredging Company,** with offices in the Sharon Building, San Francisco, continues to be a producer of gold, silver and platinum. Its dredging operations are carried on in the Mokelumne River near the Amador border.

NATURAL GAS.

Natural gas has been a very important factor in the fuel question of the manufacturing industry of San Joaquin County, and together with cheap water transportation to San Francisco Bay, gives the city of Stockton somewhat of an advantage over other valley towns. Most of the natural gas wells of San Joaquin County are located in the vicinity of Stockton. The first gas well was bored in the hope of obtaining artesian water, and when the water was tapped an unexpected flow of gas was encountered. The Central Natural Gas Company and the Western States Gas and Electric Company are developing and marketing this product, and in addition several wells owned by individuals are utilized locally for fuel and light.

MANGANESE.

Deposits of manganese are found at various points in the Livermore Hills, the best known property being the Ladd Mine. At this point the first manganese mined in California was produced in 1867. This property is situated 12 miles southwest of Tracy at Corral Hollow.

Aside from the mineral deposits within the boundaries of San Joaquin County, the entire Mother Lode region, which is one of the richest and most prolific regions in the world, is tributary in a commercial sense to Stockton and, therefore, the activities and prosperity of the mineral industry in that section has an important bearing upon the commercial life of that community.

SAN MATEO COUNTY.

By E. Huguenin and W. O. Castello.

(Field work in 1919.)

INTRODUCTION.

San Mateo County, created April 15, 1856, and comprising 447 square miles, is a peninsula county lying directly south of San Francisco with the ocean to the west and San Francisco Bay to the east; Santa Clara and Santa Cruz Counties adjoin it on the southeast and south, respectively. Its total assessed valuation in 1918 was about $38,000,000.

The principal city is San Mateo, with a population of about 7,000, situated 20 miles south of San Francisco, close to the bay shore. Redwood City, the county seat, with a population of approximately 3,000, is located 9 miles south of the city of San Mateo at the edge of the marshes and has a deep water frontage on a channel which comes into the center of the city. This gives desirable manufacturing sites, and several large factories were established here years ago.

The centers of population follow the line of the Southern Pacific Railroad down the east side of the peninsula to its southern boundary. The county is mostly famous for its development into one of the largest homesites for San Francisco people. This is due to its splendid climate, attractive surroundings, and its proximity to San Francisco. Besides the Southern Pacific Railroad, the United Railroad Company of San Francisco operates an electric line down the peninsula to the city of San Mateo. The newly completed state highway, over which automobile stages are operated, also parallels the railroad, making the county very accessible.

On the west coast the climate is more vigorous, high winds and fogs being very common. This coast is more rugged and consequently less populated; however, the rich soil on the west slope of the mountains extending to the sea is rapidly making it famous as a farming section, especially for garden truck.

TOPOGRAPHY AND GEOLOGY.

San Mateo County is traversed by two distinct mountain groups, both having a general northwest trend and being separated by the Merced Valley, which terminates in Merced Lake, the greater part of which lies in San Francisco County. The northern group, the highest point of which is San Bruno Mountain (elevation 1,315 feet), extends into San Francisco. The southern group is a continuation of the Santa Cruz Mountains and culminates in Montara Mountain, the highest peak being 1,952 feet in elevation.

Quoting from the report of Andrew C. Lawson,[1] "In character of relief these two blocks present an interesting contrast. The surface of the northern block is irregularly hilly and, except in San Bruno Mountain, shows but little linearity in the disposition of its crests and valleys. Its geomorphy is fairly mature, although a characteristic feature of that maturity is a certain ruggedness of profile due to the presence of formations composed of radiolarian chert. The exceptional resistance which these offer to erosion causes the areas they occupy to present a marked

[1]Geology of the San Mateo Quadrangle, U. S. G. S. Folio No. 193.

contrast with adjoining areas composed of sandstone. * * *

"The southern block is marked by notable linearity in its crests and valleys and its geomorphy is in general much less mature than that of the northern block. The most remarkable linear feature is the valley in which lie San Andreas and Crystal Springs lakes, a short segment of the San Andreas rift valley, a feature due to repeated faulting in recent geological times. The trace of the fault of 1906 follows this rift for about 300 miles. The valley is due in part directly to earth movement, but in large measure also to the mashing of the rock in the fault zone and its consequent easy erosion. Northeast of the San Andreas rift lies the equally linear Buriburi Ridge which slopes down to Merced Valley



Photo No. 10. San Pedro Point, San Mateo County, on line of Ocean Shore Railroad. Showing steeply-dipping sedimentary strata. Photo by Walter W. Bradley.

and to the Bay of San Francisco. The slope of the Montara orographic block in the area southwest of the rift valley is dissected by a series of subparallel steep-sided cañons and intervening ridges, which are in large part remnants of the original tilted surface. Viewed in a large way, however, this tilted slope, taken as a whole, from the crest of Montara Mountain to the Bay of San Francisco, presents a broadly terraced aspect. It comprises two terrace levels or steps, one the flat-topped ridge that is elsewhere called the Buriburi Plateau, the general elevation of which is about 700 feet, and the other the Sawyer Plateau, comprising a number of flat-topped ridges that stand at elevations of 1,100 and 1,200 feet.

"The crest of the tilted block known as Montara Mountain is composed of quartz diorite and is somewhat serrate in its longitudinal

profile, its serration being due to its incision by the head water erosion of the high-grade streams on its southwest front. On the precipitous shoulders and ridges of the southwest face of the mountain there are obscure traces of terraces at elevations of 400 and 500 feet. At the base of the mountain front, but separated from it by an alluviated valley, is a low ridge known as Miramontes, terminating in Pillar Point. This ridge is composed of folded late Pliocene strata which rest upon the quartz diorite."

The geology of San Mateo County will not be repeated here, as it has already been fully described, partly in the folio cited in the footnote [1] and partly in the Santa Cruz Folio No. 163, to which the reader is referred.

DRAINAGE AND WATER SUPPLY.

San Mateo Creek is the most important drainage channel in the county. It cuts across the Buriburi Ridge, flowing through a deep gorge northeastward to San Francisco Bay, draining the valley of the San Andreas rift both to the northwest and southeast of its head in Crystal Springs Lake. The creek is dammed at the lake, the latter forming a large reservoir whose waters are used to partly supply San Francisco and a few of the towns along the east side of the peninsula. Pilarcitos Creek, which rises in Pilarcitos Lake, forms the drainage basin for the west slope of Cahill Ridge and the east slope of Montara Mountain. It flows in a general southerly direction, emptying into the ocean at Half Moon Bay. Numerous small perennial streams flow down from the west slopes of Montara Mountain Group to the ocean, affording an ample water supply for that coastal region; the most important of these streams being the San Gregorio, Pescadero and Purisima Creeks.

MINERAL RESOURCES.

By far the most important mineral resource of the county is water. Surface water impounded by dams in stream valleys has been extensively used to supply the peninsula cities and towns. Next in importance are the building materials, crushed rock, sand, and gravel, grouped under the heading stone industry. Then follow in order of the value of their production as shown in the following table: salt, brick, limestone and miscellaneous, which includes asphalt, cement, clay, gems, petroleum and sandstone. In addition to the above minerals, small occurrences of barytes, chromite, gold, silver, and quicksilver are known. The total recorded mineral production from 1895 to 1919 was $4,277,800. The production for 1919 was $241,671, San Mateo County ranking thirty-sixth on the list of California counties.

ASPHALT AND BITUMINOUS ROCK.

Hooper Quarry. There is a small bituminous rock quarry located in section 8, T. 8 S., R. 3 W., about 2 miles north of the county line between San Mateo and Santa Cruz counties. It is owned by John A. Hooper, and some rock was used for private road work.

BRICK AND CLAY.

There is at present no common red brick produced in the county, but only pressed and fire brick.

Table of Mineral Production of San Mateo County.

(1895 to 1919, inclusive.)

	Salt		Brick		Limestone		Stone Industry	Miscellaneous and Unapportioned	Value
	Tons	Value	M	Value	Tons	Value	Value		
1895								5,000 tons Clay	$5,000
1896								1,000 bbls. Petroleum	1,250
								500 bbls. Cement	1,250
1897							$40,000		
1898			1,140	$7,000			70,000		
1899			2,870	24,225			34,600		
1900			225	9,000			7,500		
1901	40	400	500	9,070			6,000	17 tons Asphalt	255
1902	6,500	16,000	200	8,000			301,120	5,000 tons Clay	5,625
1903	7,700	25,000	3,100	77,500			150,000		
1904	12,000	62,500	3,902	56,436			113,866	3,000 bbls. Petroleum	6,060
1905	16,000	67,500	5,902	61,436			75,000		
1906	14,900	44,920	6,613	67,085			111,823		
1907	14,000	56,000	8,078	86,285			2,111		
1908	23,800	60,900	4,494	63,731	37,687	$17,451	89,142		
1909	22,100	95,400	1,346	38,405	120,306	96,245	90,221	Gems	500
1910	26,000	61,750	1,350	37,250	111,382	89,105	88,746		
1911	27,500	55,000	1,350	43,000	63,500	74,800	61,185		
1912	33,000	80,000	1,400	40,500	102,300	66,495	29,587		
1913	28,000	72,250	1,418	44,680	138,544	78,506	18,635	Gems	300
1914	27,700	75,750	950	24,074	153,329	75,941	34,648	81,000 tons Sandstone	34,120
								6,581 bbls. Lime	845
								Gems	200
1915	25,500	63,750	715	119,550			93,391	Gems	100
								Unapport.	1,100
1916	28,540	70,807	986	38,121			25,665	593 tons Clay (pottery)	732
								Gems	85
1917	36,483	114,689					71,668	Gems	150

1918	26,434	144,664					34,164	[2]Other minerals	20,656
1919	30,238	136,190					42,235	[3]Other minerals	15,044
								Other minerals	63,246
Totals	406,235	$1,277,410	46,539	$754,763	757,048	$498,544	$1,590,725		$156,358

Brick	$754,763
Limestone	498,544
Salt	1,277,410
Stone Industry	1,590,725
Miscellaneous and unapportioned	156,358
	$4,277,800

[1]The limestone produced in San Mateo County is used as crushed rock and is included under Stone Industry. Previous to 1915 it was erroneously classified as industrial limestone and tabulated under that heading.

[2]Brick and tile, magnesium chloride and potash.

[3]Magnesium chloride and potash.

Steiger Terra Cotta and Pottery Works. This company was incorporated in 1898 and a plant erected at South San Francisco at the water's edge shortly afterward. A fire destroyed most of the plant in 1917 and it has not been rebuilt. This extensive plant, including yardage, covered over ten acres. Most of the clay used was mined in the company's pits in Amador County. A red shale bank at the works was mined to a small extent for use in the manufacture of pressed brick and sewer pipe.

CHROMITE.

Small bunches of chromite occur in the serpentine areas near Crystal Springs Lake, west of San Mateo. These known occurrences are very limited and of too low grade for present commercial extraction.

GEMS.

"On some of the California beaches are found many interesting pebbles of chalcedony that frequently have the appearance of a partial polish. Among the most notable of these beaches are Crescent City, Pescadero, and Redondo. Pescadero, lying some 25 miles directly west of San Jose, may be reached by a beautiful mountain ride of 25 miles from San Mateo. The pebbles are found in great profusion of different varieties of chalcedony and agate, many of them beautifully marked, others are apparently jasper, and occasionally of fossil coral. Some of them are hollow geodes of chalcedony, inclosing a liquid with a moving bubble, like the "hydrolites" from Uruguay, South America, or from Tampa, Florida, and near Astoria, Oregon. These little sealed flasks, as they might be called, vary from the size of a pea, or less, up to rarely an inch in length, and are much sought after."

H. E. Harper of Santa Clara has devoted some time during the past few years gathering these stones along Pescadero Beach, and cutting them for gems. The commercial production has been small, as the demand is very limited.

GOLD AND SILVER.

Occasional small quartz stringers carrying values in gold have been discovered in San Mateo County, none of which are of sufficient extent or richness to be of economic importance. These stringers occur in the Franciscan rocks and are found in local zones of fracture in the metamorphosed sandstones. Several claims were filed on Black Mountain in the San Bruno Mountain group, just south of the San Francisco County line at Visitacion, and some small development work done. The veins uncovered were too poor for exploitation and the claims were abandoned.

A fairly well defined quartz vein, 30 inches in width, occurs on the ranch of **J. M. Macdonough,** ½ mile southeast of Searsville Lake, striking almost due north and south. It outcrops on the Stanford Estate to the south. The vein, a highly oxidized and iron-stained quartz containing some calcite, is deposited in serpentine in the brecciated zone of the San Andreas fault, between walls of jasper and sandstone. It carries, besides gold, some silver and galena.

In the early seventies a hermit by name of **Dominico Grosse** squatted on the land owned by the Stanford Estate and worked occasionally up to the time of his death (1915) developing the vein by digging some pits and trenches to expose it. He obtained some specimens rich in galena, which led to the circulation of highly colored reports concerning the richness of the vein. Recently examinations of the property at the instigation of the owner proved it to be of no commercial value, as the deposit is local, and geological conditions here are not favorable to ore deposition.

Some samples taken across the 30″ face of the vein exposed in the open cuts gave an average assay value of 0.03 oz. gold, 1.10 oz. silver, 0.8% lead.

An interesting discovery was made on property belonging to the **South San Francisco Land and Improvement Company** by T. V. Barton, in March, 1919.

Two parallel veins, one of which has been developed by a 75′ shaft and appears to average about six feet in width, were found outcropping on the hill behind the new high school on the edge of the town of South San Francisco.

The vein upon which the work is being done carries lead, zinc and silver values, a grab sample from which assayed about 20 ounces in silver. The vein strikes N. 40° W. and dips 60° south.

Three men were employed when the property was visited in June, 1920.

GRANITE.

A rock which has been termed "Montara granite" by Andrew C. Lawson in the Annual Report of the U. S. G. S. XV, 1893-1894, pp. 405-415, has been quarried on the property of W. C. Irwin of Montara, near the head of Montara Creek, being used to a small extent for building stone, curbing and crushed rock at Montara on the Ocean Shore Railroad. This rock has been classed as a quartz-grano-diorite by C. A. Waring of the State Mining Bureau, to whom the writer is indebted for the following analyses:

Montara Quartz-Grano-Diorite.

SiO_2	58.78	58.69
Al_2O_3	18.35	18.29
Fe_2O_3	.95	.90
FeO	5.48	5.48
CaO	5.19	5.23
MgO	1.69	1.64
Na_2O	5.25	5.25
K_2O	2.21	2.21
H_2O	.84	.87
LiO_2	1.01	1.04
P_2O_5	.20	.30
	99.95	99.90

The rock consists principally of coarse crystals of white feldspar and black hornblende. It weathers too rapidly to make a satisfactory building stone.

LIMESTONE.

The few isolated limestone deposits of San Mateo County are neither large nor pure enough to be of commercial value for "industrial" uses, such as the burning of lime for cement, fluxes, etc. Two of these deposits, however, both of which are on the west shore, have been worked for structural uses as road building, concrete work, etc., and are described under the heading "Stone Industry."

PETROLEUM.

There has been a small commercial production of petroleum in a limited area southeast of Purisima. The oil is said to be of high gravity and excellent quality. It was obtained from sandstone beds believed to be intercalated with the Monterey shale a short distance below the base of the Purisima formation.[3] The flow was small and there has been no production for some years.

Bibl.: Rept. X, pp. 586-588. Bull. 19, pp. 154-156; Bull. 69, pp. 468-469. U. S. G. S., Geological Folio No. 163.

QUICKSILVER.

Cinnabar has been found in the serpentinized rocks which are intrusive into the Franciscan group, in the region east of San Mateo. On the property of the San Mateo Development Company, 2 miles east of San Mateo, cinnabar occurs in cherts of the Franciscan group. The occurrences are too limited in extent and the rock of too low a grade to be of economic importance.

SALT.

The production of salt by the solar evaporation of sea water along the marshes bordering San Francisco Bay has been an important industry for many years. Three companies are now operating in San Mateo County.

Greco Salt Company, V. C. Greco, president and manager, Redwood City, California. This company's works are located about 3 miles east of Redwood City at the bay shore. A spur track of the Southern Pacific Railroad runs out to the property, so that the salt may be shipped by rail or water. The bay water is evaporated in a series of large vats, and the crystallized salt washed, crushed and stacked by a portable machine operated by a gasoline engine. It is marketed without further treatment. An average of ten men are employed during the season.

Leslie Salt Refining Company, Louis E. Spear, president; St. John Whitney, secretary; Leslie Whitney, vice president and manager; home office, Flatiron Building, 544 Market street, San Francisco. The plant of this company, located at Leslie one mile south of San Mateo, covers approximately 1850 acres along the marshes. It was established in 1901 and has operated continuously since. The refinery is on the east side of the Southern Pacific Railroad tracks and the salt vats stretch out

[3]Geology of the Santa Cruz Quadrangle, by J. C. Branner, J. F. Newson and Ralph Arnold.

beyond the plant toward the bay. The brine is pumped to large outer vats, where it is concentrated by solar evaporation and the concentrated brine pumped to smaller vats closer to the refinery, where the evaporation is completed to dryness. The crude salt covers the ground in depths varying from six inches to one foot. It is shoveled into a train of 1-ton cars which are hauled by gasoline locomotives over a light portable track to the factory. Here it is dumped into the conveying and washing machinery, which stacks the salt in a large pile adjoining the refinery. This machine, the whole operation of which is controlled by one man, automatically washes the salt and cleanses it of all surface dirt while it is being piled. This salt is used in the curing of hides, fish, etc., and the manufacture of ice cream. In 1910 the vacuum process for refining the salt was installed.



Photo No. 11. Plant of the Leslie Salt Refining Company, showing solar evaporating vats in foreground and storage pile of gathered salt in the background.

The process is briefly described as follows: The crude salt from the storage pile is redissolved in pure fresh water, and the resultant brine is pumped to settling tanks, where it remains for 24 hours. After leaving the settling tanks the brine is put through an intricate system of sterilization and filtration which removes all impurities. It is then pumped into large pans or evaporators, where the water is boiled away and the salt recrystallized in a pure state. Mechanical rakes then carry the salt to the dryers, where all moisture is driven out of it. From the dryer it is conveyed to the screens where it is carefully graded and selected for the various uses. The salt for table and kitchen uses is sacked by automatic weighing and sewing machines operated by girls. Electric power is used to operate the plant, and crude oil for fuel to supply steam for vacuum pans, driers, etc. An average of 100 men and girls are employed producing about 25,000 tons yearly. Mr. Fairbanks is superintendent at the plant.

Whitney Chemical Company, subsidiary to the Leslie Salt Refining Company, now operate a chemical plant in connection with the salt works. Leslie Whitney is president.

The mother liquor from the solar salt vats, at a concentration of about 30° Baume, is pumped to the works where it is evaporated in open pans by steam. There are several products. Magnesium chloride crystals (MgC) is marketed in 200-pound tins under the trade name of "Whitney Special." It is used mostly for making magnesite, for flooring, etc. Magnesium sulphate ($MgSO_4$) is put up in 4-pound cartons, and is used mostly for salt baths. Formerly a 35% potassium chloride (KCl) was produced and sold as a fertilizer, but the market for this having failed it was decided to produce a higher grade product. When visited (April 8, 1919) a 97% potassium chloride had just been produced.

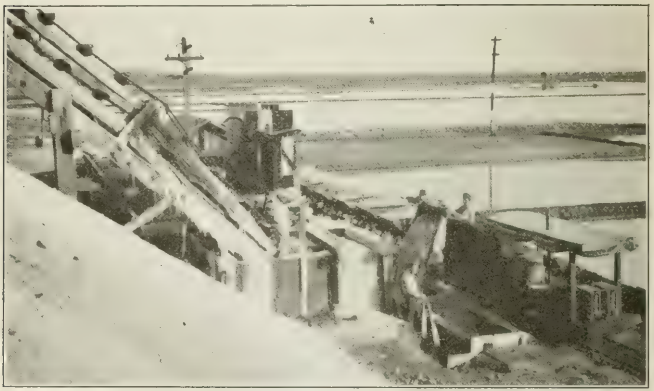


Photo No. 12. Leslie Salt Refining Company, showing a loaded train emptying the salt into bins below the washing and stacking machine. Photo by courtesy of St. John Whitney.

No market had at that time been determined for this product. Mr. See is chemist in charge of the plant.

San Francisco Salt Refinery, C. de Guigne, president; C. Jantzen, secretary; home office, 624 California street, San Francisco. This company operates the salt works formerly known as the West Shore Salt Company, on the marshes east of Redwood City adjoining the Greco Salt Company. The property covers 500 acres. The sea water is run into a series of large solar vats and evaporated, and the salt shoveled into wheelbarrows and hauled to a portable washing and stacking machine operated by electric power. This machine is on wheels and can be moved alongside of the different vats. The crude salt is shipped in bulk to the company's refinery in San Francisco, where it is redissolved and recrystallized by a vacuum process very similar to that used at the Leslie Salt Refinery. The capacity of the refinery is 30 tons

daily. Fifteen men are employed at the salt works and the same number at the refinery.

STONE INDUSTRY.

Under this heading are grouped crushed rock and sand. There are many localities in the county in which rock suitable for macadam and concrete work is available. The hard gray metamorphosed sandstone of the Franciscan group is excellent for these uses, and in some localities it has been cut to supply stone for curbing, wall building, etc. Sand is available in great quantities along the many beaches of the west coast.

Byrnes Stone Quarry. Located on Spring Valley Company's property, near the Mountain House on the Crystal Springs road, between San Mateo and Halfmoon Bay. The rock is a blue chert and was used by the county for macadamizing several miles of the road in the vicinity of the Mountain House.

There is another small quarry, about 3 miles south of Crystal Springs Lake. The rock is a red chert and was used by the Spring Valley Company and by the county for road works.

Casey Quarry (formerly the **Laurel Creek Quarry**). Located at Beresford station on Laurel Creek. A deposit of decomposed red chert and buff-colored sandstone was formerly quarried for macadamizing roads in that vicinity. There is no plant at the property. It has been worked at intervals for the past several years. W. W. and J. E. Casey of San Mateo, owners.

Daly's Quarry, operated under lease by the United Railroads of San Francisco, is situated on Daly's Hill at San José avenue ¼ mile south of the San Francisco County line. The rock is a close-grained metamorphosed sandstone, light gray in color, and extensively fractured and broken. The present quarry face is about 140′ in height. It is quarried by machine drill and blasting. The broken stone is loaded into 1-cu. yd. cars and hauled by cable over a track to the crushing plant. This is equipped into a #5 Gates gyratory crusher, bucket elevator, revolving screens, etc., operated by electric power. The crushed rock is drawn from bins along side of the railroad track and loaded into electric ballast cars. About 20 men are employed and the output averages 80 cu. yds. daily. This quarry has been operated over 15 years by the railroad company, which company uses the entire output. John Murphy is foreman.

Bibl.: Bull. 38, p. 323.

Gardner Quarry, located ½ mile east of Belmont, has been idle for years and was only worked for local road use.

Bibl.: Bull. 38, p. 323.

Pilarcitos Sand Plant, owner, E. B. and A. L. Stone Company, 210 Rialto Building, San Francisco; E. B. Stone, president. The plant, formerly located along side of the Ocean Shore Railroad at Pilarcitos Station on Half Moon Bay, has now been dismantled and abandoned.

A slack line scraper operated by electric power was used to haul the beach sands to the bins along side of the railroad. The plant in operation over six years was forced to shut down during the early part of 1916, due to the increased freight rate granted to the Ocean Shore Railroad by the Railroad Commission.

Rockaway Quarry, under lease to the E. B. and A. L. Stone Company, is located 18 miles south of San Francisco on the Ocean Shore Railroad. The rock is a hard grayish white metamorphosed limestone and occurs in a heavy bed which forms a low hill projecting into the sea. It was quarried by air drilling, blasting, the broken stone being hauled to the crusher below the quarry by a drag-line scraper. Nineteen men were formerly employed but the company has lately ceased operations due to the increase of the freight rate by the railroad



Photo No. 13. Rockaway Quarry, formerly worked by the E. B. and A. L. Stone Company.

company for hauling the stone. The plant has been dismantled and abandoned and the donkeys removed (April, 1919).

San Mateo Development Company, John E. Casey, president and manager; D. J. Stollery, secretary; home office Third and B streets, San Mateo. This company organized in 1907, operates a quarry on the Half Moon Bay road 2 miles west of San Mateo. The rock is the close-grained metamorphosed sandstone, gray in color, characteristic of the Franciscan group. Quarries have been opened at two localities along the road ½ mile apart. The upper quarry is now being worked and the stone is hauled by motor truck to the crushing plant located at the lower quarry, which is not worked due to overlying beds of soft buff-colored sandstone. This plant is equipped with a ♯6 and a ♯4 gyratory crusher, bucket elevators, revolving screens, one 50-h.p. motor and one 30-h.p. motor to operate the plant. The crushed rock is loaded from bins along side of the county road to motor trucks and wagons. It is used for macadamizing rock and for concrete work. Occasionally large blocks are cut for curbing, wall building, etc. An average of 25 men are employed throughout the year.

The **Splivalo and Johnson Quarry** is ½ mile northwest of Belmont. The rock is red chert. It is quarried occasionally for macadamizing roads in that vicinity. There is no crushing plant at the property. Idle.

Bibl.: Bull. 38, p. 323.

The **Vasquez Quarry** is situated 1½ miles southeast of Miramar, a station on the Ocean Shore Railroad. It is operated under lease by John McReynolds of San Jose, a contractor who is doing some work on the State Highway in that vicinity. The rock is an arkose of a light gray color consisting mostly of feldspar and calcite. Locally it is called a limestone. It is crushed in a small plant at the quarry equipped with a #4 gyratory crusher, screens, etc., operated by electric power. Twenty men are employed, the daily output being 100 cu. yds. This quarry has been worked occasionally for the past 10 years. Mrs. Emily Vasquez of Miramar is the owner.

A chemical analysis of this rock made by C. A. Waring is given as follows:

SiO_2	45.78	45.63
Al_2O_3	11.98	12.14
Fe_2O_3	.50	.45
FeO	.10	.05
CaO	21.27	21.29
MgO	1.82	1.87
Na_2O	2.89	3.06
K_2O	1.49	1.35
H_2O	1.40	1.50
TiO_2	.25	.30
P_2O_5	.14	.13
CO_2	13.02	12.96
	100.64	100.73

SANTA CLARA COUNTY.

By E. Huguenin and W. O. Castello.

(Field work in 1919.)

Santa Clara County, created February 18, 1850, lies south of San Francisco Bay and has an area of 1328 square miles. Alameda County bounds it on the north, Stanislaus and Merced on the east, San Benito and Santa Cruz, on the south, and Santa Cruz and San Mateo counties are on the west. Its assessed valuation in 1918 was about $95,000,000.

San Jose, the county seat, is the business center of the fertile Santa Clara Valley. It is 47 miles south of San Francisco on the main line of the Southern Pacific Railroad. The towns of Santa Clara and Palo Alto are next in importance, each having a population of approximately 7000. The former adjoins San Jose to the west and is the seat of the University of Santa Clara, one of the largest Catholic Universities in the west. In the year 1777 the Franciscan Fathers here founded the mission after which the county takes its name. Palo Alto is situated in the northern part of the Santa Clara Valley on the border line of San Mateo County. It lies 28 miles south of San Francisco, and owes its foundation to the establishment there of the Leland Stanford Jr. University, the most richly endowed university in the world. Gilroy, with a population of about 4000, is located near the southern border of the county and is the commercial center of the southern end of the Santa Clara Valley.

TRANSPORTATION.

The coast line of the Southern Pacific Railroad traverses the county throughout its length almost centrally, affording easy access to San Francisco and Oakland. A branch line runs from San Jose, via Los Gatos, to Santa Cruz. The Peninsula Railroad Company operates an electric system between San Jose and Palo Alto, via Los Altos, connecting with Los Gatos and Saratoga, and giving access to several small towns in the northwestern portion of the county. The new State Highway, over which many auto stages are operated, runs parallel to the main line of the railroad. The eastern portion of the county, particularly that mountainous region east of the Mount Hamilton Range, is very inaccessible, being traversed only by a few mountainous roads. That mineralized area in the northeastern portion of the county is at present reached only by road from Livermore. Easier access to this region from the railroad may be gained upon completion of the Patterson and Western Railroad, which is now being constructed. This road follows the Arroyo del Puerto from Patterson into the western border of Stanislaus County, the terminus of which will be not over a few miles from Red Mountain.

TOPOGRAPHY AND GEOLOGY.

The chief topographic feature of the county is the great central valley, comprising nearly one-half of the entire county, inclosed by the two parallel mountain chains which are part of the Coast Range Mountains. The westerly group, known as the Santa Cruz Mountains,

separates the Santa Clara Valley from the sea, and is a series of abrupt ridges whose peaks range in elevation from 2000 to 3000 feet. It is in general well timbered with oak, pine and redwood. The easterly group, which separates the smaller valley from the San Joaquin Valley, consists of several parallel ridges, between which are located small but fertile valleys. The highest of these ridges culminates in Mount Hamilton, whose elevation is 4209 feet above sea-level. These ridges contain only a scattered growth of oak, which is also the condition of the main valley.

The oldest geological formation found within the limits of the country is the Franciscan group. Its age has not been positively determined, but it is generally accepted as Jurassic.[1] It comprises the metamorphosed sandstones, cherts, and serpentines, which make up practically the entire eastern mountain group and the low foothills bordering the west side of the valley. A limited area of marine sandstones and shales which have been identified as Cretaceous overlies the Franciscan group southeast of San Jose. In the western part of the county, the Franciscan formation is overlain by heavy bedded sandstones of the Miocene, which produces the comparatively rugged topography of the bold ridge which separates Santa Clara and Santa Cruz counties. The quaternary formation is represented by the unconsolidated sands, gravels and clays (detritus of the older formations) which fill the valley bottom. Very few eruptive rocks are found in the county. Rhyolite occurs in the vicinity of the New Almaden Mine, southeast of San Jose. Its occurrence was first described by Mr. Becker of the United States Geological Survey.[2] A few narrow basalt dykes are exposed along Coyote Creek east of Madrone Station.

DRAINAGE AND WATER SUPPLY.

There are very few important streams in the county. The chief drainage system is that of the Coyote Creek, which rises in the mountains near the eastern boundary in the center of the county and flows southerly until it breaks through one range of hills south of Gilroy Hot Springs; thence northerly to a point about 3 miles east of Madrone Station, whence it cuts through another range of hills and enters the Santa Clara Valley, flowing northwestward to San Francisco Bay. Second in importance is the Los Gatos Creek, which rises in the Santa Cruz Mountains and flows northeastward, joining the Capitancillos or Guadaloupe Creek at San Jose, whence it also flows northward to the bay. The Los Gatos Creek and its tributaries form the main water supply for San Jose and Santa Clara. The northeastern part of the county is drained by the Alameda Creek and its tributaries, which enters the bay below Niles. The Pajaro River and its branches, the Arroyo de las Llegas, the Uvas Creek, and the San Felipe Creek, drain the southern part of the county. The numerous wells sunk throughout the length of the valley supply ample water for local use.

MINERAL RESOURCES.

Santa Clara County, essentially an agricultural county, was for many years the largest producer of quicksilver in the State, but is now second

[1]Andrew C. Lawson, U. S. G. S. Geological Folio No. 193.
[2]Monograph XIII, The Quicksilver Deposits of the Pacific Coast.

to San Benito County. The mining of magnesite is becoming one of the important mineral industries of the county, and during the past few years there has been a great increase in its production. The minerals produced in order of their value are quicksilver; brick; sandstone; crushed rock, sand, and gravel (combined under the head of stone industry); mineral water; petroleum; magnesite; natural gas; and grouped under miscellaneous and unapportioned, asphalt and bituminous rock, chrome, granite, lime and manganese.

ASPHALT AND BITUMINOUS ROCK.

The asphalt and bituminous rock deposits of Santa Clara County have been fully described in previous reports of this bureau from which the following brief description is extracted:

[3]"The bituminous deposits and springs in the southwest corner of Santa Clara County occur in the foothills forming the eastern slope of the Santa Cruz Mountains. They are principally developed upon the Sargent Ranch, about 3 miles from Sargent Station, on the Southern Pacific Railroad. They are more or less distributed over about sixty acres, although the principal outcrop of the bitumen-soaked strata are confined to an area of a few acres, within which most of the tar springs occur. At this point the shales are light in color when not stained with bitumen, and resemble those in the foothills upon the western side of the Santa Cruz Mountains. A tunnel has been run for a short distance in this formation, but is now caved in. The shales are overlaid by sandstone. About 150 feet down the mountain, and distant perhaps half a mile, are several tar springs exuding from a serpentine formation."

There has been a small production from the above deposits, but not in recent years as this natural asphalt could not compete with that produced as a by-product in the oil refineries.

Bibl.: Reports VII, p. 93; VIII, p. 548; X, pp. 607-609; XIII, p. 43.

BRICK.

The **Peterson-Kartschoke Brick Company,** established over 25 years ago, owns and operates a brick yard at Third and Keyes streets, San Jose. The clay is mined at the company's clay bank one mile east of the yard along the east bank of Coyote Creek. The clay bed is 18′ thick and covers many acres. It is mined by steam shovel and hauled by auto trucks to the yard. Capacity of trucks, four cubic yards each. The clay is shoveled into a hopper and conveyed on a belt to a set of rolls that breaks up any lumps, and feeds directly to a Pug Mill for tempering and then to a Monarch soft-mud machine. The bricks are burned in two Hoffman continuous kilns, each of 41,000 capacity. The plant is equipped with a large steam heated drying room in case of inclement weather. Electric power is used to operate the presses. The products are common brick and floor tile. An average of 40 men are employed during 9 months of the year. G. Kartschoke is president and manager; Maynard Wright is secretary.

The **San Jose Brick Company** owns a clay bank and brickyard 1 mile west of San Jose on the Los Gatos branch of the Southern Pacific Railroad. The company was organized in 1884 and the present plant

[3]Report X, pp. 607–608.

erected in 1893. This property covers 50 acres. The clay bed, of unknown depth, is now mined to a depth of 33 feet by steam shovel, which loads directly into cars of 6 yd. capacity, which are hauled to the brick presses over a cable railway, 1040 ft. long. The plant is equipped with four Monarch soft-mud brick presses, capacity 40,000 each daily; two Hoffman type continuous kilns of 40,000 and 30,000 capacity respectively; one 160-h.p. steam engine for operating plant, two 80-h.p. oil burning boilers. The capacity of the plant is 20,000,000 bricks yearly. However, it has not been run at full capacity for several years. About 40 men are employed. Louis Dossee is superintendent at the plant. In August, 1919, the company was being reorganized; A. M. Anthony, auditor.

CHROMITE.

Chromite occurs in small irregular kidneys and seams in serpentine areas of Franciscan rocks in the Red Mountain District in the extreme northeastern part of the county; in the hills above Alum Rock Park; and in the district 8 miles southeast of Los Gatos. The occurrences are rather limited and the ore is generally too thinly disseminated, or too low-grade to be of commercial value. It is stated that some ore was shipped from the district southeast of Los Gatos over thirty years ago.

Kilday Ranch Deposit. Several small lenses of chromite have been developed on this property which lies along the top of a ridge, probably 1000 feet in elevation above Guadalupe Cañon and 8 miles southeast of Los Gatos. The ridge here is capped with a decomposed serpentine, and chromite has been found at several different places, but thus far no large deposit has been uncovered, and there is very little ore now exposed. About eighty tons of the ore was shipped out by the Farish Company, Insurance Exchange Building, San Francisco, during 1916, but no work has been done since. M. J. Kilday of Los Gatos is the owner.

Laurel Lake Ranch Deposit. J. A. Ferbrache of Gilroy developed a deposit of high grade black chromite on his property 7 miles northwest of Gilroy. The serpentine in which the chrome ore occurs outcrops prominently along the ridge south of Uvas Creek. Associated with the serpentine is a peridotite, thin sections of which have been examined microscopically and show phases high in olivine, and also approaching augite piorite. Although still retaining its original outlines, much of the olivine is seen to be altered to serpentine. One large boulder was uncovered in the loose soil capping and a tunnel is being driven to cut some leaders which occur in the serpentine above. There have been some shipments since the property was visited.

Winship Properties. K. D. Winship, 350 Post street, San Francisco, owner; C. W. Rose and M. J. Gates, lessees, 211 Pacific street, Santa Cruz. Chromite occurs on section 11, T. 6 S., R. 4 E., and on SW. $\frac{1}{4}$ of section 7, T. 6 S., R. 5 E., M. D. M. Holbrook and McGuire, as sublessees in the summer of 1917, shipped several carloads of high-grade chromite from this property. In the latter part of 1918 T. S. O'Brien et al., 75 Fremont street, San Francisco, leased section 11, and built a 50-ton concentrating mill.

Several test runs were made during the first part of Feb., 1919, and about 25 tons of concentrates were produced, averaging 50% Cr_2O_3. The mill was closed down after this owing to market conditions. It is claimed that there is several thousand tons of milling ore here, which will run around 10% Cr_2O_3.

CLAY.

Garden City Pottery, H. M. Stammer, president; Gustav Nelson, secretary. The pottery is located at 560 North Sixth street, San Jose, and the company manufactures flower pots and stoneware. The clay from which the flower pots are made is purchased from the city of San Jose and hauled from Coyote Creek, about 1 mile east of the plant, while the clay for the stoneware is obtained from Lincoln, Placer County, and Carbondale, Amador County. The pottery is equipped with four oil burning kilns, two muffle and two down-draft moulds, presses, etc. Fifteen men are employed throughout the year. The plant has been in operation since 1904.

Pacific Coast Pottery and Terra Cotta Company, F. Eberhart, president; E. C. Hamlin, manager and secretary. The plant of this company at Fifth and Kayes streets, adjoins that of the Peterson-Kartschoke Company, to the east, the Southern Pacific Railroad forming the dividing line between the two. This company manufactures sewer pipe and terra cotta, importing most of the clay used from Amador County. The low-grade clay with which the higher-grade material is mixed is hauled from the company's clay bank along Coyote Creek 1 mile east of the yard. The plant is equipped with four down-draft kilns, machine presses, etc. The plant is operated by steam power using crude oil for fuel.

COPPER.

Hooker Creek Mine. Located 7 miles south of Los Gatos and 1 mile from the station of Eva on the main line of the Southern Pacific Railroad. It is near the line between Santa Clara and Santa Cruz counties. This property is owned by H. E. and J. E. Casey and G. W. Stollery of San Mateo, who began development in 1917. There are two tunnels, one about 300 feet, and the second about 185 feet in length. The ore is chalcopyrite, azurite and malachite, and some of it is said to run very high in copper. It also contains some gold and silver values.

No ore has been sold, although some negotiations were made with the Mountain Copper Company.

From three to four men were employed for several months, but it has been closed down since the latter part of 1918, on account of labor and market conditions. Fifteen men are employed throughout the year.

LIMESTONE AND LIME.

Limestone of a good commercial grade occurs at several places in the mountains bordering the west side of the Santa Clara Valley, the most important deposits being those in the vicinity of Black Mountain, and in the range extending southeastward from Los Gatos to the Guadaloupe mine. As early as 1864, kilns were constructed above the Guadaloupe mine, and a large tonnage of the limestone was burned; however, this

property has been idle since the early nineties. Another quarry was opened 2 miles southeast of Los Gatos, from which the limestone was hauled to kilns at Los Gatos. This, too, has not been worked for many years, and no lime is at present produced in the county.

The Black Mountain deposits outcrop over a considerable area. The rock is a very high grade limestone, and as such is suitable for either sugar refining (for which purpose a large tonnage was formerly quarried by the sugar company mentioned below), or for the manufacture of cement. It is fine-grained and hard, varying in color from yellowish-blue to black. The following analysis is of an average sample of the limestone taken by W. W. Bradley of this Bureau from croppings on the southwest flank of the mountain, in SW. ¼ of section 13, T. 7 S., R. 3 W., owned by **K. D. Winship,** 354 Pine street, San Francisco.

(Analyst, Sidney A. Tibbetts, Berkeley.)

Silica (SiO_2)	1.56%
Aluminum oxide (Al_2O_3)	0.47%
Iron oxide (Fe_2O_3)	0.22%
Manganese oxide (Mn_3O_4)	0.05%
Phosphoric oxide (P_2O_5)	0.06%
Calcium carbonate ($CaCO_3$)	97.20%
Magnesium carbonate ($MgCO_3$)	0.43%
Total	99.99%

These deposits suffer the disadvantage of being over 9 miles from the railroad, but they are accessible by wagon road. A railroad, however, could easily be built up the cañon of the South Fork of Permanente Creek to the foot of Black Mountain.

Bibl.: Repts. VIII, pp. 543-546; X, p. 619; XII, p. 394; XIII, p 630. Bull. 38, pp. 82-83.

The **Alameda Sugar Company,** with offices at 310 Sansome street, San Francisco, formerly operated a quarry on Black Mountain, 9 miles by road from Mountain View, on the Southern Pacific Railroad. The limestone was hauled to Mountain View and shipped to their sugar factory at Alviso where it was burned into quicklime and used for refining sugar. This quarry has been idle for the past few years.

Bibl.: Bull. 38, p. 82.

Bernal's California Marl Fertilizer Company, Pedro A. Bernal, president and manager; office 404 South Market street, San Jose. This company owns and operates a limestone quarry on the east slope of the Santa Teresa Mountains, 3 miles by road southwest of Edenvale. The limestone bed covers over 100 acres and is about 200 feet thick. It is irregular in character, grading from a fine-grained hard bluish-gray limestone to a calcareous marl, containing an abundance of shells. The analysis of the marl is given as follows:

(Authority, advertising matter.)

Silica	2.50%
Alumina	11.24%
Iron oxide	2.90%
Magnesia	1.55%
Calcium carbonate	80.81%

This marl pulverizes readily, and is said to be an excellent fertilizer, for which use it is quarried. As this material is very soft, it is easily dug out with pick and shovel, only occasional drilling and blasting being necessary. The marl is pulverized in a Williams Patent Crusher and Pulverizer, which has a capacity of 2 tons per hour, and is operated by a small electric motor. This crusher is a very efficient machine as it does not become clogged when the material is slightly moist. The product is sacked at the quarry and hauled by team to Edenvale, from where it is shipped to the consumers. This industry, established in 1915, has a promising future, as the demand for the fertilizer is steadily increasing. Eight men are employed during the dry season.



Photo No. 14. Quarry of Bernal's California Marl Fertilizer Company, nine miles south of San Jose.

A few years ago, several thousand tons of the hard gray crystalline limestone was quarried under lease by the Spreckels Sugar Company, for use at their refinery, but none of this material is at present quarried.

MAGNESITE.

Magnesite deposits occur in many serpentine areas in the eastern part of the county, the largest and best grade deposits thus far uncovered being those at Red Mountain, in the northeastern corner of the county, now being mined by the Standard Magnesite Company and the Western Magnesite Development Company. These deposits have long been known, and many attempts made to develop them, but their great distance from the railroad and the uncertainty of a market delayed their

exploitation; and it is only within the past decade that they have been put upon a producing basis.

A number of outcrops of magnesite occur at irregular intervals in a belt of soft impure serpentine along the low range of hills bordering the east side of the Santa Clara Valley, extending from east of Coyote Station to Gilroy. These outcrops are small and the magnesite is in general less pure than the Red Mountain deposits. It varies in color from white to buff. Pieces of float may be found in many places along that range. Some development work was done in 1916 at several localities, and some very promising prospects were opened. These deposits have the advantage of being within easy access of the railroad.

Bradford Ranch Deposit. Magnesite occurs in small veins in serpentine 4 miles southeast of Edenvale, along the top of an open rolling ridge. There was some production from the property several years ago, and during 1917 it was worked to some extent by Harry McLaughlin of San Jose, who shipped out several car loads. Work ceased in September.

A dump on the hillside above the Bradford ranch house marks the location of the most extensive underground work, now caved. The country rock is light-brown serpentine with many films of magnesite. Besides this caved entry, there is an open cut now partly caved. Above it a 125-ft. tunnel driven S. 30° W. found no ore. Over this is a tunnel with a cross drift or double entry which followed a vein from 2″ to 10″ thick, and it probably produced a few tons of ore, but there is none in sight now. On the east side of the hill near the top, a cut and tunnel 80 feet long found no ore, although there is a suggestion at this face that it may be approaching a deposit. On the southeast side of this hill, at about the same elevation as other developments, there is a cut 40 feet long which leads into a curving tunnel (length unknown) following a nearly vertical vein of magnesite which apparently varies from a few inches to two feet thick. The footwall is a slip fault, and the hanging wall has many magnesite veinlets or fractures in brownish serpentine. Crosscuts from the tunnel disclosed no ore, and a winze in the floor reaches the bottom of the lens at a depth of eight feet. There is practically no ore in sight in the tunnel, but a trench just above appears, however, to show the top of a 5-foot vein. A few tons of second grade ore are on the dump.

Any further production means considerable dead work to undercut the veins in these workings. Herbert S. Bradford of San Jose, is the owner.

Burnett Ranch Deposit. A deposit of magnesite was developed on this ranch several years ago. Now owned by Michael Righetti. Veins and boulders of good quality occur in an impure serpentine near the top of a ridge one-quarter mile north of the Metcalf road, and three miles northeast of Coyote Station. A vein which varied from 4′ to 10′ wide was mined by an open cut 100′ long. A tunnel was driven on this vein 10′ below floor of cut, but it is now caved. About 75′ northwest of this working, a 10′ tunnel shows a lens of white magnesite several feet in diameter and up to one foot thick. There are about ten tons on the dump. A small cut 300′ to the northwest found a little impure magnesite, and 700′ northwest of the original location a cut on a vein striking N. 45° W. and dipping 45° SW., took out a lens 60′ long.

These are now caved and the deposit is worked out. Walter Arnstein has a lease on the mineral rights here, but the property is idle.

Bibl.: U. S. Geol. Surv. Bull. 355, p. 31.

Jackson Ranch Deposit (formerly known as the **Cochrane Ranch Deposit**), is 4½ miles east of Madrone Station, and 1½ miles south of the junction of Coyote and San Filipe creeks. It is reported that some work was done on the deposit in 1897, and that several carloads of magnesite were shipped. During 1916, Harry C. Warwick, Hearst Building, San Francisco, worked it, taking out several hundred tons. The rock, an impure buff-colored magnesite, outcrops near the top of the ridge west of Coyote Creek. The serpentine is decomposed, and numerous boulders of magnesite have been taken in the open cuts. There is no well-defined ledge and the magnesite appears to be deposited as large blocks or boulders. It is said to contain 4% iron, to which it owes its buff color. No estimate of tonnage can be made, but undoubtedly a small output can be kept up indefinitely. Two men are working, using hand drills, picks and shovels. The ore is hauled down the steep hillside to the floor of the cañon in a sled, then shoveled into wagons and hauled by four-horse teams to Madrone. Alfred Jackson, Jr., is the owner.

Bibl.: Rept. XIII, p. 505. Bull. 38, p. 331; Manuscript of Bull. 79, "Magnesite in California."

Pacific Magnesite Company, Russ Building, San Francisco. This company operated on ten claims on Red Mountain adjoining the property of the Western Magnesite Development Company on the south, 33 miles southeast of Livermore. The claims were located in 1915, and some development work done the following year. In 1917 the property was tied up due to litigation over the ownership, and since then it has, by order of the court, reverted to the Western Magnesite Company.

Two tunnels were driven at elevations of about 50 and 100 feet below a large cropping of magnesite near the top of the ridge. The lower tunnel, 400 feet long, cuts the ledge, exposing an ore body of almost pure white magnesite. A gravity tramway 1200 feet long, with a drop of 400 feet, connects the lower tunnel with an ore bin above the road. A 65-h.p. gas engine and Giant air compressor were installed to supply the necessary air for the machine drills.

The Hoff-Price Company, Monadnock Building, San Francisco, had a lease on several claims of the Pacific Magnesite Company, from which they shipped a few carloads of magnesite in the spring of 1917. Work ceased here when that company began operations at the Sampson magnesite mine in San Benito County.

The **Standard Magnesite Company,** for several months during the first part of 1918, operated a magnesite property in the Red Mountain district about 33 miles southeast of Livermore, in section 18, T. 6 S., R. 5 E. Operations were discontinued in September, 1918. The company owns several claims, only one of which has been developed. There are two tunnels, one of which is 200 feet long, and the other about 75 feet. Considerable ore was hauled to Livermore, and shipped in 1918.

An average of 12 men were employed. There is considerable equipment at the property, consisting of an air compressor, drills, track, cars, etc. H. C. Haecke is president; home office 244 California street, San Francisco.

Weber Ranch Deposits. The Bay Cities Water Company, Coyote, California, owner. The deposits are located on an open ridge, about three miles in an air line northeast of Madrone. On the west slope of the hills near the top a deposit was developed under lease by H. C. Warwick of San Francisco. A large open cut shows a ledge of white to buff-colored magnesite which appears to be quite extensive. Several hundred tons have already been produced from this ore deposit.

On the east slope considerable float has been found and several large cuts were made in the hope of striking the ore in place. The magnesite occurs here in bunch-like or kidney deposits, and it was evidently not deposited in a vein or lode, but as a general alteration of the serpentine with which it is closely associated. As the slopes of the ridge are covered with an adobe soil, and the serpentine very much decomposed, it is impossible to determine without further development work, whether these deposits are in place. The kidneys or boulders are white and evidently quite pure. Several tons had been gathered and were lying on the dump ready for shipment, when visited. A few carloads were shipped by H. Sherlock during 1915 to Berkeley for the manufacture of carbon dioxide, and during 1916 some further development work was done by the owner under the management of H. L. Haehl, Humboldt Bank Building, San Francisco, but the deposits found were too small to warrant exploitation, and work ceased.

Bibl.: Cal. State Min. Bur. Bull. 38, p. 331. U. S. Geol. Surv. Bull. 355, p. 32.

Western Magnesite Development Company, Charles H. Spinks, president, 704 Thomas Clunie Building, San Francisco. This company, organized in 1912, owns and operates the magnesite mine on Red Mountain formerly owned by the American Magnesite Company. During 1917-1918 it was operated by Langdon E. Boyle, 519 California Street, San Francisco, as receiver appointed by the Federal Court on account of litigation between conflicting factions in the company. The property consists of ten claims, four of which are patented, and has been a producer since 1905. It is understood that C. S. Maltby has leased this property for five years and intends to install new machinery and make many improvements. (August, 1919.)

The magnesite outcrops in bold white ledges on the southern and western slopes of the mountain, several hundred feet above the floor of the valley. The following description of these deposits is quoted from the report of Hoyt S. Gale of the United States Geological Survey, who made a thorough study of them.

"The general area containing the magnesite outcrops is occupied by serpentine without evidence of much variation in character or of inclusions of other rocks. The serpentine is bordered on the west by sedimentary sandstones and shales, which form a distinctly different topography. The other limits of the mass of serpentine rock have not been defined. The original country rock from which the serpentine is



Photo No. 15. Open cut of Western Magnesite Development Company. Note lack of outcrop of this large body of magnesite. Ground surface is showing in upper right half of picture. Photo by Walter W. Bradley.

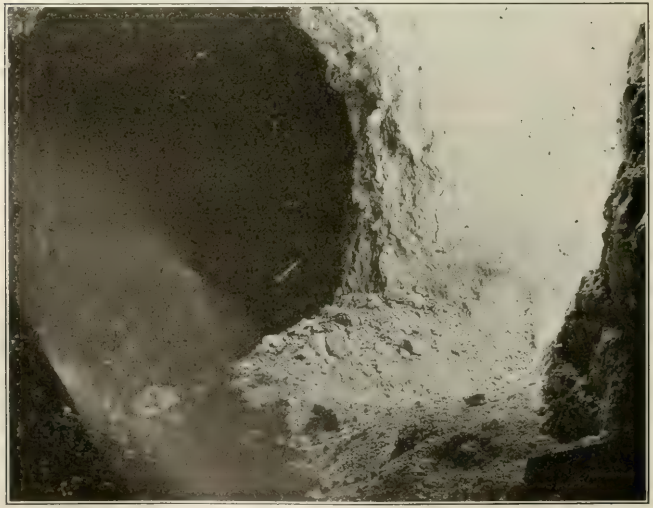


Photo No. 16. Stope in mine of Western Magnesite Development Company, showing magnesite over 30 feet in width. Photo by Walter W. Bradley.

derived is described by Hess as lherzolite and peridotite and is composed essentially of the minerals olivine, diopside, and an orthorhombic pyroxene. The mineral serpentine is a natural alteration product from such rocks. The original country rocks are composed principally of silicates of magnesia (silica, 40 per cent; magnesia, 25 to 40 per cent; alumina and iron variable, usually 5 per cent or more; and a small percentage of alkalies). It is natural to assume that magnesite might be derived by the decomposition or alteration of these silicates being deposited as veins along fissured zones or by replacing the country rock. As a whole, however, the serpentine of this area does not show the

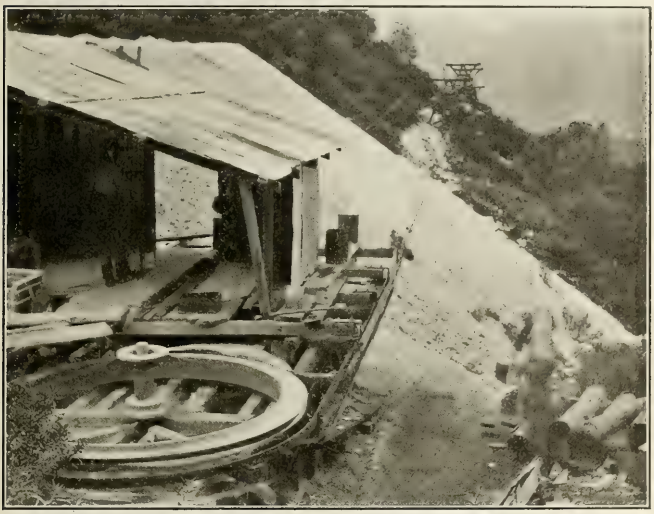


Photo No. 17. Tramway terminal and mine dump of the Western Magnesite Development Company.

excessive amount of shearing to be seen at many of the other magnesite localities.

"Throughout the dark red soil that covers the area of serpentine country rock, especially in the zones that contain the magnesite veins, silica is present in various forms. It occurs, in part, as a white and rosy opal, scattered fragments of which are strewn about on the surface, or it may be observed as chalcedonic veins or coatings in the joints of the country rocks. The silica associated with the purer mass of magnesite in the larger pit is in the form of a pale-greenish granular quartz.

"The magnesite veins are very irregularly distributed and appear to trend in all directions. The larger developed masses are of most unusual size, and even the great bodies that have been removed by mining have been taken out in large open caves or chambers, so as to

give little evidence of the real extent or size of the deposits underground, beyond that which has been taken out."

The principal workings consist of an open cut and several tunnels which have been driven at different levels, exposing a huge ore body, from which many thousand tons have already been mined. The two main tunnels are connected by a large stope or chamber which is over thirty feet in height. The vein at the surface, about 20′ in width, was mined by an open cut over a hundred feet in length. There are numerous other prospect shafts, tunnels, and cuts on the many outcrops, but present work is confined to the main workings. The magnesite is in general very pure; however, towards the border of the large bodies it becomes mixed with the soft serpentinized country rock, having a yellowish color, so that there is no well defined boundary of the magnesite bodies. The high grade ore is said to average 98% magnesium carbonate.

An aerial tramway 2400 feet long connects the main workings with the furnaces, situated in the camp below the mine. The equipment consists of two 10-ft. vertical kilns, two single-burner kilns, steam plant, warehouse, and the usual camp buildings. Crude oil is used for fuel. Sixty to seventy men are employed during nine months of the year, producing about 30 tons per 24 hours. The coarse ore is calcined before shipping, while the fines are shipped without treatment. The ore is hauled 32 miles to Livermore, by auto trucks, the contract price being $4.50 per ton.

Bibl.: Repts. XI, p. 374; XII, p. 328; XIII, p. 505. Bull. 38, pp. 330-331; U. S. G. S. Bull. 540, pp. 498-501.

MANGANESE.

Manganese ores occur in that mountainous region in the extreme northeast corner of the county, bordering Alameda, San Joaquin, and Stanislaus Counties. They occur in the form of oxides in the jasper lenses of the Franciscan formation. This formation, consisting of heavy bedded sandstone, shale and conglomerate, more or less metamorphosed, is intruded by many different igneous rocks. The manganese deposits are very irregular, varying in size from stains and small veins in the chert to comparatively large pockets. The ore varies from soft and powdery to hard and massive. In discussing the origin of these manganese deposits, E. C. Harder writes as follows:

"The manganese ores in the Franciscan jaspers in their present form are clearly secondary concentrations, as is shown by their replacement of jasper and by the intimate association of manganese oxide and quartz veins, suggesting their contemporaneous deposition. That the jasper itself is the source of the ore is shown by the facts that it is invariably associated with the ore deposits throughout the Coast Ranges, and that ores do not occur in the sandstones and shales of the formation."

This theory, however, is now regarded by many as erroneous and the manganese beds are believed to have been deposited with the chert, and to have been altered, in place, from the carbonate of silicate, to the oxide, by the action of water and other agents.

Comparatively little ore was shipped from the different deposits prior to 1916. The high price of this metal during the war period led

to some renewed activity, but at present none of the properties are being developed.

A huge boulder of manganese lies on Penitencia Creek, just below Alum Rock Park. This boulder labelled "meteorite," was at one time thought to be the outcrop of a large vein. The main ledge from which it came has never been discovered and is probably in that mountainous region at the head of the cañon.

The **Ala Mountain Mine** is 26 miles southeast of Livermore in section 28, T. 5 S, R. 4 E., M. D. M. A vein of manganese ore about four feet wide was exposed by an open cut and a tunnel, and some ore hauled to Livermore several years ago. No work has been done recently. The Merchant Estate of Livermore is the owner.

Black Bear Mine, 25 miles southeast of Livermore, is in section 34, T. 5 S,, R. 4 E., near the summit of the west slope of the Arroyo Mocho Valley, at an elevation of 3100 feet. Interbedded lenses of manganese ore occur in the jasper, some of them are 3′ in thickness and fairly extensive. Development consists of several open cuts and tunnels. Idle. D. P. Doak, Rialto Building, San Francisco, is the owner.

Black Bird Prospect is in the center of section 28, T. 6 S., R 5 E., and is owned by the Mineral Products Company. Some small pits were sunk, but no production was made.

The **Black Wonder Properties** comprise the Jones Group in the NW. ¼ of NE. ¼ of section 27; the Black Wonder in the SE.¼ of SE. ¼ of section 27; and the Mexican Prospect, in SW. ¼ of SE. ¼ of section 27, T. 6 S., R. 5 E., near the Stanislaus County boundary. It was formerly the property of the California Manganese Mining Company, of which Howard A. Broughton was President, and is now owned by the Mineral Products Company, with offices at 334 Rialto Building, San Francisco. This company, organized in 1915, is developing the property in connection with its deposits of chrome in Stanislaus County. A narrow gauge steam railroad, called the "Patterson and Western," was constructed from Patterson 23 miles up the Cañon del Puerto to the foot of Red Mountain, where Camp Jones has been established. Here it connects with a 2-ft. gauge gasoline tramway, five miles in length, which runs to the Jones Mine near the top of the ridge at an elevation of 2750 ft., almost 1000 ft. above the terminus of the Patterson and Western Railroad.

The company erected a factory at Patterson for the manufacture of manganese dioxide from the ores mined at this group.

These manganese deposits are the most important ones thus far discovered in the county, and their occurrence has been described in Harder's report[1] as follows:

"The southern part of the area covered by the claims is greenish-gray sandstone of the Franciscan formation; the northern part is a mixture of jasper and fine shale interbedded. This jasper area is part of a larger area extending in a general east-west direction for 3 or 4 miles between the sandstone on the south and a large area of serpentine on

[1] *Op. cit.*, pp. 162-163.

the north. Where the principal manganese ore deposits occur the jasper-shale belt is about a mile wide. The manganese ores extend as discontinuous deposits along the jasper belt for more than a mile in a general northwest-southeast direction, the principal deposits being to the southeast and very near the sandstone contact.

"The jasper-shale formation consists of beds and lenses of jasper interbedded with fine shale. The jasper may be thin bedded or very heavy bedded, in the last case forming prominent outcrops. The beds generally strike in the direction of the main jasper belt, but the dips are exceedingly irregular.

"The manganese ore occurs along heavy jasper beds as large masses replacing it, as veins, or merely as stains and partial replacements along cracks. The principal deposits, that is, those at the southeast end, are found along two or three prominent jasper beds 300 to 500 yards long, which are nearly parallel and 50 to 200 feet apart, separated by thin bedded jasper and shale. Of these, the deposits in the bed farthest south are most prominent."

Development consists of two tunnels and several open cuts. In both tunnels are exposed ore bodies varying from 5 to 8 feet. The ore is bluish black and more or less mixed with the country rock. Occasional pockets of soft and powdery ore of high grade occur in the ore body.

At the time visited, October, 1916, no development work was being done at this group, but it was expected to start operations upon completion of the road to the property. The company's officers are: A. F. Judd, of Honolulu, president; C. G. Bokus, secretary; H. G. Ginaca, of San Francisco, general manager.

Bibl.: U. S. G. S. Bull. 427, pp. 162-163.

Camp Bessie Mine. (See Fable Manganese Mine.)

Davenport Prospect is on the Winship properties near the center of the north line of section 27, T. 5 S., R. 4 E., ½ mile east of the Arroyo Mocho Road and 25½ miles from Livermore. Rather siliceous manganese oxide occurs in chert which strikes N. 70° W., and dips 65° S. When visited only one prospect hole five feet deep had been sunk.

Davenport and Smith Prospect is on the Winship properties in the NE. ¼ of section 27, T. 5 S., R. 4 E., ½ mile from the Arroyo Mocho road and 25 miles from Livermore. At the extreme northwest end of the claim an inclined shaft follows the ore on its dip southwest for 25 feet. Southeast of this, ore is exposed in trenches. Ninety feet southeast of the shaft there is a drift running nearly northwest along the strike of the ore body. Southeast still farther more trenching has been done, and finally, at the extreme southeast end, 300 feet from the shaft, a short tunnel exposes as much as five feet of massive siliceous manganese oxide striking N. 50° W., and dipping 25° to 75° SW. This body is considerably broken by minor shearing, and varies in width, averaging possibly two and one-half feet.

Doak Mine No. 2 is in the Red Mountain district 25 miles southeast of Livermore on the Camp Bessie Road, in sections 22-27, T. 5 S., R. 4 E., M. D. M. A few open cuts and short tunnels have been driven on some heavy croppings of manganese stained jasper, developing a vein

of manganese said to be 4 feet in width. Considerable ore has been produced from this deposit, but it is now idle. D. P. Doak, of San Francisco, is the owner.

Bibl.: Bull. 38, p. 337.

Fable Manganese Mine, in SW. ¼ of NE. ¼ of section 34, T. 5 S., R. 4 E., is in a small cañon tributary to the Arroyo Mocho, about 26 miles southeast of Livermore. The ore, a soft black oxide is deposited in an irregular layer varying from 6″ to several feet thick, interbedded in greenish-gray jasper, which has a strike a little west of north, and a dip of 45° to the west. Developments consist of a series of open cuts along the outcrop and a 100-foot tunnel driven on the vein showing 6 feet of ore. An incline shaft located near mouth of tunnel was sunk on vein to a depth of 18 feet, but it is now filled up. Idle. Thomas Green, of Dublin, California, is the owner.

Bibl.: Bull. 38, p. 337, U. S. G. S. Bull. 427, p. 162.

Keller Brothers have a slightly developed prospect of manganese in section 13, T. 6 S., R. 4 E., in San Antone Valley. No ore had been developed when the property was last visited.

Mammoth Prospect is owned by H. H. Ballantine and leased to John Plattner. The claim is in section 13, T. 6 S., R. 4 E., ¾ of a mile east of a point which is 32 miles from Livermore on the Arroyo Mocho Road. Several open cuts expose three to six feet of massive, rather siliceous manganese oxide in chert. No production is reported.

Mineral Products Company owns two unnamed prospects ½ mile east of the Black Bird Prospect, near the east line of section 28, T. 6 S., R. 5 E. Large, angular blocks of oxides of manganese occur here. A little work has been done. In the NE. ¼ of the same section a trench 60 yards long has been made and a small amount of oxide ore is exposed. No recent work has been done here.

Mateos Ranch Deposit. It is in section 8, T. 6 S., R. 2 E., eight miles by road east of Milpitas, in Alum Rock Cañon, about two miles beyond the park. There is no road connecting with the terminus of the electric railway at the park, so that at present, the ore has to be hauled over a mountainous road eight miles to the railroad station at Milpitas. A connection with the Alum Rock Cañon road could be made by constructing one-half mile of road.

The manganese ore occurs in seams and pockets in the jasper beds. Considerable high grade float is found in the cañon and a few large boulders aggregating several tons in weight, are lying in a small ravine near junctions with the main cañon. The ore, however, is intermixed with the jasper, and consequently low grade.

A tunnel was driven forty years ago in the jasper beds, and it is reported that some high grade ore was shipped. It is now caved and inaccessible. About 200 ft. west of the tunnel and at the same elevation, an open cut was made last year and about 40 tons of ore was shipped. The face of the cut is caved, so that no ore is at present exposed. Judging from the amount of float found in the cañon and

the extent of the manganese stained croppings, the property appears favorable for further development. It is idle. John D. Mateos, 165 North Fifteenth street, San Jose, California, is the owner.

Newhall Mine ("Great Expectations" Claim), E. P. Newhall, box 354, Livermore, owner; Horace B. Chase, 57 Post street, San Francisco, lessee. It is in section 36, T. 5 S., R. 4 E., on the headwaters of Colorado Creek, a branch of Black Bird Valley 29 miles southeast of Livermore. Some development work has been done by the owner; but he has recently (November, 1917) leased the property. The lessee has some ore out ready to ship showing both carbonate and oxide and said to analyze 42% manganese. The mine is three miles by wagon road from the main Arroyo Mocho road leading to Livermore. The ore is reported to show three feet in width.

Pennsylvania Manganese Mine. The property comprising two unpatented claims is in SE. ¼ of section 12, T. 7 S., R. 4 E., 35 miles southeast of Livermore via the Arroyo Mocho road. The jasper beds with interbedded lenses of manganese ores outcrop for about 500 ft. along the strike, which is northwest, in places showing high grade ore. Development work consists only of a few trenches along the outcrop. About 100 tons of ore, which appears to run high in silica, is lying on the several dumps. The property is worked for assessment only, and the owner is willing to lease on a royalty basis. Sufficient work has not been done to justify an opinion as to its importance. Morgan M. O'Day, 58 N. Fifteenth street, San Jose, is the owner. The Noble Electric Steel Company leased this property but discontinued work after shipping some ore.

On the **Wallace Ranch,** in section 8, T. 6 S., R. 2 E., 6½ miles by road east of Milpitas, a small cropping of high grade manganese ore was observed. This deposit adjoins that of the Mateos Ranch, to the northwest, and is evidently a continuation of the same beds. The jasper here outcrops prominently in bold ledges over large areas, but for the most part it is free from managnese stainings. The only ore observed in place was that exposed for a width of 12" in a small cut, about 100 ft. in elevation above the old tunnel on the Mateos Ranch. Ore taken from this deposit is reported to have assayed 50.8% metallic manganese. It is undeveloped. Mrs. Grace P. Wallace, 164 East San Carlos street, San Jose, is the owner.

Winship Properties. K. D. Winship, 350 Post street, San Francisco, owner. In the northeast corner of Santa Clara County, in the upper part of the Arroyo Mocho, these properties include the following sections containing manganese prospects: section 27 and section 35, T. 5 S., R. 4 E., M. D. M.

In the SW. ¼ of section 27, on the west side of the Red Mountain-Livermore road, at a point well above and easily accessible to the road is a series of manganese veins covering a width of about 50'. These croppings are traceable for a distance of at least a couple hundred yards long, running west of north. It could probably be followed much farther, but the chamise brush is very thick at this point. A little work was done some years ago around these outcroppings, and it is stated a few tons of high grade ore hauled out. Material from there

could be easily handled by a gravity tram to a loading point on the Arroyo Mocho road.

On the NE. ¼ of this same section 27, is a good prospect of manganese ore. Some work was done a few years ago, said to have been by the same parties who worked on the SW. ¼. A short tunnel, now caved, is stated to have cut through a 4′ vein of high grade ore. The surface indications are that it is at least that wide. The strike is west of north. There are other exposures on this same lead, to the south for about 200′-300′. This deposit is on the east side of the Arroyo Mocho road in an ideal location for a gravity tram to handle the ore to bunkers. In April, 1916, E. A. Wiltsee took a lease on these deposits on section 27 and did a little preliminary development work, but nothing further. Holbrook & McGuire, as sub-lessees, shipped a couple carloads of manganese ore from this section in 1917, but none since.

MINERAL WATERS.

The numerous mineral springs of Santa Clara County are not confined to any particular locality or zone, but occur in the mountain ranges along both sides of the valley. They are all easily accessible and attractively located, and at the more important ones, recreation parks or health resorts have been established, while at others, the waters are bottled for medicinal and table uses.

Most of the springs are carbonated and of small flow, a few are essentially sulphur springs, but the best known is a hot spring of large flow, Gilroy Hot Springs, which has been famous as a health resort for many years.

Dr. Winslow Anderson in his valuable book "Mineral Springs and Health Resorts of California" calls attention to the medicinal value of several of the springs, comparing them favorably to the famous waters of Europe, and in writing of the California springs, in general, states that "all that is needed to make them as serviceable in the restoration and maintenance of health as their famous sister springs in the East and in Europe is their further development, their chemical analysis, and the scientific administration and application of their waters."

Alma Soda Spring. A small carbonated spring issues from a clay bank in a ravine one mile from Alma Station, in the Santa Cruz Mountains. The water, containing principally magnesia, soda and iron is bottled and distributed locally for table uses, by C. Wood, 315 Willow street, San Jose. The San Jose Water Company is the owner.

Alum Rock Park Springs. A group of mineral springs issue from the banks along the sides of Alum Rock Cañon, 7 miles northeast of San Jose. The country rock here is thin bedded sandstone and shales highly tilted and folded. The springs are all of small flow and slightly sulphureted. They vary greatly in their chemical characteristics, as will be seen by referring to the analyses below, extracted from U. S. G. S. Water Supply Paper No. 338. Most of the springs have been improved by cement basins to form drinking pools, and water from several of them is piped to the baths.

Analyses of Water from Alum Rock Park Springs, Santa Clara County, California.

(Constituents are in parts per million.)

	1		2		3		4		5		6		7		8	
Properties of reaction:																
Primary salinity	38		33		69		36		28		25		39		42	
Secondary salinity	0		0		14		0		0		0		0		0	
Tertiary salinity	0		0		0		0		0		0		0		0	
Primary alkalinity	48		49		6		53		60		39		28		33	
Secondary alkalinity	14		18		17		11		12		36		33		25	
Tertiary alkalinity	104		91		10		80		61		2		2		42	
Constituents	By weight	Reacting values	By weight	Reacting values	By weight	Reacting values	By weight	Reacting values	By weight	Reacting values	By weight	Reacting values	By weight	Reacting values	By weight	Reacting values
Sodium (Na)	1,320	57.40	873	38.22	1,751	76.16	2,110	91.77	1,652	71.80	583	25.35	657	28.50	856	37.24
Potassium (K)	25	.64	24	.61	45	1.16	77	1.96	25	.64	15	.39	13	.34	15	.38
Lithium (Li)	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace
Ammonium (NH_4)									0	.00	0	.00	0	.00	0	.00
Calcium (Ca)	142	7.11	101	5.02	423	21.10	164	8.16	127	6.33	198	9.86	161	8.02	152	7.60
Magnesium (Mg)	24	2.14	39	3.18	160	13.19	39	3.18	7	3.45	58	4.78	73	6.02	64	5.21
Iron (Fe) / Aluminum (Al)	5.9	.21	3.5	.13	6.9	.25	4.2	.15	.6	.02	1.9	.07	30	1.06	5.4	.19
Manganese (Mn)									0	.00	0	.00	0	.00	0	.00
Sulphate (SO_4)	197	4.10	205	4.28	2,418	50.34	10	.21	18	.38	305	6.36	390	8.11	290	6.04
Nitrate (NO_3)									0	.00	0	.00	0	.00	0	.00
Chloride (Cl)	765	21.60	464	11.39	1,522	42.95	1,323	37.35	800	22.58	133	3.75	308	8.68	534	15.05
Bromide (Br)									0	.00	0	.00	0	.00	0	.00
Iodide (I)									Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace
Carbonate (CO_3)	1,236	41.20	934	31.12	546	18.21	1,995	63.50	689	22.96	908	30.27	785	26.18	880	29.34
Metaborate (BO_2)	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	0	.00	0	.00	Trace	Trace
Arsenate (AsO_4)									0	.00	0	.00	0	.00	0	.00

Phosphate (PO_4)	12	.39	10	.32	3.4	.11	32	1.01	Trace	Trace	0	.00	Trace	Trace	0	.00
Silica (SiO_2)	20	.66	22	.73	60	1.99	21	.70	31	1.03	26	.85	26	.87	25	.82
	3,746.9		2,621.5		6,935.3		5,775.2		3,379.6		2,227.9		2,443		2,820.4	
Carbon dioxide (CO_2)	1 483	67.41	838	38.09	192	8.73	1,835	83.41	1,093	49.66	16	.37	0	.00	447	20.34
Hydrogen sulphide (H_2S)	37	2.17	68	3.99					0	.00	10	.59	13	.77	13	.76

1. Blue Sulphur Spring. Analyst, William Irelan, Jr. Authority, advertising matter.
2. White Sulphur (Sulphur tunnel No. 1). Analyst, William Irelan, Jr. Authority, advertising matter.
3. Salt-Condiment Spring. Analyst, William Irelan, Jr. Authority, advertising matter.
4. Soda Spring. Analyst, William Irelan, Jr. Authority, advertising matter.
5. Soda Spring (on west side of creek, 100 yards north of baths). Analyst and authority, W. D. Forbes (1910). Possibly the same spring as that represented by the preceding analysis.
6. Sulphur Spring (75 yards northwest of tea garden). Analyst and authority, W. D. Forbes (1910).
7. Blackwater Spring (west of tea garden.) Analyst and authority, W. D. Forbes (1910).
8. Southernmost of three springs at Blackwater Spring house. Analyst and authority, W. D. Forbes (1910).

This property, owned by the city of San Jose, is conducted as a recreation park and is equipped with a swimming pool, tub baths, cafe, and numerous concessions. The Peninsular Railway operates an electric line to the park.

Bibl.: Repts. XII, p. 345; XIII, p. 518. U. S. G. S. Water Supply Paper No. 338, pp. 208-210. Mineral Springs and Health Resorts of California, by Dr. Winslow Anderson, pp. 78-80.

Azule Mineral Spring[1] is situated in a ravine a mile northward across a divide from Congress Springs. It was first known as Mills Seltzer Spring, but the name was early changed to Azule, from the blue appearance of the mountains to the southwest. The water was formerly bottled for table use, but it has not been on the market since about 1890. The property has, however, been improved as a picnic resort.

The spring rises in a small concrete house, from a crevice in dark-colored sandstone. Water also issues beside the spring house, apparently from the same crevice as that within the house, and the combined flow of the two streams is perhaps a quarter of a gallon a minute. The water is strongly carbonated and also tastes slightly of hydrogen sulphide. A very small deposit of Epsom salt was noticed beside the

Analyses of Water from Azule Mineral Spring and Congress Springs, Santa Clara County, California.

(Constituents are in parts per million.)

	1		2		3	
Temperature	16°C. (60 F.)				10°C. (50°F.)	
Properties of reaction:						
Primary salinity	39		42		43	
Secondary salinity						
Tertiary salinity						
Primary alkalinity	13		11		36	
Secondary alkalinity	48		47		21	
Tertiary alkalinity	146		136		42	
Constituents	By weight	Reacting values	By weight	Reacting values	By weight	Reacting values
Sodium (Na)	972	42.25	990	43.03	1,746	75.90
Potassium (K)	126	3.21	117	2.86	20	.51
Calcium (Ca)	69	3.44	62	3.08	181	9.05
Magnesium (Mg)	462	38.02	462	37.99	144	11.87
Iron (Fe)					115	4.10
Aluminum (Al)					41	4.52
Sulphate (SO_4)					378	7.87
Chloride (Cl)	1,212	34.17	1,289	36.10	1,301	33.89
Carbonate (CO_3)	1,582	52.75	1,526	50.86	1,790	59.67
Silica (SiO_2)	55	1.82			68	2.26
	4,478		4,437		5,684	
Carbon dioxide (CO_2)	2,632	119.64	2,606	118.46	756	34.36

1. Azule Mineral Spring: analyst and authority, Winslow Anderson (1888).
2. Azule Mineral Spring (bottled water): analyst, James Howden; authority, U. S. Geol. Survey, Bull. 32.
3. Upper Spring, Congress Springs: analyst and authority, Winslow Anderson (1888.)

[1]Gerald A. Waring, Springs of California, U. S. G. S. Water Supply Paper 338, pp. 212-213.

spring, and the channel is iron stained for a few yards below it. There are small deposits of lime carbonate farther downstream.

Although the spring issues from sandstone, serpentine that appears to form a dike not much more than 10 yards thick is exposed on the slope immediately above it. This dike may determine the position of the spring at this point, and the considerable amount of magnesia in the water that is shown by the following analyses, tabulated with one from Congress Springs, is probably explained by the presence of the serpentine. The water may be classed as secondary alkaline and primary saline, but the unusually large content of magnesium is noteworthy.

Bibl.: Rept. XIII, p. 518. Dr. Winslow Anderson's Report (1888), pp. 90-91.

Blodgett Magic Spring is located seven miles west of Gilroy in Bodfish Cañon. [1] "The water issues in a board-curbed and inclosed pool near camp grounds, at the base of the cañon side 25 yards east of the stream. It is not strongly mineralized, but tastes slightly saline and is mildly sulphureted and carbonated. * * * The analysis shows a primary and secondary alkaline water with notable tertiary alkalinity and primary salinity. In former years it was bottled and sold locally to a small extent. The water issues from soft white sandstone.

"A spring that is known as the **Blodgett Mineral Spring**, or Magnesia Spring, is situated on the hillside above a branch of Bodfish Creek and several miles north of Blodgett Magic Spring. It issues from ser-

Analyses of Water from Blodgett Mineral Spring and Blodgett Magic Spring, Santa Clara County, California.

(Analyst and authority, Winslow Anderson, 1889; constituents are in parts per million.)

	Mineral		Magic	
Properties of reaction:				
Primary salinity	45		28	
Secondary salinity	16			
Tertiary salinity				
Primary alkalinity			21	
Secondary alkalinity	39		51	
Tertiary alkalinity	57		50	
Constituents	By weight	Reacting values	By weight	Reacting values
Sodium (Na)	111	4.83	129	5.61
Potassium (K)	34	.88	4.7	.12
Calcium (Ca)	30	1.48	61	3.05
Magnesium (Mg)	68	5.62	37	3.03
Iron (Fe)	Trace	Trace	Trace	Trace
Aluminum (Al)	Trace	Trace	37	4.15
Sulphate (SO_4)	222	4.63	42	.88
Chloride (Cl)	112	3.15	85	2.40
Iodide (I)	Trace	Trace		
Carbonate (CO_3)	151	5.03	256	8.53
Metaborate (BO_2)	Trace	Trace	Trace	Trace
Silica (SiO_2)	93	3.08	70	2.33
	821		721.7	
Carbon dioxide (CO_2)	32	1.45	79	3.58
Hydrogen sulphide (H_2S)	48	2.81	Trace	Trace

[1] G. A. Waring op. at pp. 273–274.

pentine and its water is piped from a small covered and rock-walled basin 1 mile eastward to a tank near a farmhouse. The following analysis of the water shows that besides containing a large proportion of magnesia, the water of the mineral spring is primary and secondary saline in character."

Coes Spring. A carbonated spring rises in a creek bed on the east slope of Pine Mountain, 11 miles east of Madrone. It is not utilized commercially. An analysis of the water is given with that of Madrone Spring following.

Bibl.: Rept. XIII, p. 518. U. S. G. S. Water Supply Paper 338, pp. 214-215.

Congress Springs, formerly known as the **Pacific Congress Springs,** are in Campbell Creek Cañon, at the base of the Santa Cruz Mountains, 12 miles southwest of San Jose. A group of three springs, two of which are strongly carbonated, flows from the bank of the creek. Considerable gas escapes from the largest of the springs, the waters of which were formerly piped to a bottling plant below the springs. The gas was collected in a tank placed over the spring and utilized in charging the water, 5000 gallons of which were annually bottled and sold for table use. This property, before the burning down of the hotel in 1904, was a popular health and pleasure resort, but is now used only as an outing or recreation park. It is owned by the Peninsular Railway Company. The analysis given in the table with the Azule Springs is of the main spring.

Bibl.: Repts. XII, p. 345; XIII, p. 519. Water Supply Paper 338, p. 212. Winslow Anderson's Report, pp. 213-214.

Gilroy Hot Spring is situated 13 miles northeast of Gilroy on a hillside above Coyote Creek at an elevation of 1240 feet. There is one large mineralized spring here, which flows from a bank in a small ravine at a temperature of 112° F. It is housed in a bottomless concrete tank, from which the water is piped to tub baths and plunges. The flow is approximately 15 gals. per minute. The water is said to be efficacious in the alleviation of rheumatism, kidney, liver, stomach, skin, and blood diseases. Besides its uses for bathing, it is used for drinking, and it was formerly carbonated and bottled at Gilroy. The health resort established at this property in 1865 is one of the best known in California. There are hotel and cottage accommodations for 150 guests, and it is open throughout the year. A daily auto stage service from Gilroy to the springs is maintained throughout the summer. W. J. McDonald is the proprietor.

Bibl.: Rept. XIII, p. 518. Water Supply Paper 338, pp. 81-82. Winslow Anderson's Report, pp. 156-158.

Analysis of Water from Gilroy Hot Springs, Santa Clara County, California.

(Analyst and authority, Winslow Anderson, 1888; constituents are in parts per million.)

Temperature	43° C. (110° F.)
Properties of reaction:	
Primary salinity	60
Secondary salinity	31
Tertiary salinity	0
Primary alkalinity	0
Secondary alkalinity	9
Tertiary alkalinity	62

Constituents	By weight	Reacting values
Sodium (Na)	228	9.93
Potassium (k)	17	.42
Calcium (Ca)	66	3.30
Magnesium (Mg)	43	3.57
Iron (Fe)	2.1	.075
Sulphate (SO_4)	185	3.85
Chloride (Cl)	422	11.91
Iodide (I)	Trace	Trace
Carbonate (CO_3)	46	1.53
Arsenate (AsO_4)	Trace	Trace
Silica (SiO_2)	57	1.88
	1,066.1	
Carbon dioxide (CO_2)	114	5.16
Hydrogen sulphide (H_2S)	61	3.58

Grant Spring is situated in Alum Rock Cañon, 5 miles above the park. It is a slightly mineralized spring of small flow, whose waters contain principally sodium and magnesium carbonates. The water is bottled at the spring and distributed locally for table and medicinal uses by J. W. Shannon, 343 South Eighth street, San Jose, who has it under lease. J. D. Grant is the owner.

Bibl.: Water Supply Paper 338, p. 212.

Hillydale Sulphur Spring.[1] A small sulphur spring is situated on property known as Hillydale, about 4½ miles south of the reduction works of the New Almaden quicksilver mine, or 20 miles by road southward from San Jose. The spring is on the western bank of a stream, 200 yards from the house on the place, and yields about one-half gallon a minute of moderately sulphureted water. The following analysis indicates a primary-saline, secondary-alkaline water whose total mineral content is small.

[1]Water Supply Paper 338, pp 271–272.

Analysis of Water from Hillydale Sulphur Spring, Santa Clara County, California.

(Analyst, F. T. Green, 1904; authority, owner of spring; constituents are in parts per million.)

Properties of reaction:	
Primary salinity	57
Secondary salinity	0
Tertiary salinity	0
Primary alkalinity	6
Secondary alkalinity	37
Tertiary alkalinity	6

Constituents	By weight	Reacting values
Sodium (Na)	95	4.12
Calcium (Ca)	32	1.60
Magnesium (Mg)	9.5	.78
Iron (Fe)	}	
Aluminum (Al)	1.0	.04
Sulphate (SO_4)	39	.81
Chloride (Cl)	104	2.93
Carbonate (CO_3)	83	2.76
Silica (SiO_2)	11	.37
	374.5	
Hydrogen sulphide (H_2S)	Present	Present

The water is used locally for drinking and is considered useful medicinally.

The spring is situated at the base of a basaltic slope, in an area of sedimentary rocks that may belong to the Franciscan formation. The rock near the spring contains much calcite and is stained with metallic sulphides, from which the sulphide constituents of the water are possibly derived.

Madrone Spring is situated 14 miles east of Madrone Station, and about 5 miles north of Gilroy Hot Springs, on a tributary of Coyote Creek. The spring issues at edge of creek, and the water, which is strongly carbonated, is caught in a cement basin. It was formerly hauled in barrels to San Jose and bottled, but is now used only for drinking purposes about the place. There are several other springs which are only slightly mineralized on the property. A resort was established here over thirty years ago, and it is open each year from May 1 to November 1. There are hotel and cottage accommodations for about 50 guests. Owners, J. D. Arnold, et al., Madrone, California.

Bibl.: Rept. XIII, pp. 518-519. Water Supply Paper 338, p. 214. Winslow Anderson's Report, p. 191.

Analyses of Water from Madrone and Coes Springs, Santa Clara County, California.

(Authority, 13th California; constituents are in parts per million.)

	1		2	
Properties of reaction:				
Primary salinity		1		3
Secondary salinity				
Tertiary salinity				
Primary alkalinity		29		8
Secondary alkalinity		70		89
Tertiary alkalinity		12		18
Constituents	By weight	Reacting values	By weight	Reacting values
Sodium (Na)	217	9.45	56	2.45
Potassium (K)	7.5	.19		
Lithium (Li)	Trace	Trace		
Barium (Ba)	1.2	.02		
Strontium (Sr)	Trace	Trace		
Calcium (Ca)	380	18.94	90	4.47
Magnesium (Mg)	37	3.04	182	14.94
Iron (Fe)	4.7	.17	21	.74
Aluminum (Al)			Trace	Trace
Manganese (Mn)	.8	.03		
Sulphate (SO_4)			27	.57
Chloride (Cl)	14	.40	6.4	.18
Carbonate (CO_3)	940	31.34	649	21.63
Metaborate (BO_2)	Trace	Trace		
Phosphate (PO_4)	3.2	.10	7.0	.22
Silica (SiO_2)	108	3.60	97	3.21
	1,713.3		1,135.4	
Carbon dioxide (CO_2)	Present	Present	Present	Present

1. Madrone Spring: analyst, G E Colby.
2. Coes Spring: analyst, M. E. Jaffa.

The **Santa Teresa Springs** are located on the east slope of the Santa Teresa Mountains overlooking the Santa Clara Valley, 3 miles south of Edenvale. The water, which is very slightly mineralized, issues from seams in a formation of hard gray sandstone, flowing over 20 gallons per minute. It is caught in a large concrete reservoir, from which the water is piped to the ranch house below, where it is bottled and distributed for drinking purposes to houses and offices in San Jose. Pedro A. Bernal, 404 S. Market street, San Jose, is manager. Mrs. Ygnacio Bernal, of Edenvale, is the owner.

Analysis of the Santa Teresa Spring Water.

(Constituents are in grains per gallon; analyst, Dr. H. Kleinhans; authority, advertising matter.)

Silica	5
Aluminum and Iron Oxide	1
Calcium Carbonate	8
Magnesium Carbonate	3
Magnesium Sulphate	2
Sodium Sulphate	4
Sodium Chloride	1
Total solids	24

There are several sulphur springs along Bodfish Creek, none of which are utilized commercially. One, larger than the rest, situated about 7 miles west of Gilroy, close to the wagon road, is used for drinking purposes by campers and teamsters.

NATURAL GAS AND PETROLEUM.

Natural gas and petroleum have been produced in the county at two localities, namely, in Moody's Gulch, south of Alma Station, and on the Sargent Ranch, near the southern boundary of the county. A number of wells were drilled at both of these localities, yielding some natural gas and oil. The first well was drilled in Moody's Gulch in 1878, and oil prospecting has been carried on there spasmodically to date. The Sargent field has been a producer only since 1900 (although wells were drilled there as early as 1886), yielding a few thousand barrels annually. Drilling has also been done northeast of Los Gatos, but no commercial production has resulted.

QUICKSILVER.*

The first known occurrence of quicksilver within the area of the United States, was that found at the New Almaden mine in Santa Clara County in 1824 by Antonio Suñol and Louis Chaboya. Though some occurrences had apparently been earlier noted in Mexico, the New Almaden was the first producing quicksilver mine in North America. Suñol and Chaboya built a mill nearby and endeavored to extract silver from the cinnabar. Late in 1845, the ore was shown to Andreas Castillero,[1] a Mexican officer, who identified it as cinnabar, and under whose direction development work was immediately begun. Gun barrels were utilized as their first retorts. The output was small, however, until after California became part of the United States, since which time more than a million flasks have been produced in this county, as may be noted from the tabulation herewith, the greater portion of which came from the New Almaden mine.

The quicksilver deposits of Santa Clara County are confined, with one exception, to what is known as the New Almaden district (see Plate II). This district lies east of south from San Jose, extending from the northeasterly foothills of the Gabilan Range on the west to the low foothills that lie between Coyote and Dry Creeks on the east. It also embraces the Santa Teresa Hills, a low spur ridge which lies between and in general parallel to the other two. The principal deposits are 8 to 13 miles from San Jose, on the ridge which forms the southwestern boundary of the Santa Clara Valley at this place, having a general NW.-SE. direction, and locally called the New Almaden Ridge.

The geology of this district and particularly of the New Almaden Ridge and its ore bodies has been described in considerable detail by various writers, especially by Becker[2] and by Forstner,[3] the latter of whom says:

*Much of this report on the quicksilver resources of Santa Clara County, particularly that with reference to plant equipment, is taken from Bull. No. 78, California State Mining Bureau, "Quicksilver Resources of California," by W. W. Bradley.

[1]Black's Supreme Court Reporter: The United States vs. Andreas Castillero: vol. 2, 1862. Also U. S. G. S., Mon. XIII, pp. 8–10, 1888.

[2]Becker, G. F., Geology of the quicksilver deposits of the Pacific Slope: U. S. Geol. Surv., Mon. XIII, pp. 310-330, 467, 1888.

[3]Forstner, Wm., Quicksilver resources of California: Cal. State Min. Bur., Bull. 27, pp. 168-171, 1903.

"The three ridges in which the deposits occur are to a great extent formed by serpentine, especially the two first named. The serpentine is associated with metamorphic sandstone and jaspilites. Large bodies of croppings can be found in each of these ridges, having also a general northwestern trend, but not coinciding with the backbone of the ridges.

"In the New Almaden ridge the most extensive orebodies have been found in and close to Mine Hill, the highest peak of the ridge, lying in its southeastern part. From this point going northwestward the croppings, while not continuous, can be traced along the ridge into the territory of the Guadalupe mine, a distance of about 3½ miles. At the surface the serpentine shows in large detached bodies surrounded by the sandstones and shales of the Franciscan series and having a general northwestern trend. This general direction of the serpentine exposures is important in connection with its occurrence underground, proven in the New Almaden mine. The line of ore croppings runs from Mine Hill to the American shaft, passing about 600 feet southwest of the Randol shaft. The underground workings in this territory have shown that the fissures wherein the orebodies have formed have invariably a serpentine footwall; hence the serpentine must be considered to occur underground in a continuous body through this entire territory and to be in places covered by overlying sandstones and shales. Southwest of Capitancillos Creek lies another parallel exposure of serpentine, contiguous to which the outcrops of the Costello mines are found. The Santa Teresa and Bernal mines are located in the serpentine of the Santa Teresa hills, and the North Almaden or Silver Creek mine close to those of the most northern ridge. In the latter a great part of the serpentine is very highly altered by silification, as also the sandstones, a great portion of the rocks being jaspilites. The western slope of the adjoining Mount Diablo range is nearly exclusively formed of shales.

"In this district the occurrence of cinnabar-carrying orebodies is clearly closely allied to that of serpentine, and as the New Almaden was the first extensively worked quicksilver mine in California, this association explains the reason why, for a considerable lapse of time, cinnabar ores were, in the opinion of most quicksilver miners, considered related to this rock formation. The croppings consist of a more or less weathered material having usually an ochreous color from the oxidation products of the iron sulphides, and traversed by a network of quartz seams, from a knife blade to quarter of an inch wide. Overlying the orebodies is almost invariably found a body of clay, generally black, and containing more or less inclusions of a dark-gray sandstone. As this clay overlies the ore bodies it has received the name of 'alta' (Spanish for 'high' or 'upper'). At the surface of this 'alta' crops as a light-gray material, resembling disintegrated sandstone, traversed by a network of very thin, yellowish-brown seams, often very much like a bunch of very fine roots. In places the same material can be found in the New Almaden mine several hundred feet below the surface, forming part of the 'alta.' * * * The rocks of the Franciscan series in this region show a great amount of silification. The chert beds are, however, almost entirely unrepresented.

"To the west of the New Almaden ridge a belt of bedded sandstone is exposed. The beds are from 3 to 5 feet thick and interbedded with thinner beds of shale. * * * The country west of the New Almaden ridge and south of Capitancillos Creek, belonging to the Gabilan mountain system, consists almost exclusively of the sandstones and shales of the Franciscan series with occasionally some jaspilites. * * * West of the serpentine belt which lies west of the New Almaden ridge, south of Costello's house, a small exposure of glaucophane schist was found. A body of rhyolite lies in the northern part of the New Almaden ridge, having a nearly east and west strike and being about two miles long."

The alta, or so-called clay referred to above, is not a substance of definite composition, though it is usually a dark or black mass, readily distinguishable even in hand specimens from the country rock. It is simply an attrition product of the country rock and varies in composition with the material from which it has been produced. Its black color is in part due to the presence of manganese.

With reference to the age of the formations in the New Almaden district, Becker[1] summarizes his observations in the following:

"Upon highly metamorphosed rocks lie Miocene sandstones, which were sharply folded at the Post-Miocene upheaval. They are not conformable with the lower series and contain pebbles from these older beds. In the older rocks near New Almaden Mr. Gabb found *Aucella*, proving the presence of the Knoxville series.

"In this district is the only mass of rhyolite thus far found in the Coast Ranges. It forms a dike nearly parallel to the line connecting the New Almaden and the Guadalupe. It is almost continuous, and I have followed it for a distance of several miles. It is certainly Post-Miocene and probably Post-Pliocene.

"The New Almaden is a very extensive mine * * *. The ore is cinnabar, with occasional traces of native quicksilver, accompanied by pyrite and marcasite, with rare

[1] *Op. cit.*, p. 467.

crystals of chalcopyrite. The gangue is quartz, calcite, dolomite, and magnesite. These materials were deposited in shattered masses of pseudodiabase, pseudodiorite, serpentine, and sandstone. * * *

"The other mines of the district contain similar ores in similar rocks. The Guadalupe was the most productive. * * *

"All the deposits of the district appear to occur along a rather simple fissure system. The main fissure is nearly parallel to the rhyolite dike at the Guadalupe. It follows the direction of the hills, the axis of which curves gradually away from the dike for a certain distance. Passing through or near the San Antonio and Enriquita, it seems to break across the ridge at the America and enters the Almaden on the strike of its two great fissures. It is near this fissure that new orebodies are most likely to be found. The Washington seems to be on a branch of the main fissure.

"This was probably formed at the time of the rhyolite eruption, to which also I ascribe the genesis of the ore."

Also:[1]

"This dike not only proves the former existence of volcanic activity in this district, but emphasizes a fundamental structural axis. The character of the metamorphic rocks shows that the line along which compression and upheaval took place in the early Cretaceous was about west by north, east by south. The folding of the Tertiary rocks shows that compression was repeated in the same direction at the close of the Miocene. The position of the rhyolite dike proves that the dislocation which opened a passage for this lava again followed a similar course."

Also:[2]

"Ore deposition followed the eruption of lava. The minerals deposited and the manner of their deposition are such as in the more northerly quicksilver districts were induced by volcanic springs. Though there are now no indubitable remnants of the volcanic activity which certainly prevailed here since the beginnng of the Pliocene, the analogies of the deposit, together with the presence of lava of approximately the same age as the ore, make any theory of deposition excepting from hot sulphur springs improbable."

There have been but two mines of consequence developed in this district, the New Almaden and Guadalupe, though there are a number of small properties which have at times produced a few flasks of quick-

[1] *Idem*, p. 314.
[2] *Idem*, p. 328.

Table of Mineral Production of Santa Clara County—1860 to 1918, Inclusive.

Year	Quicksilver		Mineral water		Petroleum		Brick		Clay		Sandstone		Limestone		Stone industry value	Magnesite		Miscellaneous and unapportioned	Value
	Flasks	Value	Gallons	Value	Barrels	Value	M	Value	Tons	Value	Cubic feet	Value	Tons	Value		Tons	Value		
1850	7,723	$768,052																	
1851	2,579	130,248																	
1852	19,001	957,005																	
1853	23,384	1,255,648																	
1854	20,004	1,063,752																	
1855	29,142	1,560,554																	
1856	27,158	1,401,678																	
1857	25,291	1,374,381																	
1858	25,761	1,232,149																	
1859	1,234	81,000																	
1860	7,061	378,117																	
1861	34,429	1,447,739																	
1862	30,671	1,442,041																	
1863	42,285	1,860,540																	
1864	42,189	1,860,215																	
1865	47,194	2,166,206																	
1866	43,150	1,867,349																	
1867	24,161	1,122,760																	
1868	25,628	1,176,625																	
1869	16,848	770,618																	
1870	14,422	827,592																	
1871	18,568	1,171,641																	
1872	19,374	1,234,364																	
1873	11,042	887,694																	
1874	9,081	895,155																	
1875	20,000	1,050,000																	
1876	16,180	1,422,867																	
1877	27,340	1,528,929																	
1878	30,337	1,127,840																	
1879	21,934	920,000																	
1880	30,654	1,076,212																	
1881	30,125	984,185																	
1882	31,238	953,321																	
1883	29,508	824,542																	
1884	29,484	830,105																	
1885	20,000	610,000																	
1886	21,410	699,000																	
1887	18,000	630,000																	
1888	20,000	847,000																	
1889	18,840	705,000																	
1890	13,100	589,500																	
1891	12,040	630,000																	
1892	8,500	371,100																	
1893	5,563	239,170																	
1894	6,051	243,044																	
1895	7,235	222,369	5,000	$1,250	3,500	$3,500	22,725	$119,256			24,000	$8,392						Natural gas $6,000 cu. ft.	$4,072
1896	7,060	263,800	20,000	5,000	4,000	10,000	24,750	131,250										Natural gas $30,000 cu. ft.	12,000
1897	6,225	211,650	44,000	18,960	900	1,115	15,000	80,000							$33,900				
1898	4,700	169,200	30,500	17,600	4,000	10,000	19,000	105,000					500	$600	5,000			Natural gas	1,300
1899	5,876	235,000	25,863	11,358	3,000	6,000	13,468	65,490	200	$2,500									
1900	4,150	186,250	70,000	16,150	1,000	2,000	30,741	170,635							12,600				
1901	5,145	241,073	30,000	8,000			20,000	130,000	2,000	6,000	130,000	100,000	1,800	3,000	3,000	100	$1,350	632 tons asphalt	640
1902	5,220	250,008	55,000	8,800			21,840	94,570			60,000	80,000	8,000	9,000		30	375	15 tons manganese	75
1903	5,809	259,260	24,000	5,000			22,982	178,602			35,000	31,500			917	50	300	17 tons asphalt	255
1904	5,943	231,130	50,000	12,500	4,695	3,995	28,069	188,284			112,330	225,000	7,000	7,000	100			2,000 cu. ft. granite	1,200
1905	3,889	148,103	50,000	12,500	42,000	13,350	24,909	178,581							12,000			121 tons bituminous rock	17
1906	2,603	95,968	5,000	1,200	41,000	14,755	28,486	204,357	700	1,050	100,000	150,000			3,000			111 tons asphaltum	132
1907	2,592	94,688	5,000	1,250	7,000	2,240	33,397	183,676	1,000	1,500			10,000	15,000					
1908	2,518	96,689	11,374	2,187	22,300	5,575	30,053	250,424			3,500	3,500	9,000	16,694					
1909	2,460	103,851	371,635	39,065	25,000	15,000	15,000	63,618					671	1,417	45,142			10,017 bbls. lime	10,017
1910	3,747	168,490	373,327	40,754	63,780	70,158	6,000	30,000					2,221	4,150	75,916	300	3,000	1,000 bbls. lime	1,000
1911	4,038	182,719	182,500	11,250	39,500	29,625	12,000	60,000	12,000	60,000			4,284	3,451	63,765	7,560	51,937	/ Unapportioned 1909-1918	85,294
1912	7,583	346,303	165,720	10,000	12,853	5,016	6,000	30,000					7,417	2,918	62,595				
1913	8,695	365,538	152,500	10,250	14,092	8,455	18,000	103,000					3,374	4,120	48,228	600	6,000	13,508 bbls. lime	10,151
1914	3,709	119,213	101,500	10,750	20,000	12,800	18,000	95,000					3,519	4,200	29,377	70	560	113,100 bbls. lime	9,783
1915	2,467	118,083	29,000	10,750	10,000	5,700	15,500	79,500							39,093	1,425	14,250	/Natural gas 2,000 cu. ft.	560
1916	4,380	276,319	38,800	10,750	16,617	11,077	10,000	55,764							98,342	7,633	74,597	Other minerals	340
1917	4,016	375,190	50,000	11,500	16,488	10,991	12,100	82,800	2,024	3,235					111,074	23,297	222,156	Other minerals (b)	23,028
1918	3,977	478,924	13,625	1,078	20,499	21,818	8,000	80,000	6,014	4,929					111,304	9,963	99,387	Other minerals (c)	28,411
1919	3,012	371,762			16,734	26,095	7,250	63,000	2,532	2,232					79,237	10,912	132,924	Other minerals (d)	983,289
																		Other minerals (e)	480,721
Totals	548,383	$54,019,863	1,929,014	$230,235	415,518	$354,010	447,356	$2,907,701	26,470	$86,504	454,830	$595,392	51,276	$60,550	$950,750	30,635	$905,502		$1,598,773

TOTALS

Brick	$2,907,701
Clay	86,504
Limestone	60,550
Magnesite	744,495
Mineral water	230,235
Petroleum	354,010
Quicksilver	54,019,863
Sandstone	595,392
Stone industry	950,750
Miscellaneous and unapportioned	1,616,015
	$61,656,570

(b) Chromite, limestone and manganese.

(c) Chromite, manganese, tile and limestone.

(d) Chromite, manganese, clay, tile, potash.

(e) Manganese, limestone, mineral water and potash.

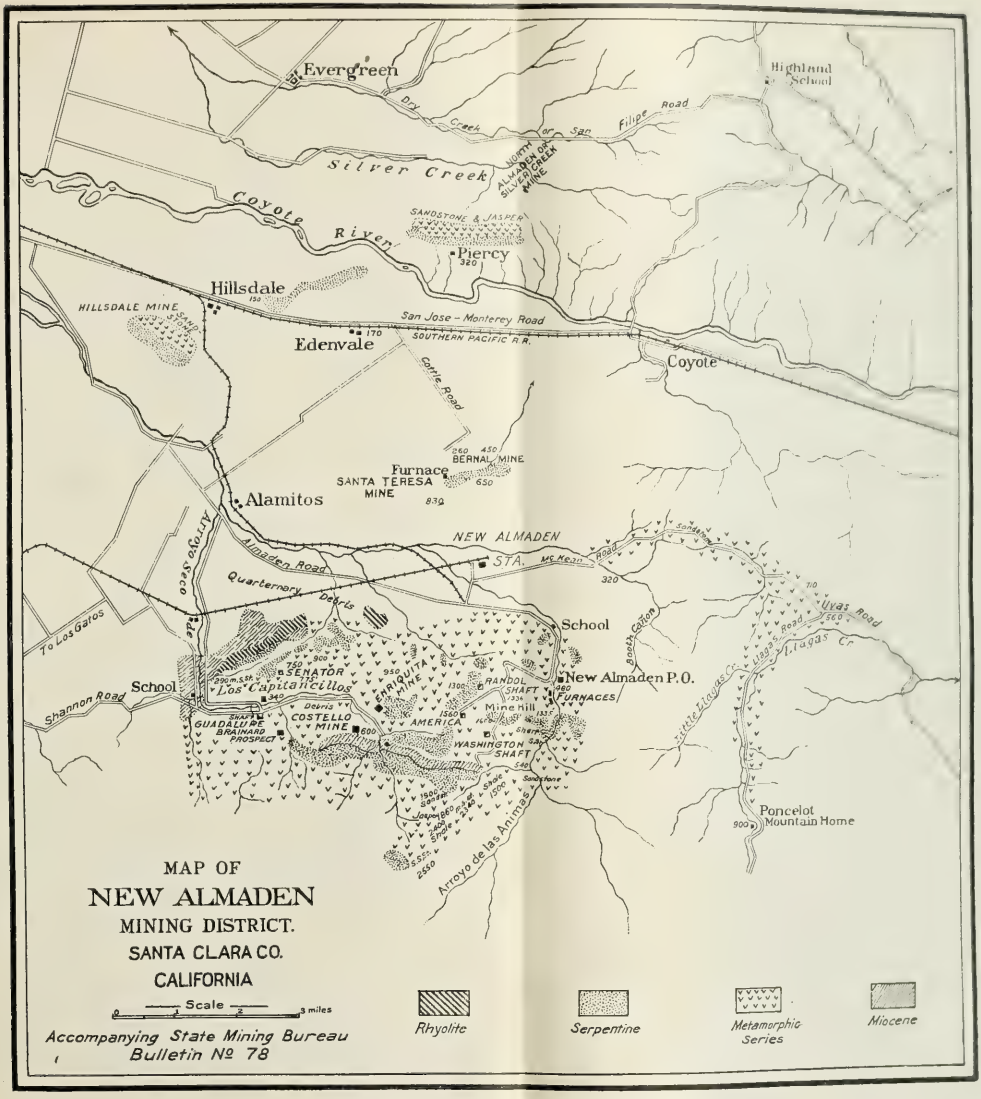


Plate II. Map of New Almaden Mining District.

silver. The total recorded output of quicksilver from this county is given in the following tabluation:

Quicksilver Production of Santa Clara County.

Year	Flasks	Value	Year	Flasks	Value
1850	7,723	$768,052	1886	18,000	639,000
1851	27,779	1,859,248	1887	20,000	847,6 0
1852	15,901	927,5.5	1888	18,000	765,000
1853	22,284	1,235,648	1889	13,100	589,500
1854	30,604	1,633,722	1890	12,000	630,000
1855	29,142	1,560,554	1891	8,200	371,105
1856	27,138	1,401,678	1892	5,563	226,470
1857	28,204	1,374,381	1893	6,614	243,064
1858	25,761	1,232,149	1894	7,235	222,160
1859	1,294	81,690	1895	7,050	253,800
1860	7,061	378,117	1896	6,222	211,570
1861	34,429	1,447,739	1897	4,700	169,200
1862	39,671	1,442,041	1898	5,875	235,000
1863	32,803	1,380,350	1899	4,435	186,270
1864	42,489	1,950,245	1900	5,145	241,073
1865	47,194	2,165,205	1901	5,220	236,608
1866	35,150	1,867,518	1902	5,869	254,260
1867	24,461	1,122,760	1903	5,603	233,130
1868	25,628	1,176,325	1904	†3,889	148,103
1869	16,898	775,618	1905	2,693	95,938
1870	14,423	827,592	1906	2,592	94,608
1871	18,568	1,171,641	1907	2,518	96,086
1872	18,574	1,224,584	1908	2,460	103,954
1873	11,042	887,004	1909	3,747	158,490
1874	9,084	995,455	1910	4,038	182,719
	*20,000	*1,098,000	1911	7,533	346,593
1875	16,980	1,423,887	1912	8,635	365,538
1876	27,930	1,228,920	1913	3,709	149,213
1877	30,237	1,127,840	1914	2,467	118,063
1878	24,924	820,000	1915	4,386	376,319
1879	36,054	1,076,212	1916	4,016	375,496
1880	30,135	934,185	1917	5,921	639,594
1881	31,288	933,321	1918	3,977	478,524
1882	29,208	824,542	1919	3,012	271,762
1883	29,084	836,165			
1884	20,000	610,000	Totals	148,283	$54,049,803
1885	21,400	$658,050			

*Estimated production of Guadalupe Mine previous to 1875.
†Flasks of 75 pounds since June, 1904; of 76½ pounds previously.

Bernal Mine. Mrs. Ygnacio Bernal, owner, Edenvale. It is 10 miles southeast of San Jose, on the east slope of the Santa Teresa hills, at an elevation of about 450 feet. A tunnel, over 200′ long, was driven along a clay gouge and serpentine contact, many years ago; but failed to encounter any important ore body, so it was abandoned. No work has been done in recent years.

Bibl.: Cal. State Min. Bur. Bull. 27, p. 171; Bull. 78, p. 157.

Bowie Prospect, New Almedan district. Circle B. Mining Company, owner, Prospect only. Idle.

Brainard Prospect. This is on patented property owned by Mrs. M. D. Brainard et al. of San Jose, situated south of the Guadalupe mine, and west of the northern end of the New Almaden lands. There is an old adit in which it is stated some cinnabar-bearing material was cut, but there has been no work done in recent years.

Comstock Mine. T. H. French, owner, Lone Tree via Hollister. It is in the extreme southeastern corner of Santa Clara County, in section 19, T. 11 S., R. 7 E., M. D. M., and in the Stayton district most of which lies in San Benito County. The Comstock mine is located on the only surface exposure of serpentine found in the Stayton district. Abandoned some years ago.

Bibl.: Cal. State Min. Bur. Report XII, p. 367; Bull. 27, p. 172; Bull. 78, p. 157. Mineral Resources West of Rocky Mountains, 1875, p. 14.

Costello Mine. M. Costello, owner, New Almedan. It is about $1\frac{1}{2}$ miles by road southeast of the Guadalupe mine, on the hillside above Los Capitancillos Creek at an elevation of about 1000′. It is a prospect only and no ore was found in place. It has been idle for a number of years.

Bibl.: Cal. State Min. Bur. Bull. 27, p. 172; Bull. 78, p. 157.

Guadalupe Mine. New Guadalupe Mining Company, owner; Hugh C. Davey, president; John L. Stubbs, vice president; Chas. W. Aby, treasurer; route A, Los Gatos. This property, covering a territory of 2500 acres, is situated 10 miles south of San Jose on the west slope of New Almaden Ridge, and adjoins the land of the New Almaden Company on the northwest. The mine was discovered in the early 50's and is said to have produced 20,000 flasks of quicksilver up to



Photo No. 18. Reduction plant at the Guadalupe Mine, looking southwestward from dump shown in Photo No. 20.

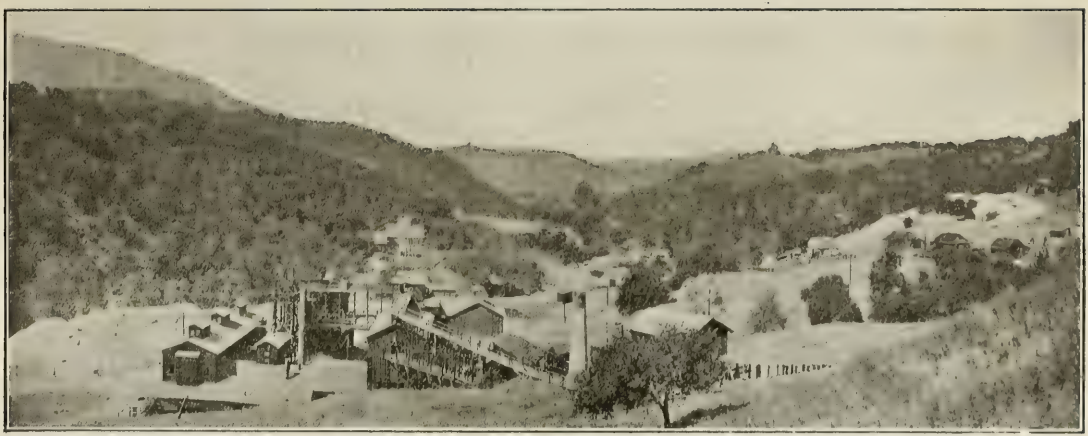


Photo No. 19. Guadalupe Mine, Santa Clara County. Furnaces in foreground; old vertical-shaft house in middle distance; main working incline shaft at extreme right. Photo by W. W. Bradley.

1875, when it became the property of the Guadalupe Mining Company. This company erected furnaces and made many surface improvements. In 1886 the mine was shut down due to litigation, remaining idle until 1900 when H. C. Davey, one of the present owners, organized the Century Mining Company. The old furnaces were remodeled, the mine unwatered, and operations resumed, since which time it has been an important and continuous producer.

The mine was first worked by a vertical shaft, 625′ deep, sunk on the south side of, and near the bottom of Capitancillos or Guadalupe Creek. It was very difficult to keep the surface water out of this shaft during the wet seasons, and it was finally abandoned. A 700 foot incline, which is now the main working shaft, was then sunk on the opposite side of the creek on the dip of the vein. It has three compartments down to 180′ on the incline (where it connects with No. 1 Tunnel, whose portal is just above the creek bed), and two compartments below that. There are many miles of underground workings in the Guadalupe. Several shallow shafts and drifts have been driven on different outcrops about the property, but mining in recent years has been confined to the main workings.

From the plan of the old workings, it appears that the ore body developed by the vertical shaft on the south side of the creek had a northwest strike and southwest dip. The second level, 300′ below the collar of the vertical shaft, connects with the incline shaft on the opposite bank of the creek. From the sixth level (625′) of the vertical shaft an incline winze was sunk from which the seventh, eighth and ninth levels were driven; but ore was developed only on the seventh and eighth levels. The ore of the Guadalupe mine is similar in appearance to that of the north-end New Almaden ground, being in part at least a silicified serpentine with cinnabar. There is some associated pyrite. In the latter part of 1917, the bed of the creek was replaced by a concrete flume, 740′ long and 55′ wide, with side walls 9′ high, to carry the stream over the portions of the old mine beneath. There is a 1′ high cross-wall every 100′ to hold the gravel and protect the flume floor from excessive wear. With this improvement in service, the mine was unwatered later. Electric power is used.

Equipment includes electric hoists, air compressors and machine drills. The reduction plant consists of two coarse-ore furnaces of 18 tons capacity each and two fine-ore furnaces of 30 tons capacity each, all oil-burning, and modeled after the Davey patents. The ore is broken to cobble size and sorted by hand in the mine, the waste being partly used to fill old stopes. At the surface, the ore is screened and then trammed by mule-drawn trains to the fine and coarse-ore furnaces respectively. The fine ore is passed through a rotary drier, 29′ long x 28″ diam. lined with one row of fire-brick, and driven by a 4-h.p. electric motor at 2 r.p.m. The discharge is directly into the feed end of the fine-ore furnace, in a sealed compartment to prevent escape of any mercury vapors that might be present.

A concentrating plant of 50 tons daily capacity was built, and started operating in February, 1917, handling material from the old mine dumps. Crushing is done in a ball mill with 20-mesh screen. After classification, the fine pulp goes to a Deister table, and the sand to two Wilfleys. The plant is driven by a 25-h.p. Semi-Diesel oil engine. The concentrates are said to assay 8%-10% mercury, and

are reduced in the fine-ore furnaces. In September, 1917, there were 75 men employed, 25 of whom were underground. Due to the "after the war" slump, the mine was closed down and has not been in recent operation. (June, 1919.)

Bibl.: Cal. State Min. Bur. Repts. VIII, p. 542; XIII, p. 600. Bull. 27, p. 173; Bull. 78, pp. 157-160. Mineral Resources West of Rocky Mountains, 1885, p. 13; 1876, p. 20. U. S. Geological Survey, Mon. XIII, p. 236.

Hillsdale or San Juan Bautista Mine (one time called **Chapman**; also **Chaboya**). Elizabeth Kohrs, owner; Hillsdale, via San Jose, R. F. D. It is about 2 miles southeast of San Jose on the east slope of the San Juan Bautista Hills, and within one-half mile of a street car line. These hills, an isolated group, composed of metamorphic rocks, largely serpentine, rise to a height of only a few hundred feet above the valley, and are a northward continuation of the Santa Teresa Range.

The mine is said to have been discovered in 1847 and worked to 1861 by Mexicans, subsequently becoming the property of a Mr. Chapman, who worked it up to 1874. In the spring of 1871, production was at the rate of 30-40 flasks of quicksilver per month. It lay idle from 1874 until 1892, when it was reopened by R. H. Harper, of San Jose, and worked spasmodically in a small way up to 1907. In 1915, under the name of New Discovery Quicksilver Company, a lease and bond was taken and a few flasks of quicksilver produced; but little work was done underground, and the lease forfeited. There are said to be over 4000 feet of underground workings, but most of the tunnels are now inaccessible, being caved. The reduction plant consists of two 12-pipe retorts, evidently built in later years, as they are in good condition.

Bibl.: Cal. State Min. Bur. Rept. XIII, p. 600; Bull. 27, p. 174. Geol. Surv. of Cal. Geol., Vol. 2, pp. 112-113.

New Almaden Mine (originally **Chaboy**, then **Santa Clara**). The Quicksilver Mining Company, owner; New Almaden Company, Incorporated, lessee; Geo. H. Sexton, president, 45 Broadway, New York; Chas. A. Frank, secretary and treasurer; Edmund Juessen, general manager, 57 Post street, San Francisco. This property, covering over 8000 acres, lies from 8 to 13 miles east of south from San Jose along the New Almaden Ridge, and was at one time second only in production to the famous Almaden mine in Spain, after which it was named. This property is the oldest known quicksilver mine in the United States, being first worked in 1824 by Antonio Suñol and Luis Chaboya. In 1845, Andreas Castillero, a Mexican army officer, "denounced" (located) it under the name of Santa Clara. After the admission of California into the Union, Castillero and associates leased the mine to Barron Forbes and Company, who changed the name to New Almaden. It has been worked continuously since 1845, but the greatest surface improvements were made after it became the property of The Quicksilver Mining Company in 1864.

Many important practices and appliances in the metallurgy of quicksilver had their beginning here, including the development of the Hüttner-Scott fine-ore furnace in 1875-1876. The present operating company took over the property under a lease and bond in 1915. The total production has been surpassed by only one mine in the world (Almaden mine, Spain) during the period in which New Almaden has been operating. Published records show that this total, however, has been exceeded by the Indria mine, Austria, and the Santa Barbara mine, Huancavelica, Peru, the bulk of whose production was made prior to 1850; in fact, Huancavelica has yielded but little quicksilver since 1800.

GEOLOGY AND MINE WORKINGS.

The New Almaden property really contains three mines, all of which are located on the same mineral belt: the great New Almaden mine proper, the Enriquita, and the Senator or El Senador, as the Mexicans named it (also referred to as the North Line mine). A distance of nearly 4 miles separates the first and the last named. The workings of the main New Almaden mine, cover a territory of about 2½ square miles, which is exclusive of the Enriquita and Senator; and their greatest depth is 2450 feet below the top of Mine Hill, which is the datum point for all underground workings. The elevation of Mine Hill is 1600′ above sea-level. In this territory 18 shafts have been sunk, and there are nearly 100 miles of underground excavations, much of which is at present inaccessible. Forstner[1] states that in 1903, the Victoria shaft, a short distance to the southwest of the Randol shaft, and the Harry shaft, on the southeast slope of Mine Hill were the only two shafts then in operation. The deepest workings then being followed were on the 1000′ level, as below 1300′ the mine was filled with water. Since that time, most of the work has been done through the Harry shaft and the Day tunnel, and more recently at the Senator mine.

Geology.

The geology of the New Almaden mine has been studied and described in considerable detail by a number of authors, the most important of whom was Becker. He states:[2]

"The ores * * * are composed of the usual association of minerals: cinnabar (sometimes accompanied by a little native mercury), pyrite, quartz, calcite, and dolomite, and more or less closely associated masses of bituminous matter. Accompanying the deposits is a small amount of chalcedony or opal, usually black in color, but this substance is much less abundant here than in the greater part of the northern mines. Dolomite is more prevalent as a gangue mineral here than in most quicksilver districts * * *.

"The rocks associated with cinnabar in this district include every variety of the metamorphic series. Where the rock happens to be a permeable sandstone, impregnations have resulted. Elsewhere the ore seems to occur exclusively in crevices in the rock * * *. I was unable to perceive any indication that ore had been deposited by substitution or that the rock had influenced the deposition of ore by its chemical properties. Ore is found with nearly equal frequency in contact with various rocks and the existence of fissures appears to have been the necessary and sufficient condition for the deposition of cinnabar and gangue minerals. * * *

"The ore in the New Almaden mine seems never to occur except close to evidences of faulting. This evidence consists in the presence of layers of attrition products, so-called clays, full of slickensides and of fragments of rocks more or less rounded by attrition. These layers of clay usually occur on the hanging sides of deposits and are known to the miners as atlas, the Spanish term for hanging-walls. The clays are impermeable to solutions and the ore usually forms on their lower side, as if the cinnabar had ascended and been arrested by the atlas. * * *

[1]Forstner, Wm., Quicksilver Resources of California: Cal. State Min. Bur. Bull. 27, p. 175, 1903.

[2]Becker, G. F., Quicksilver Deposits of the Pacific Slope: U. S. Geol. Surv. Mon. XIII, pp. 314 et seq., 1888.

"While the evidence of the existence of a fissure system is, if possible, more abundant in the New Almaden mine than in most quicksilver deposits of the Pacific Slope, the deposits themselves are of various types. The commonest is the reticulated mass, or stockworks, consisting of irregular bodies of broken rock into which solutions of cinnabar and gangue minerals have filtered, cementing the fragments together with ore. Where the disturbance has been less extensive and irregular, clean-cut fissures may sometimes be seen filled with ore, and these can only be classified as veins, though they are not persistent. * * *

"Certain features must be common to the ore bodies taken singly and to the ore-bearing ground as a whole. It would be impossible to suppose that each stockwork has an independent fissure system, and a mere glance at the mine map shows that a connection between them exists. It is also a historical fact that the thin seams of ore * * * have led from one ore chamber to another. * * *

"The distribution of serpentine, the average strike of the metamorphic strata, the compression of the Miocene beds, the position of the rhyolite dike, and the trend of the range, in short the whole structural geology of the region shows that the fundamental axis of disturbance must have a direction which is approximately northwest and southeast."

Also:[1]

"Considered in detail, the orebodies are stockworks; but they are arranged along definite fissures and the deposits as a whole have a vein-like character and answer to the 'chambered veins' defined in a subsequent paragraph. The workings have developed two main fissures. One of these dips from the surface at a high angle and in a nearly straight line. The other strikes in nearly the same direction as the first, dips steeply from the surface, then flattens and approaches the first fissure rapidly, again becomes very steep, and in the lowest workings almost coincides with the first. In vertical cross-section the two fissures form a figure resembling a V. The great ore bodies are distributed along these two fissures, making irregularly into the walls. The wedge between the fissures also contains ore bodies."

Mine Hill Workings.

The surface and workings of the New Almaden mine have been minutely surveyed and the data carefully preserved by the officers of the Quicksilver Mining Company in the form of a large, detailed, colored map which hangs in a specially constructed fireproof draughting room, adjoining the office at the Hacienda. An excellent reproduction of this map, up to the date of its publication, 1888, accompanies Becker's report.[2] The map herewith (Plate III) was compiled from the company's records and is reproduced herewith by courtesy of Mr. Edmund Juessen, general manager. The principal dumps are shown in brown with the surface contour lines. The principal ore bodies extracted since Becker's publication of the map, are indicated by: 1. The N.-S. line of stopes to the west of and nearest the Harry shaft. 2. The line of stopes lying approximately at right angles across the northwestern end of the older stopes, and extending southwesterly from the "mouth of Randol tunnel." 3. Portions of the stopes south of the Cora Blanca shaft.

The ore deposits are limited on their hanging wall side by the alta, which being an impermeable layer prevented the passage of water circulation. According to Forstner,[3] the footwall side is persistently serpentine, from which it is concluded that the serpentine, or rather the intrusive peridotite which has altered to serpentine, is the cause of the fracturing of the other rock strata.

"The fracturing has taken place on both sides of the serpentine, which apparently can not be considered otherwise than as an intrusive body having uplifted the rocks of the Franciscan series.

The orebodies form principally in those parts of the zones where the dip of the 'alta' is very flat * * *. The contact of the alta with the underlying vein filling,

[1] *Op. cit.*, p. 467.
[2] *Op. cit.*, Atlas Sheet IX.
[3] *Op. cit.*, p. 178.

and where this is missing with the serpentine, is very tortuous in both directions, vertically and horizontally, so that in the gangways, which * * * follow this contact, it is an exception to find a straight line of any length. The stopes are locally called 'labores.' The material which fills the zones of fracturing and wherein in places cinnabar forms, is generally rather hard and siliceous, traversed by a network of seams of quartz and dolomite, showing repeated fissuring and filling containing some inclusions of serpentine, the cinnabar forming principally in connection with the seams. In places the vein-filling has more of an ochreous character, the matrix being more or less leached out, leaving only the network of seams intact. * * *

"The general character of the vein-filling indicates that, as in most of the other quicksilver deposits in the State, the deposition of cinnabar has been associated with the process of silicification, which characterizes the alteration of the rocks of the Franciscan series.

"The general direction of the seams in the vein-filling is not parallel to the line of contact with the alta. * * * In the upper workings the part nearest to the alta is seldom the richest, the cinnabar forming more plentifully at from 5′ to 8′ below the alta, while in the lower workings the richest ore is invariably close to the alta.

"The contact between the alta and the vein-filling is very sharply marked, but there is a gradual change of the above-described vein-filling into the material of the serpentine footwall, the vein material gradually carrying more serpentine, until it has entirely changed into the latter. The hanging-wall is a shale, judging from surface exposures. Underground, no crosscut through the alta to the hanging-wall was seen."

Recent Work.

In the latter part of 1917, some ore was broken in stopes connected with the Day tunnel, which was burned in the coarse-ore furnaces at the Hacienda. A connection was made later on the 800 level, from the Santa Rosa drift near the main shaft, to Deep Gulch Tunnel. This permits of tramming around the hill to the Hacienda furnaces, a distance of about ½ mile, or about one-half that previously traveled for delivery from the Day tunnel. Equipment at the mouth of the Day tunnel includes an Ingersoll-Rand duplex compressor, 16″x14″ and 10″x14″, driven by a 100-h.p. electric motor.

Senator Workings.

The principal ore extraction of recent months has been from the Senator workings, which are, as already stated in a preceding paragraph, nearly 4 miles distant from Mine Hill. This ground adjoins that of the Guadalupe mine, they being on opposite sides of the same ridge. A new 'shaft' (winze) is being sunk, on a 60° incline, starting at 1300′ in from the portal of the main adit. The collar of the old winze is at 1150′ in. An electric hoist with 75-h.p. motor is used. The tunnel level is designated as the 260′ level, and levels down to ♯5 have been established in the winze, with sinking nearing ♯6 level. Only a little sorting is done in the stopes underground. The ore going to the furnaces is stated to vary from 0.2% to 1.0% mercury. The formations and orebodies in the Senator and Enriquita mines are in general similar to those at the southern end of the New Almaden belt, but no bonanza shoots have been found like the massive cinnabar bodies worked in the upper levels of Mine Hill. The Enriquita mine was opened up in 1859, and up to January 1, 1865, had yielded 10,571 flasks of quicksilver. It has not been worked in recent years.

REDUCTION EQUIPMENT.

A study of the development of practices and appliances in the metallurgy of quicksilver during the past 60 years shows the intimate relations of such developments to the history of operations at New Almaden. In the earlier operations, the intermittent form of furnace was utilized. These furnaces and their *modus operandi* are described in detail by Goodyear,[1] who observed them working in 1871 at New

[1]Goodyear, W. A., Examination of the Quicksilver Mines of California: Geol. Surv. of Cal., Geol., vol. II, pp. 106, 119, 131–132, 1882.

Almaden, Knoxville, and New Idria. The most important item for which credit is due to the staff of the New Almaden mine was the development in 1875–1876, of the Hüttner-Scott fine-ore furnace (now generally referred to as the Scott), by H. J. Hüttner, Robert Scott, and J. B. Randol.

For some years, the furnace equipment at the Hacienda (the name given to the community grouped about the reduction plant) included

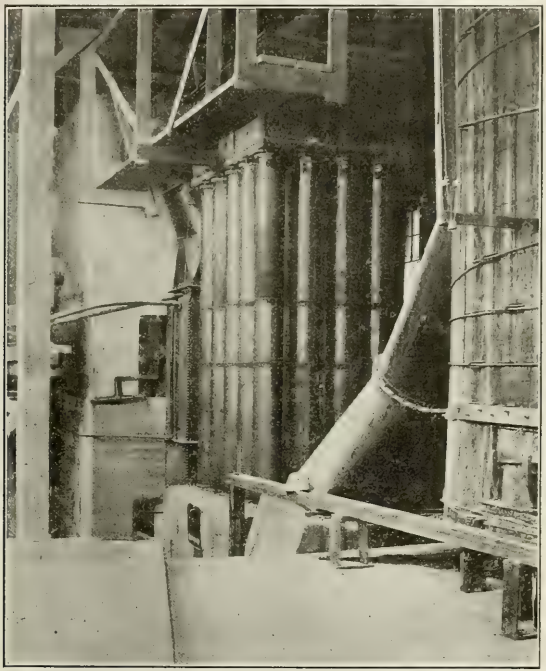


Photo No. 20. Cottrell Dust Precipitator, or 'Hot Treater' (concrete chamber at left), and condensers connected with Herreschoff Furnace, at Senator Mine of New Almaden Company, Santa Clara County. Photo by W. W. Bradley.

two Exeli coarse-ore furnaces of 12 tons capacity each; two Scott furnaces for 'granzita' (medium ore) of 36 tons and 18 tons capacity, respectively; and two Scott furnaces for 'tierras' (fine ore) of 36 tons and 24 tons capacity. In the latter part of 1917, these were all torn down, except the Exelis, and treated for their absorbed quicksilver. The soil and gravel under the site of the old intermittent furnaces and

of the Scotts was excavated to bedrock, a depth of 30 feet, and run through a washing plant for recovery of the metallic quicksilver contained. An important yield of metal was obtained from this material.

At the Senator mine, in 1917, a Herreschoff multiple-hearth furnace, mechanically rabbled, was handling the ore. (See Photo No. 21.) It was installed early in 1916, by the then manager, W. H. Landers, who also, in connection with this installation, patented certain features of the condenser system. This furnace is 14 feet inside diameter and

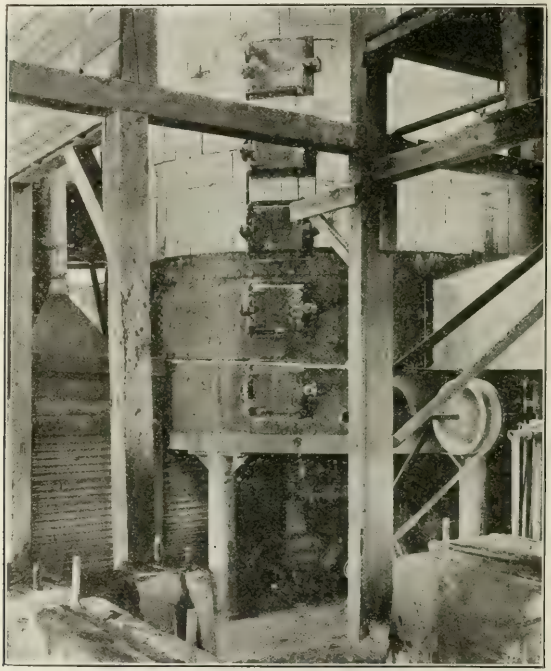


Photo No. 21. Herreschoff Multiple-hearth Furnace at Senator Mine of New Almaden Company, Santa Clara County. Photo by W. W. Bradley.

has 6 hearths, plus a drying floor on the top (see Photo No. 22). There are two fire-boxes on #5 hearth (next to bottom) level, set opposite to each other. On #2 hearth level, about one-third of the way around from the top exit-pipe, a third fire-box has been added in order to keep the temperature of the gases above 600° F. while going through the Cottrell dust precipitator which follows. The central column and the rabble arms are air-cooled, the resulting hot air being utilized for concentrate drying and other purposes. A Brown recording pyrometer

is connected in at the furnace exit to enable regulation of the fume temperature.

This furnace is stated not to work economically on material coarser than ¾ inch. Up to 58 tons have been treated in 24 hours; but it seems to do its best work at between 40 and 50 tons. Feeding and discharging are both automatic. The feed hopper is shown in Photo No. 22, while the housing for the discharge may be seen in the lower left-hand corner of Photo No. 23. A steel ore-car is kept under the discharge chute, and when filled is trammed out by hand to the dump.

By reason of the dust raised and thrown into the fume circulation as the ore is mechanically scraped from one hearth to the next, a bother-

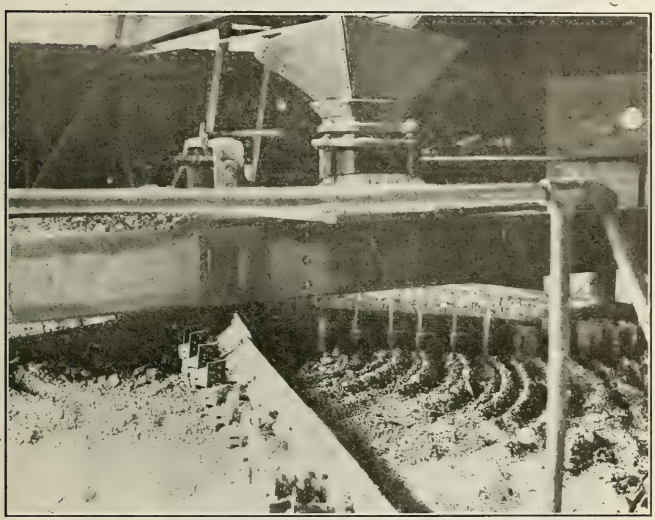


Photo No. 22. Top, or Drying-hearth, of Herreschoff Furnace. Feed hopper is seen in upper part. Photo by W. W. Bradley.

some accumulation of dust was at first obtained in the condensers. To correct this and keep the dust from passing into the condensers, a Cottrell fume precipitator, called the 'hot treater' was installed between the furnace and the first condenser. (See Photo No. 20.) To prevent the mercury from condensing in this treater, the temperature of the gases (as already mentioned) is kept above 600° F. on leaving the furnace. As a precaution to recover any quicksilver which might have condensed in case of irregularities occurring in the furnace operation, the hot-treater dust is run into a settling tank before being discharged to the dump. Following the last condensing chamber is a second Cottrell precipitator (Photo No. 23), called the 'cold treater,' to throw down any remaining mercury 'mist' in the fumes. It is stated that a little quicksilver is obtained in this cold treater. The incoming electric

current of 440 volts is transformed to 50,000 volts for the 'hot treater' and 100,000 volts for the 'cold treater.'

The fuel consumption of this furnace is stated to have proven rather high, being approximately 8 gallons of oil per ton of ore treated, as against 5-6 gallons per ton for a 50-ton Scott furnace. The installation cost of the multiple-hearth type of furnace is much less than it is with the Scott, being stated to be about $20,000 for a 100-ton plant, or $200 per ton-day capacity (1916; but for 1917 nearly double that).

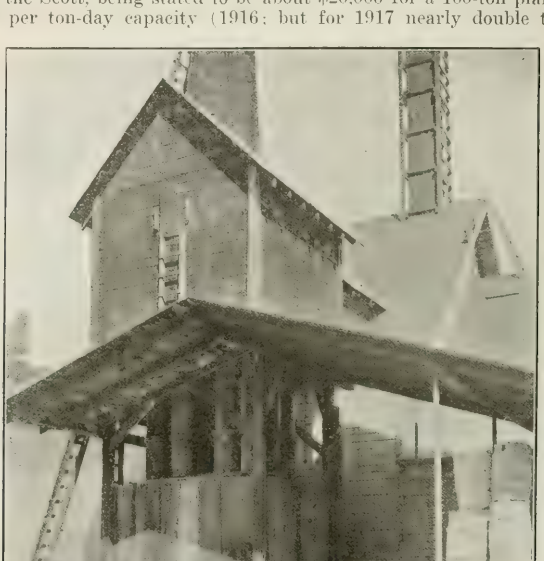


Photo No. 23. Cottrell Precipitator, or 'Cold Treater,' at Senator Mine.
Photo by W. W. Bradley.

The cheapest operation of this type of furnace is obtained with the larger units or with several units under a single roof, as a single machinist can attend to the mechanical features of several units. To repair the rabble arms or other parts of the interior mechanism, the furnace must be shut down and cooled off. This is apt to occur oftener than interior repairs are required in a Scott furnace, though Herreschoff units have been in operation on copper ores for more than two years without such repairs. It is stated that an 82% recovery of the assay value of the feed was obtained with the Herreschoff furnace for

the 4 months ending with July, 1917. The heads assayed approximately 0.9% mercury, and contained from 3 to 5 tons, daily, of concentrates assaying up to 4%, which were mixed with the mine-run ore.

As the furnace does not work economically on material coarser than $\frac{3}{4}''$, the ore after preliminary breaking in a gyratory crusher, is passed over a shaking screen of $\frac{3}{4}''$ mesh, and the oversize re-crushed in a jaw breaker. A bucket elevator is included in the equipment, and electric power is used. The first condenser consists of 20 iron pipes 12″ diam. x 12′ long, an arrangement patented by Landers[1] in 1916, then manager of the New Alamaden Company. Condensers #2, #3, and #4 are redwood-stave tanks, 12′ diam. x 16′ high. No. 2 can be seen at the right of the photograph. These tanks are cleaned out one a week.

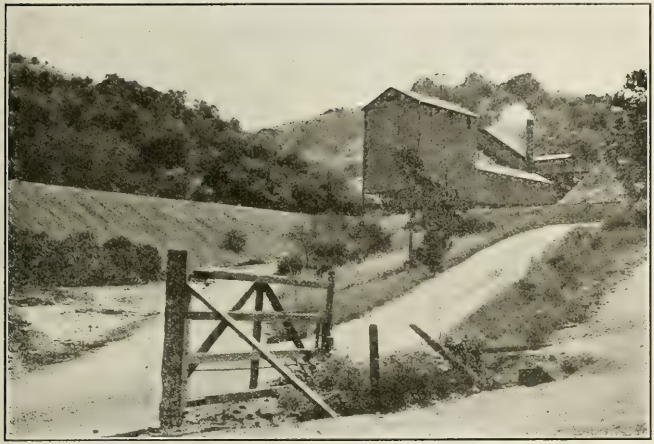


Photo No. 24: New 90-ton Scott furnace at Senator Mine of New Alamaden Company. Photo by W. W. Bradley.

A 90-ton double Scott fine-ore furnace was built in the early part of 1918. It has 4 fireboxes and handles a minimum of 75 tons per day, though it has treated up to 96 tons per 24 hours. It is thus the largest Scott furnace at present in operation. The ore is crushed to pass a 2-inch ring; and is transported from the crusher bins, by an inclined belt-conveyor, discharging directly into the top of the furnace. The side walls of the furnace are built up several feet above the level of the throat, thus giving an auxiliary ore-bin and providing an automatic furnace-feed

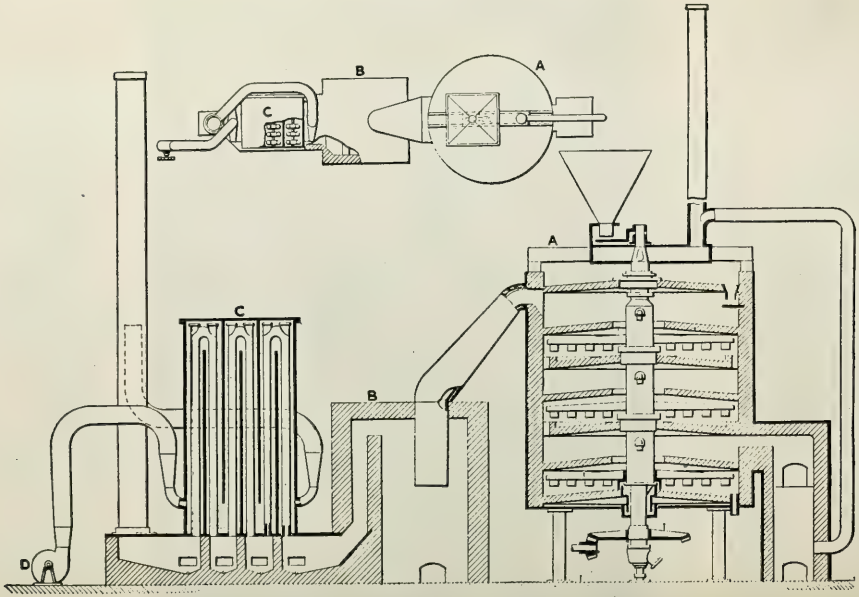
There are eight new condensing chambers connected with this furnace, arranged in a double row. The first chamber in each row is of concrete, and the other three are of tongue and groove redwood, built rectangular. A 3-foot redwood-stave flue connects the last of this series of condensers to the first circular wooden condenser of the Herreschoff series. Crude oil is used for fuel.

Concentration.

Both table concentration and flotation were tried in 1916-1917, but were discontinued in September, 1917. In June, 1916, a concentration

[1]Landers, W. H., The smelting of mercury ores: Eng. & Min. Jour., vol. 102, p. 634, Oct. 7, 1916.

PLATE III.



Plan and Sectional Views of the "Landers Mercury-Smelting Furnace."

plant consisting of a ball-mill and a Deister-Overstrom table was in operation at the old Randol dump, but later moved to another part of the property, as the quicksilver values in the dump material were spotted and too low for commercial work. On June 15th, with the plant running smoothly and apparently doing good work, samples taken every half-hour for 5 hours assayed as follows: Heads 0.03% mercury; tails 0.015%; middlings 0.03%; concentrates 1.16%. The ore treated in the 5 hours amounted to 20 cars of 15½ cu. ft. each. There was occasionally a very little native quicksilver, which was caught by amalgamation on a piece of tin at the concentrate-discharge end of the table.

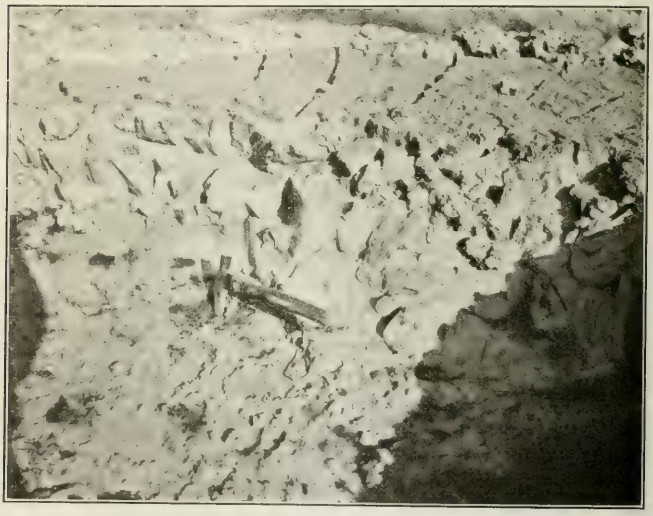


Photo No. 25. Flotation Concentrates drying in the sun, at the Senator Mine of New Almaden Company, Santa Clara County. Photo by W. W. Bradley.

Following that, concentration plants were placed in operation at the Day tunnel and at the Senator mine which is at the north end of the New Almaden property. These plants consisted of crushers, ball-mills and Deister-Overstrom tables. The concentrates were roasted and mixed with ore, in the Herreschoff furnace installed at the Senator. Electric motors furnished the power. In the Day tunnel mill, below the jaw crusher was a 6′ x 5′ Allis-Chalmers ball-mill in closed circuit with a Dorr Simplex classifier. The grinding was regulated so that approximately 87% of the pulp passed 60 mesh. The overflow from the classifier passed through 4 Callow flotation cells, and then to 1 double-deck Deister-Overstrom table. The table was not only crowded (120 tons per 24 hr.) but was compelled to handle an unclassified feed. A 12′ diam. x 6′ high, Dorr settler dewatered the concentrates, followed

by a 6′ diam. x 4′ Oliver filter. The concentrates were handled by motor truck to the Herreschoff furnace. It is stated that the heads sample averaged 0.23% mercury; that the tailings could have been brought down to 0.03% mercury by finer grinding; that the equipment and practice could have been improved so that an extraction of over 80% could have been obtained; but that it cost from $80-$85 per flask (including furnace reduction of the concentrates) to produce the metal, as against $45-$50 per flask by careful sorting and regulation of the ore feeding direct to the furnace. Fine grinding was the expensive part of the process. The ore being largely a hard and tough, silicified serpentine, the steel-liner and ball consumption was high.

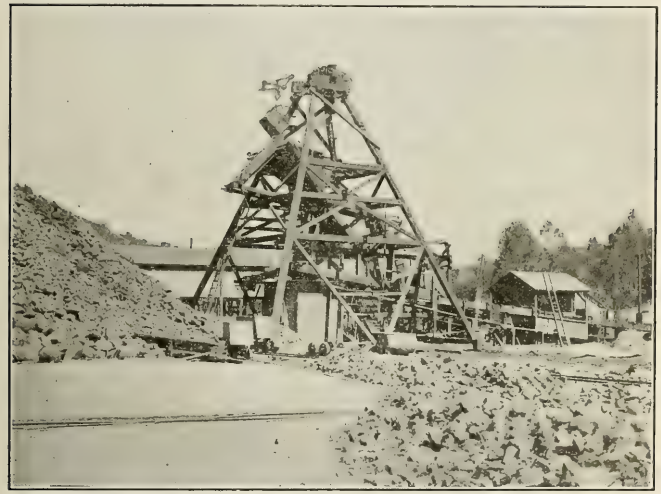


Photo No. 26. Gravel-washing plant for recovering metallic quicksilver from material excavated from old furnace sites, at Hacienda of New Almaden Company, Santa Clara County. Photo by W. W. Bradley.

There is no ochre in the ore, but considerable slime from the serpentine. Screen analyses showed cinnabar in the flotation tailings on the — 80 and — 100-mesh 'chats'.

The flotation plant at the Senator had 3 Callow cells and a Deister-Overstrom table; and at first used two 4′ x 4′ ball-mills. These latter were replaced by a 4½′ x 6′ Marcy mill. The flotation concentrates proved to be messy stuff to handle, and not the easiest thing to dry for convenient feeding to the furnace. According to R. S. Lewis[1] others have found the handling of flotation concentrates far from being an 'unalloyed pleasure.' After passing through the flotation cell, the pulp passed directly to the tables without further classification or

[1]Lewis, R. S., The disposal of flotation products: Min. and Sci. Press, Vol. 114, pp. 473–484, April 7, 1917.

dewatering. Some experiments were tried with dewatering at the Senator plant, but with only slight success, it is stated.

As mentioned above the ground underneath the site of the old intermittent adobe furnaces, and of two of the older Scott furnaces and their condensers, was excavated to bedrock, a depth of 25′ to 30′. This earth, sand and gravel was well-sprinkled and disseminated globules of quicksilver, which had worked their way down from the furnaces during the years of operation here. The material is hoisted and transported by an Alaska-carrier cable, having a bucket of 1 ton capacity. From 50 to 100 buckets per day are hoisted, the men working on a bonus system. The bucket dumps into a bin (see Photo 26) from which the material is fed to a revolving screen with ¾-inch round holes. The — ¾″ material then passes to a 'log washer' (having a screw conveyor); then, successively, through a riffled launder; a Richards pulsator-riffle (Hungarian riffles with a pulsator compartment); and finally through another riffled launder. This has proved to be quite an effective plant for the material being handled. Even the bin at the head had to be made mercury tight with provision for drawing it off as considerable quicksilver settles out there when the bucket is dumped. The larger boulders are handsorted out, in the pit, and dumped to one side of the washing plant.

Timber, Labor, etc.

There is little or no mining timber available in the vicinity of these mines. Sawed timber is brought in by the railroad from outside points. Fuel oil is used at the furnaces. In September, 1917, a total of 105 men were employed, including 60 underground, and 6 at the Senator furnace plant.

Bibl.: [Note—The New Almaden mine and plant have been described by so many writers, that only the principal references are here given. Others will be found in the Bibliography in Part III, of this bulletin.] Cal. State Min. Bur. Repts. 1, pp. 26, 27; IV, pp. 336 et al; VIII, pp. 541–542; X, pp. 604–606; XI, pp. 374–375; XII, pp. 367–370; XIII, pp. 600–601; Bull. 27, pp. 174–186; Bull. 78, pp. 160 et al. U. S. G. S., Mon. XIII, pp. 8, 310–330, 467; Bull. 78, pp. 80–83; Min. Res. 1883–1915 inc. Mining Resources West of Rocky Mountains, 1867, pp. 170-178; 1874, pp. 33, 380, 540; 1875, p. 13; 1876, pp. 4–18, 20. Min. and Sci. Press, vol. 84, pp. 393–404, 1902; vol. 87, p. 201, 1903; vol. 100, pp. 15–16, 446–447; Feb. 16, 1916, pp. 282–284. Eng. and Min. Jour., Vol. 34, pp. 185–186, 334, 1882; Vol. 91, p. 85, 1911; vol. 102, p. 630, 1916. Geol. Surv. of Cal., Geol. Vol. I, p. 68; vol. II, pp. 91–110, 122.

Santa Teresa Mine. Enos Fontis, of Edenvale, owner. This property is 8 miles southeast of San Jose on the east slope of the Santa Teresa Hills. It was developed by the Santa Teresa Quicksilver Mining Company, of which R. H. Harper of San Jose was superintendent. A 40-ton Scott furnace was erected, and several tunnels driven into the hill to cut the vein. The country rock is serpentine, and the ledge matter an alteration product of serpentine through silicification, carrying a low percentage of cinnabar. After working a few years, without

encountering any orebodies of sufficient size or richness to warrant their further exploitation, the mine was abandoned; and is still idle.

Bibl.: Cal. State Min. Bur. Bull. 27, p. 186; Chapter Rept. Bien. period, 1917–1918, in preparation.

Silver Creek Mine (North Almaden). A. R. Bradford et al., owners, 770 East St. John street, San Jose. This property, formerly known as the North Almaden mine, is 12 miles by road southeast of San Jose, on the east side of Silver Creek. A large body of serpentine containing cinnabar was found in Silver Creek gulch, overlying Knoxville gravels. This detached body was evidently due to a great landslide which is plainly visible about the works. It was approximately 1000′ in length, 300′ wide, 60′ in thickness, and was exhausted in a few years, producing about $60,000 worth of quicksilver. Occasional prospecting has been carried on since, but no important ledge has been found in place. The property is equipped with a 20-ton Scott furnace and a pipe retort.

Bibl.: Cal. State Min. Bur. Repts. XII, p. 367; XIII, p. 600; Bull. 27, pp. 187, 235, 238; Chapter Rept. Bien. period, 1917–1918, in preparation.

Wright Mine. Mrs. A. Rodgers, owner, San Francisco. It is 3 miles south of the New Almaden Hacienda, on Llagas Creek, and is said to have produced some high-grade ore many years ago. It is hardly more than a prospect, and has had but little development work done on it. Idle.

Bibl.: Cal. State Min. Bur. Repts. XII, p. 370; XIII, p. 600; Bull. 27, p. 187; Chapter Rept. Bien. period, 1917–1918, in preparation.

SANDSTONE.

An extensive body of hard buff-colored sandstone, which is deposited in beds varying from a few inches to several feet in thickness, occurs at Graystone Station, 9 miles south of San Jose, on the Almaden branch of the Southern Pacific Railroad. This stone was formerly quarried for building purposes in San Francisco, San Jose and other towns, and it was used for the construction of the buildings of Stanford University. There has been no stone cut from this deposit for several years, and the only sandstone quarries now operated in the county are those producing crushed rock, described under the heading, "Stone Industry."

Bibl.: Repts. VIII, p. 547; X, p. 618; XII, p. 399; XIII, p. 637; Bull. 38, pp. 133–138.

STONE INDUSTRY.

Alum Rock Quarry. A deposit of siliceous shale occurs in Alum Rock Cañon a few hundred yards above the end of the car line. This rock is occasionally quarried for local road uses by the City of San Jose. The quarry was idle at the time visited.

Bibl.: Bull. 38, p. 223.

Campbell Gravel Plant. The E. B. and A. L. Stone Company, Rialto Building, San Francisco, owns a bed of gravel and sand in Los Gatos Creek, 1 mile south of Campbell, alongside of the Peninsula Railroad.

The plant was erected in 1912, and was in continuous operation up to the first part of 1919, when it was closed down, due to lack of construction work. The deposit is said to be at least 80 feet in depth and is inexhaustible, as the pits dug in the bed during the year are refilled with gravel and sand in the wet seasons by the swollen creek. The material is mined by a slack line scraper which hauls it to the plant alongside of the creek. Here it is dumped onto a grizzly, the over-size going to a Sturtevant mill, while the under-size is passed through a series of revolving screens and washed. The washed and sized products are then stored in bins, from which they are loaded directly onto trucks, or railroad cars. The water for washing purposes is obtained from a well at the property, and as there is a scarcity, after washing it is returned to settling tanks and re-used. The plant is operated by electric power supplied by the Pacific Gas and Electric Company. The daily capacity of the plant is 300 tons. E. U. Leh, district superintendent for the company, is in charge of this and the Coyote plant.

Coyote Gravel Plant. This plant, erected by the E. B. and A. L Stone Company, in 1913, is on Coyote Creek, ½ mile south of Coyote Station. A spur track of the Southern Pacific Railroad is laid to the property, which covers 15 acres. The gravel bed here is a few hundred feet wide and about 12 feet thick. It is mined by a 70-ton oil burning Bucyrus steam shovel and hauled to the plant by an electric motor train operated by a 3d rail conductor. The plant, equipped with a gyratory crusher, trommels, elevators, washing vats, etc., has a daily capacity of 1000 tons, and is operated by electric power. Sufficient water for all purposes is supplied by a well sunk in the creek. Sixteen men are employed when the plant is operated at full capacity. For several months (last part of 1918 and first part of 1919) the plant has been operating at only part capacity.

Hillsdale Quarry, also known as the **Gay Quarry,** is near Hillsdale Station, 3 miles south of San Jose, at the northern end of the San Juan Hills. The rock is a fine-grained, hard, metamorphosed sandstone, fractured and traversed by clay seams and was formerly quarried for macadam and concrete uses. The machinery has been removed and the land is now used as pasture. Formerly owned by the Security Savings Bank of San Jose, but recently sold to John E. Anderson.

Bibl.: Repts. XII, p. 399; XIII, p. 626; Bull. 38, p. 324.

Quality Sand and Rock Company, formerly known as the **Saratoga Crushed Rock Company.** G. W. C. Baker, president; Wm. T. Macdonald, secretary; office 903 First National Bank Building, San Jose. This company owns and operates a quarry situated in Campbell Creek Cañon, one mile west of Saratoga, just below Congress Springs. The rock is a hard, gray, metamorphosed sandstone, approaching a quartzite, which has been greatly shattered, so that it breaks up readily in small angular fragments. The deposit is approximately 700 feet thick and covers many acres. A bench is now being quarried 300 feet above the road. The rock is loosened by blasting and then quarried by steam shovel, which loads into cars hauled by electric power to the crushing plant. Here it is passed through the usual equipment, consisting of a gyratory crusher, trommels, belt conveyors, washing vats, etc. The crushed and washed products are then conveyed to the storage dump

below the plant. Two concrete lined tunnels 387′ and 115′ in length, respectively, have been driven into the hill under the dump and above the loading bins that are placed alongside of a spur track of the Peninsula Railroad. These are equipped with belt conveyors, and steel doors placed at intervals along the tops of the tunnels, through which the crushed rock is drawn and conveyed to the loading bins. Besides crushed rock, a siliceous sand is produced which is said to be excellent for concrete and plaster use. The entire plant is operated by electric power supplied by the Pacific Gas and Electric Company. Twenty men are employed, producing 450 cu. yds. of crushed rock daily. Chas. C. Bell is superintendent at the plant, which has been in operation since 1908.

Stanfield and Knowles Quarry. This quarry adjoins that of the Saratoga Crushed Rock Company, 1 mile west of Saratoga, on a precipitous hillside, being a continuation of the same hard metamorphosed sandstone. The rock is loosened by blasting, and hauled to the plant alongside of the road by a drag line scraper. Here the rock is crushed, sized and stored in the loading bins, from which it may be drawn into cars or trucks. Electric power is used. The quarry has been worked for the past twelve years. Three men are employed. Owners, Jim Stanfield and Dr. Knowles, of Los Gatos.

Stanford Quarry. A deposit of basalt which outcrops on the Stanford Estate, one mile back of the university, is quarried to supply crushed rock for macadam and building purposes about the university. Some of the rock is sold to contractors, principally for road use, the balance being used locally at the university. The basalt flow covers many acres, and the quarry is a circular cut, a couple of hundred feet in diameter with a face 100 feet in height. It is equipped with a crushing plant, consisting of a No. 5 gyratory crusher, trommel, bucket elevator, small jaw crusher. Two electric motors of 40-h.p. and 20-h.p., respectively, are used to operate the plant. Twenty-five men are employed. J. E. Hewsted is general superintendent, and F. Capperman is in charge of the quarry, which is operated by the university authorities.

SANTA CRUZ COUNTY.

By E. Huguenin and W. O. Castello.

(Field work in 1919.)

Santa Cruz County, created February 18, 1850, is one of the original twenty-seven counties of the state. Its name, signifying "Holy Cross" was derived from the cross which marked the site of the mission which was founded upon its shores by Padres Lopez and Salzar. This county, consists of 7437 square miles, and has a coast line of about 40 miles. San Mateo and Santa Clara counties are on its north, Santa Clara on its east with Monterey adjoining it on the south.

The city of Santa Cruz, the county seat, lies along the north shore of Monterey Bay, and is one of the most attractive seaside resorts of California, boasting of a fine bathing beach, combined with a delightfully equable climate, within easy access of San Francisco by rail or highway.

Watsonville, located along the Pajaro River, which forms the southern boundary of the county, is second in size, with a population of approximately 7000 and is a thoroughly modern town, being the shipping center of the fertile Pajaro Valley.

TRANSPORTATION.

The county is readily accessible as it is traversed by a line of the Southern Pacific Railroad from San Jose via Los Gatos to Santa Cruz, having a branch line at Felton which follows the San Lorenzo River northward.

Another line of the same company follows the coast southwestward from Santa Cruz to Watsonville, connecting with the main line at Watsonville Junction two miles eastward. A branch line also follows the coast from Santa Cruz northward to the plant of the Santa Cruz Portland Cement Company at Davenport. A municipal pier constructed at a cost of over $100,000 allows docking of deep sea ships. Several highways make the county readily accessible to the motorist.

TOPOGRAPHY AND GEOLOGY.

The geology of the greater portion of the county has been described in detail by J. C. Branner, J. F. Newsom, and Ralph Arnold, in the Santa Cruz Folio, No. 163, issued by the U. S. G. S., from which the following general description is taken, and to which the reader is referred for greater detail:

The curving shore line of the Pacific Ocean and Monterey Bay and the corresponding curve of the Castle Rock Ridge, which forms the eastern boundary of the county, enclose an irregular crescent-shaped area averaging 20 miles in width, and of fairly mountainous character, the general trend of the ridges being northwest and southeast. The main ridge is the Castle Rock Ridge, which consists essentially of heavy bedded sandstones and Monterey shales. It rises to elevations of over 3000 ft. and forms an escarpment with a steep northeastern slope bordered by the line of valleys lying along the San Andreas fault line. Ben Lomond Mountain, which lies between Castle Rock Ridge and the ocean, running parallel to the main ridge, has been formed by the

upward tilting of a granite block along the Ben Lomond fault, forming a mountain with a steep escarpment towards the northeast and a long gentle slope along the southwest, which extends to the ocean.

The hillsides are generally steep, covered with a deep coating of soil, and cliffs are rarely found on them. Away from the ocean the hills are densely wooded, and in the region of the San Lorenzo River are several redwood groves containing trees of gigantic size.

The Monterey shale areas which cover the greater portion of the county are characterized by steep, narrow, V-shaped cañons and high ridges with steep slopes, while the massive sandstone beds of the Vaqueros formation generally produce a comparatively rugged topography. Filled U-shaped valleys are developed in many places along the sea coast, as are well-developed sea terraces. Isolated patches of micaceous schist and highly crystalline white limestones occur lying above the granite core of Ben Lomond Mountain northwest of Santa Cruz and west of Felton. They have been broken and shattered by the intrusion of the granite, and appear from their extreme metamorphism to be older than the Franciscan formations.

DRAINAGE AND WATER SUPPLY.

The main drainage system of the county is that of the San Lorenzo River, which rises in the Castle Rock Ridge and flows southeastward along its base, draining the eastern slopes of Ben Lomond Mountain and emptying into the sea at Santa Cruz. It drains an area of 126 square miles, almost one-third of the territory of the entire county. The Pajaro River drains the southern portion of the county, flowing in general westward and entering Monterey Bay at the southern boundary of the county. Numerous small perennial streams flow from the west side of Ben Lomond Mountain to the sea. These streams have cut back rapidly into the soft sediments which form the western slopes, so that the lower parts of their channels are fairly well graded.

Santa Cruz has but a few small springs and is dependent upon the numerous perennial streams for its water supply. The region drained by the headwaters of the San Felipe River, as well as the coastal region, is kept moist during the dry season by dense fogs which drift from the sea up the valleys. In the winter and spring heavy rainfall occurs. This rainfall, combined with the summer fogs common to that region, made possible the dense growth of redwoods that formerly covered most of that country, but few of which remain.

MINERAL RESOURCES.

By referring to the table of mineral production of Santa Cruz County it will be seen that while the production is fairly large, amounting to a total of $18,436,088 for the period from 1894 to 1918, inclusive, the variety of minerals produced has been very small, and practically confined to the structural materials, bituminous rock, cement (which is included under unapportioned so as to conceal the output of the individual producer), clay, lime, and stone (which includes crushed rock, sand, and gravel). A fairly large production of limestone for commercial purposes is also reported. Minerals that are known to occur in the county other than those listed in the table are coal, gold, iron, mineral water, petroleum, and silver. The production, in order of its value to date, is: cement, lime, bituminous rock, limestone, stone industry and

those combined under "miscellaneous," including asphalt, brick, clay, and granite. There are no segregated, county figures available earlier than 1894.

ASPHALT AND BITUMINOUS ROCK.

The bituminous rock deposits of Santa Cruz County have long been known. The name "bituminous rock" is rather misleading, as the material is a porous, loose, fine to fairly coarse-grained sandstone impregnated with asphaltum. The most important and only deposits worked in recent years of this so-called bituminous rock are those of the City Street Improvement Company described below, located in the west slopes of Ben Lomond Mountain, approximately five miles in an air line northwest of Santa Cruz. Quoting from the U. S. G. S., Santa Cruz Folio, "The bituminous rocks are sandstone beds lying near the base of the diatomaceous shale, which is referred to the Monterey. Most of the sandstone beds which immediately underlie or are intercalated with the diatomaceous shale of this locality are more or less bituminous. The structure is monoclinal, with a gentle southwest dip, hence the asphalt-bearing strata crop out along the sides of the southwestward-flowing streams where these have cut down nearly or quite to the bottom of the shale.

The zone of the bituminous rock is exposed near the base of the diatomaceous shale from Santa Cruz northwestward as far as the western side of the Big Basin, a distance of more than 20 miles. Throughout this distance the dip of the lower part of the diatomaceous shale and of the immediately underlying sandstone is gently to the west and southwest. At many places through this district the sandstone beds are more or less bituminous, but at only one locality have they been found to be of commercial value.

Bibl.: U. S. G. S. 22nd An. Rept., Part I. pp. 383-405; Geological Folio 163.

Cowell Mine. This deposit of bituminous sandstone is situated 8 miles by road northwest of Santa Cruz and ½ mile east of the City Street Improvement Company's mine. There is no road connection between the two, so that when working it is necessary to haul the material by road to Santa Cruz. The bituminous sandstone bed here varies from 12′ to 20′ in thickness and is overlain by a heavy bed of the diatomaceous shale. The bed has been exposed by several open cuts, each of several hundred feet in length. It is worked occasionally in a small way for local use. Owner, Henry Cowell Lime and Cement Company, 2 Market street, San Francisco.

Bibl.: Repts. X, p. 621; XII, p. 28; XIII, p. 44. U. S. G. S. 22nd An. Rept., Part I, pp. 399-404.

Santa Cruz Bituminous Rock Mines (formerly the **Walrath Mines**) are also known as the **Pacific Improvement Company's Mines.** This deposit has been worked for over thirty years, and is situated at an elevation of from 800′ to 900′ above sea level. There are three distinct layers of the bituminous sands, which lie fairly flat. The lower bed or strata is about 7′ thick and has not been developed to any extent, as the work has been confined to the upper and heavier beds. Above the lower bed is a layer of sand 8′ thick containing a low percentage of bitumen.

Table of Mineral Production of Santa Cruz County—1894 to 1919, Inclusive.

	Lime		Limestone		Bituminous rock		Stone	Miscellaneous and unapportioned	
1894	167,000	138,200	4,000	5,000	20,782	79,980			
1895	145,000	133,750	12,055	12,055	32,067	102,486	4,000	75 M brick	375
1896	116,000	95,500	27,827	28,633	43,843	109,536	4,000	497 M brick	2,485
1897	149,600	111,800	10,688	8,005	43,179	123,056		300 M brick	1,500
1898	151,000	151,000	7,912	5,738	40,598	113,898			
1899	161,893	176,893	4,135	3,780	27,503	70,560	200		
1900	163,985	131,288	1,669	1,213	21,960	58,590			
1901	161,500	161,500	3,845	3,595	13,580	30,654		10 tons clay	30
1902	185,223	161,302	1,850	1,850	31,700	41,084		105 tons asphalt	1,000
1903	220,835	185,442	3,000	2,725	18,426	45,190	20,756	700 cubic feet granite	140
1904	293,207	306,775	[1]	[1]	[1]	[1]	2,925		
1905	218,084	199,974	7,325	52,125	17,583	42,560	1,756		
1906	255,469	347,490	11,431	55,242	13,544	38,866	3,500		
1907	213,599	241,179	6,370	6,000	21,955	64,707	14,800		
								470 cubic feet granite	336
1908	119,996	119,996	1,178	2,167	25,041	85,123	19,736	28,400 tons clay	28,400
								63,541 tons clay	13,800
1909	228,875	296,785	3,457	5,273	31,392	110,067	20,717	Unapportioned, 1900-1909	1,791,294
								52,976 tons clay	15,981
1910	214,137	230,513	4,361	6,770	35,565	124,195	23,425	Unapportioned	2,096,631
1911	216,508	206,225	22,622	44,591	24,815	80,371	7,627	Unapportioned	2,448,339
1912	169,646	159,505	7,507	7,553	32,146	80,439	22,710		879,457
1913	75,000	60,000	39,494	30,994	26,932	67,330	10,511	Apportioned	1,647,970
1914	173,282	157,011	14,666	25,082	40,540	115,700	4,276	Unapportioned	1,341,089
1915	191,643	177,873	2,047	4,873	17,399	60,728	6,794	Unapportioned	1,331,268
1916	176,263	225,485	4,318	9,820			2,815	Other minerals[2]	1,440,991
1917				185,156			2,368	Other minerals[3]	1,180,800
1918	182,083	285,316	7,132	15,313			9,107	Other minerals[4]	2,569,717
1919	150,271	234,039	5,527	12,690			17,074	Other minerals	1,981,233

Bituminous rock	$2,225,333
Lime	4,460,882
Limestone	733,402
Stone industry	179,085
Miscellaneous and unapportioned	19,105,201
Total	$26,703,993

[1]Included in unapportioned 1900-1909.
[2]Cement, marble and bituminous rock.
[3]Cement, potash and bituminous rock.
[4]Cement, potash and bituminous rock.

Above this is the middle bed, which is a rather coarse-grained sandstone averaging 30′ thick, and containing from 10% to 14% asphalt. Upon this rests a bed of diatomaceous shale which varies from 50′ to 60′ in thickness. Above this lies the top strata, a fine-grained, hard, bituminous sandstone carrying from 14% to 18% asphalt and varying from 6′ to 22′ in thickness. These beds have been exposed by open cuts for over a thousand feet and may be traced for a couple of thousand feet. It has been estimated that the deposit will yield several million tons before being exhausted.

The material was formerly mined by removing the shale capping by blasting and a drag line scraper, then augurs were used to bore holes through the bituminous bed. The holes were blasted by using one-half pound of dynamite to spring the bottom of the hole for the blast, for each keg of powder. Seven kegs of powder, containing 25 pounds each, was the usual charge. Large blocks were dynamited and broken into small pieces, which were loaded by hand into three-ton skips. The skips were in turn lifted by means of two 80′ guy derricks onto trailers which were hauled three miles to the railroad by a steam tractor, hauling 40 to 50 tons per load. A stiff-leg derrick at Godola, the railroad station, was used to empty the material from the skips onto the flat cars for transportation. Oil burning donkey engines were used to operate the derricks. The water used was pumped from a spring several hundred feet below the quarries by means of two large overshot water wheels. An average of 20 men were employed during nine months of the year.

During the recent war period, the quarry was worked only occasionally, about 2000 tons being sold to the United Railroads of San Francisco and, more recently, several hundred tons, to the City of Santa Cruz. This material was hauled by auto trucks, out of the face of the quarry, without disturbing the overburden.

The material is prepared for road use by mixing, into the proper proportion of sand, stone dust, and such other materials as are necessary, in a Torpedo mixer, which is a revolving conical shaped drum, heated by oil, and mounted on a conveyance, so that it can be hauled to the location at which the road work is being done. The excellency of this material for road and street work is demonstrated by several streets in San Francisco, which were laid over 20 years ago and are still in excellent condition. The enormous amount of this bituminous sandstone so readily accessible should be a great factor in the building of good roads in California.

Owner, City Street Improvement Company, 166 Geary street, San Francisco, J. H. Bishop, manager; W. E. Flannagan, resident superintendent at Santa Cruz.

Bibl.: Repts. XII, p. 28; XIII, p. 43. U. S. G. S. 22d Annual Report, Part I, pp. 384-394; Santa Cruz Folio Cal. Journal of Technology, August, 1913.

Thurber's Quarry. This deposit is north of and adjoining the City Street Improvement Company at 950′ elevation. The bed of bituminous sandstone here varies from 10′ to 30′ thick and has not been extensively developed. Some work was done several years ago, but it has lain idle since. The material is said to be not as uniform as that of the adjoining deposit and comparatively little of the bitu-

minous rock has been utilized. Owner, Consolidated Bituminous Rock Company, Nevada Bank Building, San Francisco.

Bibl.: Repts. VII, p. 96; VIII, p. 554; XII, p. 29; XIII, p. 44. U. S. G. S. 22d An. Rept., Part I, pp. 393-396.

CEMENT.

Santa Cruz Portland Cement Company. The manufacture of cement in Santa Cruz County began with the operation of this company's plant in 1907, since which time it has been the largest producer in California, although not working up to full capacity. The plant is situated on the coast at Davenport, 13 miles northwest of Santa Cruz, on both the Southern Pacific and Ocean Shore railroads. The quarry from which the limestone is taken for the manufacture of the cement is 3 miles northeast of the plant along the northwest side of the San Felipe Cañon. The present quarry face at the highest point is at least 500′ high and it has been opened by a semicircular cut, several hundred feet in diameter. The stone is coarsely crystalline, white to blue limestone, similar to that at other quarries in the county. It is shattered and broken and traversed by seams of clay. It comes from the quarry in huge irregular blocks, which are broken by blasting into pieces sufficiently small to enter the No. 9 gyratory crusher installed at the reserve bins below the quarry. The stone is quarried by driving a short tunnel, with air drills, and drifting across the face, forming a T. This is loaded with dynamite and the whole face caved, bringing down thousands of tons at one charge. The broken rock is loaded into 3-ton steel cars, and trammed to the large storage bins, where it is put through the crusher. From the bins the limestone is drawn into 20-ton side dump cars and hauled by a steam locomotive over a standard gauge railroad, owned by the company, to the plant at Davenport. Eight cars are hauled per trip, making a trip every hour. The clay required is shipped in from the company's clay bank at Glenwood, a station on the Southern Pacific in the Castle Rock Ridge Mountains, where it is mined by steam shovel.

The following description of Portland cement and its manufacture is given for the benefit of those who are not familiar with it:

[1]"Portland cement was invented by Joseph Aspdin of Leeds, England, and was thus named from its fancied resemblance, when set, to the well known oölitic limestone of Jurassic age quarried for building purposes on Portland Isle, Dorsetshire, England. Portland cement is the product obtained by finely pulverizing clinker produced by calcining to incipient fusion an intimate mixture of properly proportioned argillaceous and calcareous substances, with only such additions subsequent to calcining as may be necessary to control certain properties. Such additions shall not exceed three (3%) per cent of weight of the calcined product. Chemically, Portland cement is a combination consisting principally of silicates and aluminates of lime, and the raw materials must necessarily contain silica, alumina, and lime.

"The first process in the manufacture of Portland cement is the mixing of raw materials. In order that this mixture may be uniform

[1]U. S. G. S., Mineral Resources, 1914, Part II, pp. 222–223.

and homogenous and the respective ingredients properly proportioned, they must be reduced to a fine powder. * * * ''

At the plant of the Santa Cruz Portland Cement Company the limestone hauled from the quarry is dumped into bins from which it is passed through two No. 6 gyratory crushers and by belt conveyor to oil-fed rotary driers. The dried product is then conveyed to the ball mill bins and into a set of ball mills, where it is reduced to the size of sand grains. It is sampled automatically and the percentage of the constituents determined. The clay which is stored in bins along the railroad track by means of a steam shovel is drawn out of the bins into 5-ton cars and hauled by cable to a bin from which it is conveyed to a rotary drier and in turn to a separate set of ball mills. The clay is also automatically sampled, and to every 1000 lbs. of the limestone from the ball mills is automatically added the necessary weight of the clay to give the required mixture. This mixture is effected in a double screw conveyor which introduces the material to the tube mills for grinding, where a thorough mixture is obtained. The raw mixture before burning is made up approximately as follows: 75% lime carbonate, 20% silica, alumina and iron oxide, 5% impurities, which include magnesia, sulphur and some alkalies. The mixture is next conveyed to the 125-ft. rotary oil-burning kilns, where it is heated to incipient fusion, the resultant clinker being grayish or bluish black in color. The clinker is dropped into pits below the kilns from which it is drawn out in cars to the yard. It is dumped on the storage pile in yard ($\frac{1}{2}$ million tons capacity) by means of an electrically operated aerial tramway suspended between two high steel towers. A series of concrete tunnels equipped with belt conveyors, below the storage clinker dump conveys the clinker to a series of Williams pulverizers and tube mills for the final grinding, gypsum up to 2% being added just before the final grinding. Extreme fineness of grinding is very essential for a good Portland cement, and of the finished product 90% to 95% will pass 100 mesh, and 75% to 85% through 200 mesh.

The plant is equipped with 12 ball mills, 24 tube mills, and 24 125′ kilns of which only 14 are in use. The total capacity of the plant is 12,000 bbls. daily. The present output is 8000 bbls. Electric power is used throughout the plant and at the quarry to operate the compressors, tramway, crusher, etc. From 350 to 500 men are employed depending upon the output. Fred Davis is in charge of the plant. This company also operates the cement plant at Napa Junction under the name of the Standard Portland Cement Company. Geo. F. Cameron is president, home office, Crocker Building, San Francisco.

CLAY.

The only clay now produced in the county is the argillaceous shales mined at Glenwood by the Santa Cruz Portland Cement Company (see Cement). There are several good deposits of clay in the vicinity of Glenwood, and some common clay suitable for burning brick along the San Lorenzo River. During the early 90's two brick yards were in operation, both of which were situated on the San Lorenzo River, but have since been dismantled.

Bibl.: Repts. X, p. 625; XII, p. 383; XIII, p. 619.

COAL.

Several small veins of soft coal are known to occur in the Santa Cruz Mountains, but they have never been developed and are not of commercial value.

GOLD.

Gold is found in Santa Cruz County in auriferous black sand deposits; in placers of several creeks that flow down from Ben Lomond Mountain; and in small quartz veins on Ben Lomond Mountain, one of which was mined in the early 80's by F. B. Stirling[1] of Santa Cruz.

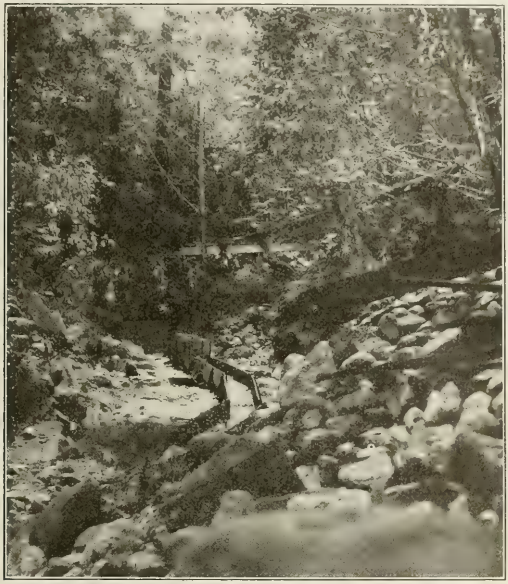


Photo No. 27. Sluice boxes of C. H. Jewitt in Gold Gulch. The six-inch pipe for carrying water up gulch is seen running along right side of and above the creek.

The discovery of a huge boulder containing a large amount of gold, upon which it is reported the Hihn fortune was founded caused some excitement and led to considerable prospecting.

The following account of the gold extracted is taken from the History of Santa Cruz County by Harrison, page 203:

"In Santa Cruz County gold has been found at various times and in varying quantities, but no systematic effort has ever been made to develop this resource. A cañon known as Gold Gulch shows colors in almost any part of it, and wages have been made with a pan and shovel in this locality in days gone by. Many years ago a huge boulder was

[1]See Rept. VIII, pp. 551-552.

discovered in this cañon, from which was extracted $35,000 in gold. Whether this boulder was detached from a lead in the immediate vicinity or whether ages ago it was broken from the mother lode in the Sierras and found its way here, is a question that has not been determined."

A tunnel which is said to be over 900 ft. long was driven in the east slope of Ben Lomond Mountain above Gold Gulch in the hope of striking the lead from which the boulder originated. This tunnel is run in the soft sediments and is now caved. The parties doing the work abandoned the project after spending all their funds without finding the supposed lead.

The formations here are so faulted and broken that there is little hope of finding any continuity to any small stringers that might be encountered.

C. H. Jewitt of Santa Cruz formerly worked the placer deposits in Gold Gulch 2 miles south of Felton, under a two-year lease from the F. A. Hihn Estate. A centrifugal pump operated by a gas engine, installed above the mouth of the creek on the San Lorenzo River, pumped the water up the gulch through a 6" pipe. A "giant" nozzle was used against the gravel bank which was washed down through a series of sluice boxes.

Deposits of **auriferous black sands** occur along many of the beaches, particularly those along the northern shore of Monterey Bay extending from Soquel Point to the mouth of the Pajaro River. In the vicinity of Leonard Station these sands have been washed during the winter months, at intervals, for many years, the washers averaging from $2 to $3 daily per man.

Auriferous black sands are found on the Lizzie Leonard ranch ½ mile east of the coast in the low rolling sand hills which were formerly a sea beach. The black sands occur in strata from a few inches to several feet thick interstratified with light beach sands, and are said to carry a small amount of platinum as well as gold. The following varying analyses of samples of the black sands at Aptos, show a uniform low gold content. Many attempts have been made to extract the gold from these sands, none of which have been commercially successful.

POUNDS PER TON.

	Magnetite	Chromite	Ilmenite	Garnet	Olivene	Zircon	Quartz	Unclassified	Gold
1	668	8	340	10	9	26	752	189	$0.62
2	502	26	230		4	18	1,046	170	.62
3	668	126	224	2	52	22	744	162	.62
4	672	72	250	1	62	24	814	104	.62

GRANITE.

Some granite was quarried from Ben Lomond Mountain several years ago. This stone is classified as quartz diorite, and is a fair building material. The stone is not at present used, however, due to its inaccessibility and distance from the market.

IRON.

Iron occurs in the auriferous black sand deposits on the Leonard ranch. Attention was recently directed to these deposits by a report prepared by L. T. Bachman, chemist of the Santa Cruz Portland Cement Company at the instigation of the Santa Cruz Chamber of Commerce for the purpose of determining the commercial possibilities of the manufacture of red oxide of iron and obtaining the gold and platinum as by-products from these sands. A complete survey of these sands was recommended before attempting any other work.

So far as could be determined there is no immediate likelihood of this work being undertaken.

LIME AND LIMESTONE.

Large bodies of highly crystalline white to bluish-white limestone or marble occur on Ben Lomond Mountain northwest of Santa Cruz and west of Felton. The limestone is shattered and broken and is not suitable for use as marble, but, it is in general very pure, running from 95% to 98% calcium carbonate, and is utilized for several purposes.

Six quarries are now being operated, the most important and largest ones for the manufacture of cement and the burning of lime. The stone from the smaller quarries is used for concrete work, for macadamizing streets in Santa Cruz, for flux, fertilizers, and formerly, to a small extent, for the manufacture of carbon dioxide.

The first lime kiln built in Santa Cruz County was in 1851 by I. E. Davis and A. P. Jordan; it afterward became the property of Henry Cowell. The old pot kilns may still be seen alongside of the Cowell road running from the Henry Cowell quarry to Rincon.

The burning of lime is the oldest mineral industry of the county, and second in importance to the manufacture of cement.

Caplatzi Quarry, formerly known as the **De Doro Quarry,** is located at the end of Spring street, Santa Cruz, about 2 miles northwest of the Southern Pacific depot, at an altitude of 250 feet. The rock is a coarse to fine-grained, highly crystalline, bluish-white limestone shattered and broken. It is worked by a large irregular cut, with a present face 40′ to 50′ high and several hundred feet in length, and quarried by air drilling and blasting. The stone is hauled by one-horse dump-carts to the crushing plant, which consists of a No. 4 Gates and a No. 2 Eureka crusher, 42″ Buhr mill, rolls, bucket elevators, screens, etc. The plant is operated by electric power. The limestone is ground for fertilizer (20 to 25 mesh), for poultry food (4 to 10 mesh) for flux (2″ and over); and also for concrete work. This quarry has been operated since 1907 by the present owner, W. A. Caplatzi of Santa Cruz. Seven men are employed.

Henry Cowell Lime and Cement Company, S. H. Cowell, president; W. H. George, secretary; home office No. 2 Market street, San Francisco. This company is at present operating the two following quarries in Santa Cruz County, both of which were opened many years ago and have been continuous producers since.

Henry Cowell Quarry.

This quarry is 2 miles northwest of Santa Cruz and one mile up a cañon beyond the old quarry first worked by Henry Cowell, where

is situated the pot kilns. Limestone outcrops in this cañon in many places and the deposit now being worked is very extensive, covering several acres. The limestone, usually covered with an adobe clay which has been washed down through the numerous cracks, lies fairly flat, dipping to the northwest. The stone is coarsely crystalline, white to grayish white. It has been quarried at several places along the cañon, but the present quarry is the largest, with a face over a hundred feet in height and several hundred feet in length. The stone is quarried by hand drilling, using giant powder to cave the face. It is shoveled into 5-ton wagons and hauled by 5-horse teams to the kilns. The coarsely crystalline white limestone is hauled to the pot kilns near the ranch house. Here are three kilns of 1200 bbl. capacity each, equipped with oil burners. About five days is necessary to thoroughly burn this stone. The dense and medium grained grayish blue limestone is hauled to the company's kilns at Rincon Station on the Southern Pacific Railroad, three miles northwest of Santa Cruz. A greater heat is necessary to burn this stone. The plant at Rincon consists of four 34-ft. oil-burning Standard continuous kilns. A set of three pot kilns of 1600 bbls. capacity each, is being built here to replace the old pot kilns at the ranch house. This will eliminate the heavy cost of transporting the fuel by wagons and concentrate the work at the railroad. The barrels in which the lime is packed are made in a cooper shop at the Rincon plant from redwood cut on the Cowell Ranch above Felton. An average of 50 men are employed at this quarry and at the two kilns.

Bibl.: Repts. VIII, p. 554; XII, p. 395; XIII, p. 631; Bull. 38, pp. 83–85.

I. X. L. Quarry.

This quarry is situated 2½ miles northwest of Felton at an elevation of about 800 ft. above sea-level. Steeply dipping beds of coarsely crystalline limestone form a bold projecting hill which lies at the confluence of two deep cañons. This hill is several hundred feet in height and has been quarried at several places. The limestone is shattered, and in places traversed by seams of silica, which has replaced the lime. The face of its present quarry is about 200 ft. in height. The stone is hauled by team to the three pot kilns located below the quarry. Wood, obtained from the surrounding hills, is used for fuel at these kilns. A cooperage is also maintained here to make the necessary barrels for packing the lime. About 20 men are employed. A. S. T. Johnson is superintendent for the Henry Cowell Lime and Cement Company, at Santa Cruz.

Bibl.: Repts. VIII, p. 555; XII, p. 395; XIII, p. 631; Bull. 38, pp. 86–87.

Holmes Lime and Cement Company, John Buck, Jr., president; O. M. Tupper, manager; home office, Postal Telegraph Building, San Francisco. This company owns and operates a quarry 2 miles northwest of Felton, ½ mile south of the I. X. L. Quarry. The limestone is exposed along the strike northwestward from the base to the top of a mountain of about 1000 ft. It is shattered and mica schist occurs in irregular patches through the deposit. There are several cuts at dif-

ferent elevations on the mountain, the principal working being about half-way up the mountain. The stone is hauled by a tram to the kilns near the town of Felton. There are four pot kilns and two Standard continuous kilns at this plant. Crude oil is used for fuel. The lime is barrelled at the kilns in barrels made at the property. An average of 30 men are employed during the greater part of the year. This quarry has been in operation over forty years.

Bibl.: Repts. VIII, p. 554; X, p. 626; XII, p. 395; XIII, p. 632; Bull. 38, pp. 85–86.

Miller Quarry, formerly known as the **Thurber Quarry**, is 2 miles northwest of Santa Cruz and south of the Caplatzi Quarry. The limestone is similar to that found in the other deposits of that vicinity. It is worked by a large shallow cut, the rock being crushed in a jaw crusher. The product is used for road and street work in Santa Cruz. Worked occasionally during past 20 years. Idle when visited. Owner is W. E. Miller, 81 Church street, Santa Cruz.

Bibl.: Rept. XIII, p. 631; Bull. 38, p. 88.

Santa Cruz Lime Company formerly operated a limestone quarry three miles inland from Davenport and adjoining the property of the Santa Cruz Portland Cement Company. Comparatively little lime was burned and the company is not now operating.

Bibl.: Bull. 38, pp. 87–88.

MINERAL SPRINGS.

There are a number of small sulphureted springs in Santa Cruz County, only one group of which has been improved and utilized commercially. This is known as **El Pajaro Springs** and is situated near the northern bank of the Pajaro River at Chittenden Station. A resort is conducted here with hotel accommodations, under the management of Geo. Sully of Chittenden. The following description is quoted from the report of Gerald A. Waring.[1]

"At least 12 cool, strongly sulphureted springs issue at this place along a sloping bank about 20 feet high that borders a flat willow-grown area along the river. The springs rise at intervals of a few yards for a distance of about 120 yards along the bank, being 25 to 50 yards from the edge of the river during the normal stages of the water. Three of the springs, each of which yields 1 or 2 gallons a minute, have been used locally for many years for drinking. One of these has been known as the Railroad Spring, as it has been a favorite with some of the railroad men. The other two, which are about 75 yards northwest of it, are known as White Sulphur Springs. The water of the Railroad Spring has the dark appearance that is characteristic of so-called black sulphur springs, but it becomes milky from suspended sulphur when it stands in an open vessel for a short time. The water of the White Sulphur Springs becomes milky and deposits native sulphur after flowing a few yards from the sources. The difference between the Black Sulphur or Railroad Spring and the White Sulphur Springs is possibly due to different degrees of oxidation of the sulphide constituents in the water as it reaches the surface.

The same feature is shown in several minor springs of the group.

[1]Springs of California, U. S. G. S. Water Supply Paper 338, pp. 274-276.

"The springs were long known locally as Chittenden Sulphur Springs, but were not improved until 1909 when concrete basins were constructed around the springs and the property opened to the public as Shale Sulphur Springs. Later the name was changed to El Pajaro.

"The following analyses of water from the Railroad Spring and the larger of the White Sulphur Springs show them to be secondary alkaline, primary saline waters:

Analyses of Water from El Pajaro Springs, Santa Cruz County, California.

(Constituents are in parts per million.)

	1		2		3	
Properties of reaction:						
Primary salinity		37		31		
Secondary salinity		0		4		
Tertiary salinity		0		0		
Primary alkalinity		1		0		
Secondary alkalinity		62		65		
Tertiary alkalinity	(?)		(?)			
Constituents	By weight	Reacting values	By weight	Reacting values	By weight	Reacting values
Sodium (Na)	199	8.83	159	6.94		
Potassium (K)	4.3	.11	4.5	.12		
Lithium (Li)	0	.00	0	.00		
Barium (Ba) and strontium (Sr)	0	.00	0	.00		
Calcium (Ca)	154	7.63	182	9.08		
Magnesium (Mg)	83	6.81	84	6.88		
Iron (Fe) } Aluminum (Al)	6.2	.22	2.8	.10		
Sulphate (SO_4)	150	3.12	234	4.85	85	1.77
Chloride (Cl)	193	5.45	109	3.08		
*Sulphur (S)	.4	.02	.8	.05		
Carbonate (CO_3)	402	13.41	392	13.07		
Metaborate (BO_2)	0	.00	0	.00		
Phosphate (PO_4)	0	.00	0	.00		
Silicia (SiO_2)	58	1.92	57	1.88		
	1,249.9		1,225.1			
Carbon dioxide (CO_2)	Present	Present	Present	Present		
Hydrogen sulphide (H_2S)	4.8	.28	8.6	.50	28	1.67
Methane (CH_4)			Present	Present		

*In suspension.

1. Railroad Spring. Analyst, Riddell and McCreary (1908). Authority, owner of springs.
2. White Sulphur Spring. Analyst, Riddell and McCreary (1908). Authority, owner of springs.
3. White Sulphur Spring. Analyst and authority, F. M. Eaton (1909).

"The first two samples were analyzed several weeks after they were collected. In order to determine, if possible, to what extent change had taken place in the unstable sulphur compounds between the times of collection and analysis, a sample from the White Sulphur Spring was later collected in a bottle containing iodine solution, so that the sulphide constituent was at once precipitated as sulphur according to the reaction $H_2S + 2I = 2HI + S$ and could be determined independently of the sulphate radicle. The sulphide and sulphate constituents were then determined within a few days of the time of collection, with the results shown in the analysis by F. M. Eaton. These results are not very satisfactory, however, for although the content of hydrogen sulphide is much greater in the sample treated with iodine than in

the other, the much smaller amount of sulphate indicates that there was a marked change in the concentration of the water during the year that intervened between the collection of the two samples. However, in the first samples there appears to have been a considerable increase in the amount of sulphate in the water on standing, and a decrease in the sulphides, a change that probably somewhat alters the medicinal properties of the water. Although sulphides were not reported in the analyses, the change that takes place in the sulphur compounds when the water stands for a time is believed to show that sulphides are present.

"Considerable inflammable gas rises in several of the springs. Analysis[1] of a sample of this gas indicates that it consists principally of methane (marsh gas, CH), with carbon dioxide (CO_2), and hydrogen sulphide (H_2S).

"A third of a mile north of El Pajaro Springs are two other springs, or wells. One issues at the base of a steep hillside through a 12-inch casing. A few bubbles of gas rise with the water and the surface of the pool that surrounds the casing is covered with a film of oil. The spring yields about 1½ gallons a minute of sulphureted water that becomes milky by the time it reaches a watering trough 10 yards away. The other spring is situated in meadowland, 300 yards northwest of the first. It yields perhaps 8 gallons a minute of clear water that is not noticeably sulphureted. It has been piped to a near-by storage tank for supplying cattle troughs.

"The rock of this area is light-colored shale of Tertiary age. Oil is obtained from wells a few miles to the northeast. The fault zone along which the earthquake of April 18, 1906, took place passes through the locality. The shale along the fault zone has been crushed by the earth movements, and landslides have been caused by the shocks. The issuance of gas and sulphur water along this zone of shattered material, where escape for them has been furnished, is noteworthy."

NATURAL GAS AND PETROLEUM.

There has been no commercial production of petroleum in Santa Cruz County although several small seepages, have been found and a few wells drilled. A well drilled to a depth of 700 ft. in 1901 on the Hughes tract 5 miles north of Watsonville is said to have encountered a 40′ bed of oil sands at 160′ depth and a 100′ stratum at 490′. A heavy flow of gas was struck at 640′ and the gas was utilized in the boilers for deeper drilling. The well was lost due to a heavy flow of sands and no further work has been done at this location.

Quoting from the report[2] of J. C. Branner, J. F. Newsom and Ralph Arnold.

[1]Analysts, Riddell & McCreary, 1908.
[2]Geology of the Santa Cruz Quadrangle U. S. G. S. Geological Folio 163.

SOLANO COUNTY.

Solano County touches San Francisco Bay on the northeast, and although mostly valley land, it is an important producer of mineral products. Developed and undeveloped resources include brick and clay, cement, chromite, coal, fullers earth, lime and limestone, mineral water, natural gas, petroleum, onyx, salt and miscellaneous stone. Most of these properties are described in the Fourteenth Report of the State Mineralogist. Such additions and changes as are here given will supplement the above and bring it to date.

"Apparently the most promising locality for prospecting for oil is that along the coast west and southwest from the outcropping bituminous rock beds, since those beds pass down under overlying shale in that region. Wells drilled here, however, failed to find oil, and it is supposed that the oil which must formerly have existed in the sandstones of the region has been drained off through large fractures which extended from the surface of the shale down to the underlying sandstone. Many sandstone dykes, some of them of large size, occur along the coast in this region. These were formed from the underlying oil-bearing sandstones and the larger ones probably represent the channels through which the oil from the underlying strata escaped."

Bibl.: Repts. VIII, p. 550; X, p. 622; XIII, p. 585; U. S. G. S., Geological Folio 163.

POTASH.

The **Santa Cruz Portland Cement Company** at Davenport erected a small experimental plant for the commercial extraction of potash from the flue dust and gasses emanating from the kilns.

A large deposit of soft decomposed granite located near the junction of Soquel and Hinckley Creeks 8 miles northeast of Santa Cruz was reported to contain a farily high potash content. No thorough sampling of this deposit has been undertaken, but samples analyzed by the chemist of the cement company mentioned above showed the percentage of soluble potash present to be too low for commercial extraction.

STONE INDUSTRY.

The **City of Santa Cruz** owns and occasionally operates a small quarry on the Big Tree road about 3 miles north of Santa Cruz. There is a small crushing plant at the quarry. The rock is used for road and street work by the city. It was idle when visited.

Caplatzi Quarry. (See under Limestone.)

Miller Quarry. (See under Limestone.)

BRICK AND CLAY.

Both the **Houze Brick and Cement Company** and the adjoining plant of the **Vallejo Brick and Tile Company, Consolidated,** have been idle during 1920, and for several years past. The United States Housing Corporation recently purchased most of this ground and erected housing facilities for employes of the Mare Island Navy Yard.

CEMENT.

Pacific Portland Cement Company, R. B. Henderson, manager; I. H. Colton, general superintendent of plants, including mountain quarries at Auburn and gypsum plaster plant, Mound House, Nevada; M. W. Locklin, plant superintendent, Cement, California.

Since publication of the Fourteenth Report, the old mill, "A," has been completely wrecked, and mill "B" is the only one operated. The plant has been running steadily throughout the year.

A new concrete "finished stock-house," consisting of 15 'Silo' and 8 'Star' bins, with a total capacity of 90,000 lbs., has been added. The 'Silo' bins are 20′ in diameter and 60′ high. The 'Star' bins are formed by partitions about 2′ long connecting the silo bins. Cement is drawn from the bins onto conveyor belts running in tunnels underneath.

Only about one-third of the raw rock used is mined at Cement, the balance coming from the Auburn quarries and from Mound House, Nevada. Three shifts are employed, and the mill has run to the full capacity of its 10 kilns. Wages are $4.50 per 8 hours for common labor, $5.50 for stock-house men. One and one-quarter time is paid for all over time. The company has had very little trouble with labor shortage, but some difficulty was experienced at times in getting cars. The large storage capacity of the new "finished" stock house has enabled continuous operation to be maintained, however. The small labor turnover is no doubt due in part to the company's rooming and boarding arrangements. A company hotel is run for employes at which both room and board may be had. There is also a separate dining room for employes who have their own cabins or rent company houses. Another feature is the company kitchens. These are used mainly by single men who "batch." One kitchen is used by about six men who do their own cooking, and it appears to be a very satisfactory arrangement, especially among the foreign element, whose different tastes are often difficult to satisfy in the regular boarding house.

FULLERS EARTH.

Western Fullers Earth Company. The fullers earth deposit ½ mile northeast of the railroad station at Vacaville which this company opened up is on the Blum ranch owned by C. H. Blum, 24 California street, San Francisco. The Standard Oil Company purchased 30 acres covering the principal exposure. They erected a small house and put down a well. During 1918 and 1919 several carloads of the material were mined and shipped, but the deposit has not been worked during the past year.

Fullers earth has also been found on **Old Rocky Ranch**, Dr. L. C. Marshall, Vacaville, owner. This lies a mile or so northerly from the Standard Oil Company's property, and is a probable continuation of the same beds. It is undeveloped.

MINERAL WATER.

Tolenas Springs. These springs were formerly under lease to H. W. Conkle of Suisun. They have been closed during 1920, and no water has been bottled.

Solano County—Table of Mineral Production.

Year	Quicksilver		Mineral water		Lime and limestone		Stone industry value	Miscellaneous and unapportioned		
	Flasks	Value	Gallons	Value	Tons	Value		Value	Kind	Value
1873	1,800	$144,594								
1874	1,900	199,842								
1875	2,100	176,715								
1876	1,683	74,652								
1877	1,403	51,570								
1878	802	26,386								
1879	1,290	38,567								
1880	492	15,252								
1881										
1882										
1883										
1884										
1885										
1886										
1887										
1888										
1889										
1890										
1891										
1892										
1893										
1894					6,400	$8,000	$225			
1895					4,300	4,635	19,650			
1896			3,054	$1,547	5,477	5,989	15,752		75 tons pottery	$125
1897					9,608	9,801	20,975		400 tons pottery	500
1898					6,125	5,570	15,065			
1899			20,000	4,000		356	12,581			
1900			20,000	4,000	1,800	1,896	18,900			
1901			17,800	4,450		5,950	2,200			
1902	42	1,890	10,000	4,000			14,251		75,000 barrels cement	150,000
1903	106	4,100	10,000	4,000			21,514		250,000 barrels cement	375,000
1904	*377	15,080	10,000	4,000			11,113			
1905	542	18,518	10,000	4,000	100,000	100,000	78,573			
1906	528	19,272	4,000	4,000			143,487			
1907	640	24,422	40,000	4,000			202,146	$6,584	125 tons salt	600
									3,000 M brick	25,000

1908	764	33,294	140,000	11,600			527,319	8,053	400 tons salt	2,800
									1,000 M brick	7,000
1909			32,650	5,490			176,813	7,538	100 tons salt	200
									1,600 M brick	20,000
									5,600 tons clay	11,200
1910				32,400	3,960		241,949	9,100	50 tons salt	150
1911			30,000	4,000			181,952	8,596	100 tons salt	300
									500 M brick	4,000
1912			285,050	44,000			130,445	8,528	50 tons salt	100
									2,200 M brick	20,000
1913			23,600	3,440			28,915	7,365	Unapportioned, 1909-1913, inclusive	13,570,019
1914	320	15,696	43,020	5,208	86,128	86,128	71,288	5,546		1,500,000
1915			64,200	8,000			37,576			1,290,347
1916	660	61,710	11,200	3,750			49,711		Principally cement, fuller's earth,	1,090,164
1917	554	52,765	10,960	2,580			39,826		natural gas, salt and onyx	1,804,080
1918	593	59,122	11,440	2,722			30,124			1,378,758
1919							44,156			1,627,928
Totals	16,650	$1,035,787	829,414	$132,747	219,838	$228,229	$12,136,505	$61,311		$22,878,251

*Flasks of 75 pounds since June, 1904; 76½ pounds previously.

Totals.

Quicksilver	$1,035,787
Mineral water	132,747
Lime and limestone	228,229
Stone industry	12,136,505
Natural gas	61,311
Miscellaneous and unapportioned	22,878,251
Grand total	$36,472,830

Vallejo White Sulphur Springs. This property is now generally known as **Blue Rock Springs,** the bottled water being called Blue Rock Water. There is a swimming pool, hotel, and camping accommodations.

NATURAL GAS.

Rochester Oil Company. This company made no effort to produce during the year. The well has been neglected, and the gas flow has gradually diminished until only a small amount is now obtained. They are negotiating with some of the other oil companies who contemplate drilling for petroleum in the vicinity for the sale of their holdings. See Bulletin No. 89.

PETROLEUM.

Besides earlier attempts (see XIV Report) **Wm. Hanhuth** of Vallejo et al. drilled a well near Suisun without results and disincorporated. The **Honolulu Consolidated Oil Company** has also recently become interested in this field. Bulletin No. 89 contains a full report of the possibilities of the section and development attained during the year.

QUICKSILVER.

St. Johns Mines Company. This was the only quicksilver mine in the county operated during the year. Twelve men employed.

STONE INDUSTRY.

County Crushed Rock Plant. The county has erected bunkers and a trommel screen at the dump of the St. Johns Quicksilver mine. Rock from the dump is crushed and screened, three sizes being produced. The material makes an excellent road metal, and its distinctly red color gives a pleasing appearance to the highway.

Lambies Gravel Pit. There is a deposit of reddish sandy gravel on the Lambies Ranch in the W. ½ of section 4 and E. ½ of section 5, T. 4 N., R. 1 E. The gravel has been used on the country roads by the county and others for many years. It makes a good surfacing material, and gives a pleasing red color to the road. The county pays 25c per load for the gravel.

Southern Pacific Company. The railroad company quarries rock at several points along their right of way for ballast and fills. These are worked intermittently.

Thomasson Quarry. (Also known as **Cordelia** or **McNaughton's.**) Owned by E. B. and A. L. Stone Company; E. B. Stone, president; H. A. Keefer, secretary and sales manager, 804 Claus Spreckels building, San Francisco; A. Hanson, superintendent at plant. This plant was operated continuously during the year. The contract system of working and the production of paving blocks have been discontinued. Day labor is used, a minimum wage of $5.50 per 9 hours being paid. There has been a scarcity of men at times. Thirty were employed at the time of visit.

Crushed rock is the only product. Sizes furnished are—

$1\frac{1}{2}$" to $2\frac{1}{2}$".
$\frac{3}{4}$" to $1\frac{1}{2}$".
$\frac{1}{2}$" to 1".
$\frac{1}{4}$" to $\frac{3}{4}$".
Dust to $\frac{1}{4}$".

Waste sells for 50c per yard.

In June, 1920, all sizes were quoted at $1.85 per yard.

Eleven motors are used throughout the plant, and the number of bunkers has been increased from 12 to 18 with a corresponding increase in capacity from 2000 to 2700 tons. A washing plant estimated to cost $45,000 will be installed shortly. Salt water pumped from Cordelia Slough will be used.

Vulcan Rock Company. This quarry has been idle for the past three or four years. All equipment has been removed. It is reported that the rock was of rather poor quality.

SONOMA COUNTY.

Sonoma County is both a coast county and one of the "North of the Bay" group. It lies north of Marin County and San Pablo Bay and extends from the Pacific Ocean on the west to Lake and Napa counties on the east. Mendocino County bounds it on the north. The northern two-thirds is drained into the Pacific by the Russian River and its tributaries, but the southern part is drained by Petaluma and Sonoma Creeks into San Pablo Bay. The main valley, through the central part of the county, is sixty miles long by twenty-five miles wide.

The mineral products of Sonoma County are diversified and include brick, chromite, clay, copper, graphite, infusorial earth, magnesite, manganese, marble, mineral paint, mineral water, quicksilver, and miscellaneous stone.

The Fourteenth Report of the State Mineralogist contains a general report on the mineral resources of the county. Bulletin No. 78 covers the quicksilver mines in detail and Bulletin No. 76, the manganese and chrome deposits. Such changes and new developments as have occurred during the present year only, are here noted.

CHROMITE.

None of the chrome deposits described in Bulletin No. 76 were producing during the present year.

Parmeter Ranch Deposit. This property is now known as the **Laton Group.** Owner, A. H. Laton, et al.; home office, 1601 Posen avenue, Berkeley, California.

There are three claims in this group, the Rattlesnake, Lone Bird and Serpentine, located in section 13, T. 9 N., R. 12 W. Eight miles by good road from Cazadero, the nearest railroad point. The mine has an elevation of 800 to 900 feet. There is a good water supply and some small mountain cedar on the claims. Country rock is serpentine. The first work was done in 1916 by B. M. Bauman. Mining continued in 1917 and part of 1918 by A. H. Laton. It was closed down late in 1918. Some high grade kidneys were found, but the deposit, as a whole, is low grade, and concentration will be required to obtain a shipping product. The total production to date has been 200 tons. This was sold to the L. B. Butcher Company of San Francisco.

Jones and Cranson have a chrome deposit about 2 miles north of the Culver-Baer Quicksilver Mine, and along the same ridge. George Elder worked it in 1918 and shipped about 150 tons.

COPPER.

Cornucopia Copper Mining Company. Assessment work has been kept up on this property.

MAGNESITE.

Healdsburg Marble Company. This property was operated by the California Magnesia Company for about one year. A brick lined concrete furnace of the shaft type was erected on the railroad at Guerneville in 1917, where the magnesite was calcined. The property is now closed down and the calcining plant was dismantled this year and sold.

Local reports state that poor management was largely responsible for closing down.

Kolling Deposit. This property is known as the **Refractory Magnesite Mine.** It has been idle since the beginning of 1919. F. R. Turton (deceased) was president of the Refractory Magnesite Company, who last worked it. The magnesite was calcined and ground at the mines and shipped to South San Francisco. The plant is well equipped. Power was furnished by three gas engines. The furnace is of the shaft type and rests on a concrete foundation. Fuel oil was used. Fuel oil pumps, crusher, rolls, Sturtevant mill, air compressors and gas engines are all housed in a substantial building. This property has been recently examined by a San Francisco engineer from C. L. Wilson, Hobart Building, San Francisco, and it is reported that it is soon to be operated again.

Snyder Ranch. There is said to be an undeveloped deposit of magnesite on the Geo. Snyder Ranch on Piney Creek, about 12 miles southwest of Healdsburg.

MANGANESE.

Shanks and Copps Lease. This property, described in Bulletin No. 76, was last operated by Hyde Flannigan of Sacramento. Their lease expired in July, 1920, and the mine was closed in June of this year. The total production to date has been 900 tons. There is said to be considerable ore still remaining.

C. C. Foss has a manganese prospect on his ranch in section 19, T. 11 N., R. 8 E., about one mile above "The Geysers."

MINERAL WATER.

Alder Glen Springs. This resort has not been opened during the present season.

Mark West Springs. Purchased by W. H. Otterson in 1917.

Salvation Army's Boys' and Girls' Industrial Home and Farm, Incorporated, formerly **Lytton Springs.** Commissioner Thos. Estill, Chicago, Illinois, president; Lieutenant Colonel Arthur Smeeton, Lytton, California, vice president and treasurer; Staff Captain Jacob A. Koerner, Lytton, California, secretary.

In April of this year the main administration building was destroyed by fire. A new concrete building is being erected. In addition to the "Soda" and "Seltzer" Springs, there is one of cold sulphur water. Water is free to the public. The water is no longer bottled.

Skaggs Hot Springs. The swimming tank is supplied by the combined overflow of all the mineral springs. There are accommodations for 250 people in the hotel, cottages and tents.

The Geysers. This famous property has been leased, with option to purchase, by John D. Grant, of Healdsburg. A new bath house has been built and opened this year where hot steam and sulphur baths may be had. The hotel is lighted by electricity generated on the property by water power.

QUICKSILVER.

The quicksilver mines of Sonoma County have been described in detail in Bulletin No. 78. Of the thirty or so mines whose history is given therein, but one was in active operation during the present year.

Cloverdale Mine. This mine has been in steady operation throughout the year. Through the courtesy of Mr. Andrew Rocca, Jr., superintendent, the following data, regarding the present reduction equipment, from the report of Mr. C. N. Schuette of the U. S. Bureau of Mines Station at Berkeley, was made available:

"The modified Livermore furnace equipment as in 1918 was unsatisfactory on account of small capacity and faulty construction caused by excessive salivation of furnacement.

Erection of rotary furnace began Oct. 17th and was completed in 79 days. Minor troubles caused irregular operation in January and February. Steady operation began in March. The kiln leads into a 3-comp. concrete dust chamber from which the gases pass through a double line of 15″ tile pipe to two 15′ x 26′ wooden tanks in series and then to 30′ stack 2′ in diameter.

The ore bin is above the dust chamber. Spent ore from kiln drops into large concrete pit under bin box. Furnace and condenser tanks are built over concrete floors. The tile pipes are underlaid by tarred roofing paper.

The plant is operated by a 25-h.p. Fairbanks Company ore engine, which drives kiln, rock crushes, compressor and feeder. Ore brought down gravity incline, over grizzly above ore bin—oversized bin crusher to bin of 125-ton capacity. Crushed to 2″ size.

Rotary Kiln. 56′ long and 4′ outside, upper six feet coned to 3′ in outside diameter. Lined with 5″ fire brick, slope $\frac{1}{2}$″ to 1′ toward discharge. Brick firebox over concrete pit has opening for oil burner and small door in case of clinkering. Peep hole for sampling in side of fire box. Rotated by belt drive at fixed speed. Furnace fed by inclined pipe with longitudinal shaking motion, devised by Mr. Rocca, extending six inches into furnace and running through dust chamber. The pipe is fed by a Challenge feeder. Fume tight joints are provided between furnace and dust chamber and furnace and firebox.

CONDENSER SYSTEM.

(Double strength tile pipe used throughout.)

Unit and data	Area square feet	Volume cubic feet
3 compartment concrete dust chamber 4′ 4″ x 7′ 4″ x 11′ 6″ 4′ 10″ x 7′ 4″ x 11′ 6″ 3′ 2″ x 7′ 4″ x 11′ 6″	970	1,040
2 lines tile pipe 15″ dia., 135′ long	1,060	332
Wooden tank condenser 15′ dia., 28′ long	1,581	4,602
Tile pipe 21″ dia., 25′ long	138	60
Wooden tank condenser 15′ x 26′	1,581	4,602
Tile pipe 21″ dia., 7′ long	39	17
Stack 2′ dia., 30′ high	188	94
	5,557	10,747

Dust chamber divided in 3-comp. by baffle walls. The two lines of pipe are provided with drains, sprays and cold air injection. Wooden tanks have sloping floors and drain through lowest point to concrete pots. Door in side of tanks. Every fourth joint in the tile lines has a T for cleaning purposes.

OPERATION OF FURNACE.

Power. 25-h.p. Fairbanks-Morse engine, drier kiln, 6 x 6 WG 3 Sullivan compressor, 10 x 16 Blake crusher and Challenge feeder. Tonnage 75 tons per twenty-four hours at 1 r.p.m. Ore assay between 10 and 15 lbs. Hg per ton, moisture 2 to 7%.

Furnace feed. Through 8″ inclined pipe kept full by Challenge feeder. Rotation of furnace draws ore away from pipe end. Ore is a hard siliceous chert and has strong abrasive action on kiln liners and joint between furnace and dust chamber.

Discharge. Burned ore falls into concrete pit from where it is drawn into cars and trammed to dump 150′ away. Drawn from pit through arc gate in bottom. Car tunnel is ventilated by 28″ galvanized iron pipes which lead hot air dust from rear end of tunnel to air above furnace building. The capacity is such that the drawing of a twenty-four hour run of waste rock can be done by one man in eight hour shift. The furnace tailings are clean, no cinnabar or free mercury and nearly dustless.

Fuel. Consumption has average for 1919 of 7.55 gals. per ton of ore. A Witt oil burner is used, the oil being atomized by compressed air. Compressor runs at 221 r.p.m. and delivers 7.35 cu. ft. a minute at 55# gage pressure. Air is preheated by coiling air line three times around hot end of kiln. Oil delivered by gravity and preheated by laying line across hot floor above waste bin. Oil tank 125′ above furnace, feed line 2″. If too hot a fire is maintained the furnace will clinker.

Furnace crew. Four men, one man per eight hour shift attends to operation of furnace, one man works twelve-hour shift, attends retort and trams burned rock to dump.

OPERATION OF CONDENSER SYSTEM.

(See Blue Print.)

Gas travel. The distance the gas has traveled at points of observation are:

Station 1	Feet
1	50
2	180
3	230
4	270
Top stack	300

Draft. Natural draft—vertical distance between kiln and top of stack 80′.

Date	Temperatures—Data				
	Station 1	Station 2	Station 3	Station 4	Atmosphere
March 10, 1919	175	82-76	56	53	17
	178	58-55	50	46	15
March 11, 1919	208	58-60	54	50	14
	221-220	52-55	49	46	13
March 12, 1919	234-234	60-66	56	53	13
	240-240	57-60	54	46	11
March 13, 1919	240-237	52-62	54	50	12
March 14, 1919	238-239	61-63	52	51	7

A blower which was used to blow cold air into the system was disconnected as it increased the gas volume enough to cause a slight pressure in dust chamber and caused furnace to back fire.

Gas analysis for Co_2 ab Stations 1 and 4 with Honigman burrette.

Date	Time	CO^2 at Station	Station 2
March 12, 1919	10.00 10.30	10.6	8.8
March 13, 1919	8.45 9.00	11.4	8.0
March 14, 1919	8.30 8.45	9.9	6.7

These results show that inward flow of air varied between 20% and 50% of original gas volume.

Spray. Water spray (see blue print) designed to arrest any dust passing dust chamber. Is ordinary garden nozzle pointing up hill in each pipe adjusted to give very fine conical spray. Spray from both nozzles 4.5 gals. per minute. Water entered pipe at 15° C. and was heated to about 53° C. The drain pipe emptied in a concrete pot from which the water overflows to a series of settling boxes.

Clean up. By washing down tanks and pipe with water. Overflow passing to settling boxes.

Soot is worked with lime and retorted.

This furnace installation has practically cut operating costs in two."

Culver-Baer Mine. This mine was closed down in February, 1919, on account of high costs and unsatisfactory labor conditions.

Squaw and Big Chief Claims. Assessment work has been kept up on the Squaw Claim, but the Big Chief has been abandoned.

STANISLAUS COUNTY.

Stanislaus County is the leading dairying, and one of the principal agricultural counties in the state. Its mining interests are relatively small, being confined to a narrow strip along the west border, which includes areas of Miocene, Cretaceous and Franciscan, sand stones, shales, lime stones and serpentines of the Mount Diablo Range, and a small area at the eastern extremity of the county which enters the Jurassic slates of the foothills of the Sierra Nevadas.

BUILDING MATERIAL.

Clay suitable for the manufacture of brick has been utilized at various times in the past from deposits near Modesto, Grayson, Newman and Patterson, although at the present time there is no brickyard in operation in the entire county, and none of the clays are being used for any purpose. The plant of the Modesto Repressed Brick Company, which was mentioned in the Fourteenth Report of the State Mineralogist, has been dismantled, and the ground upon which it was located has been sold as town lots.

Mr. Martin Kelch manufactured a small number of brick during the years 1918 and 1919 from a clay deposit located on the Waterford Road about a mile east of Modesto, but owing to the difficulty of obtaining satisfactory help, he has discontinued operations, and is attempting to sell his holdings, which consist of nine acres underlaid with a bed of clay, having a maximum thickness of twenty feet, with little or no overburden.

The gravel pits mentioned in the Fourteenth Report located near Oakdale are still being operated intermittently. The **Dixon Gravel Pit** is now owned by Samuel and Roy Kauffman of Oakdale; additional work is being done by the State Highway Commission operating a rock crusher and sand pit in the bed of the Stanislaus River at Knights Ferry; a similar plant is operated by **Palmer and McBride,** San Francisco contractors, above the Orange Blossom Bridge about three miles below Knights Ferry. The two last mentioned plants are being temporarily operated for the purpose of securing material for use in paving the Oakdale lateral of the State Highway.

CHROMITE.

Stanislaus County became a producer of chrome ore early in 1916. Most of the deposits so far developed are situated on the east slope of the Coast Range Mountains in the Aurora del Puerto Cañon and its branches. This industry has been practically at a standstill since the signing of the armistice, and the detailed account of various properties contained in Bulletin No. 76 still hold true in all important detail.

COAL.

Several small veins of coal have been discovered at various times in the southwest portion of Stanislaus County, notably in section 12, T. 6 S., R. 7 E.; section 12, T. 5 S., R. 6 E.; and on the Hoges Ranch about 13 miles northwest of Newman. None of these deposits have been thoroughly investigated or developed to date.

GOLD.

The Bureau's records contain a mention of but two gold quartz mines in this county—the **Alto,** situated in the Calaveras grant near Knights Ferry, which has long since been abandoned, and the **Don Pedro,** near Cooperstown, which is included in a reservoir site recently purchased by the Turlock Irrigation District, and which will soon be flooded by the waters of the reservoir, and made entirely inaccessible.

The **LaGrange Gold Dredging Company,** H. G. Cumberly, superintendent, is still operating its dredge on the Tuolumne River, at La Grange, and according to the company's estimates enough ground remains for at least ten years more work. Further details relative to this enterprise may be found in the Fourteenth Report, and in Bulletins Nos. 57 and 85.

The **Yankee Hill Gold Dredging Company,** E. R. Healy, manager. Oakdale, California, launched the hull of a new dredge May 8, 1920, at a point on the Stanislaus River, 1½ miles below Knights Ferry. Installation of machinery was immediately undertaken, and actual digging operations were begun on November 19, 1920. Electric power is used; the buckets are four and a half cubic feet capacity, close connected. Fifteen men employed.

MAGNESITE.

Various magnesite deposits have been discovered and worked to some extent in the southwest portion of the county. The situation with regard to most of them has not changed singe the compilation of Bulletin No. 79, entitled "Magnesite Resources of California." Among new developments noted in May, 1920, were the activities of the **Plastic Magnesite Company,** owned by D. W. Shanks and H. H. Harlan, 625 Market street, San Francisco; property located in section 32, T. 8 S., R. 7 E., 16 miles west of Ingomar, Walter H. Parsons, superintendent, Ingomar post office. The bed or vein which is being worked is from four to eight feet thick, dipping about 15° to the south. The material is removed through a 350-ft. tunnel, and workings consist of about 350 ft. of drifts with both overhand and underhand stopes. Fifteen men are employed and daily production amounts to about 30 tons, some of which is hand-sorted. At the time the property was visited (May, 1920) three 2-ton trucks were hauling about twenty tons of magnesite per day to the railroad at Ingomar.

MANGANESE.

Considerable manganese occurs in the northwest corner of the county, in the southeasterly extension of the belt of Franciscan serpentine, which begins near Tesla in Alameda County. The production of manganese in this belt had assumed proportions of considerable size at the close of the war, but only work on a very small scale has been carried on since that date. Detailed description of deposits may be found in Bulletin No. 76, page 83.

OCHRE.

Deposits of both red and yellow ochre have long been worked in the vicinity of Knights Ferry. Outcroppings occur in many places on

both sides of the Stanislaus River. Development on a small scale is now under way at the following properties:

Bartlett Ranch, J. G. Fulton, lessee, Knights Ferry post office, operating on ground adjoining the Voyle deposit. A tunnel is being driven to cut the ochre bed, which had reached the distance of 16 ft. in May, 1920.

Schaefer Deposit, situated near Knights Ferry about ¼ mile from the Voyle mine on land leased by C. L. Schaefer of Jamestown, from the San Francisco Light and Power Company. There are two men employed. Ochre is removed from the tunnel in wheelbarrows, and dried on platforms before shipping. Small production reported in 1920.

Wiedman Ranch Deposit, Prowse and Williams, lessees, Knights Ferry. This property, which is idle and undeveloped, is located directly across the Stanislaus River from the town of Knights Ferry.

Voyle Mine, Jack Winkler, lessee, Knights Ferry, worked intermittently on small scale during past few years, has been described in Fourteenth as well as earlier reports of State Mineralogist.

PETROLEUM.

Considerable interest has been taken in the petroleum possibilities of the county during the past year or more. Full details relative to this subject will be found in Bulletin No. 89, entitled "Petroleum Resources of California," recently issued by the Bureau. In May, 1920, active drilling operations were under way by the Southern Oil and Gas Company near Oakdale, and by Pattee Brothers and Ellis, near Knights Ferry. The Pioneer Oil Company of Oakdale, organized May 18, 1920, had obtained lease on land located between Oakdale and Knights Ferry.

The **Turlock Oil and Gas Company,** organized March 12, 1920, hold under lease 340 acres in section 34, T. 5 S., R. 9 E., as well as a large additional acreage in T. 6 S., R. 9 E., which lies in Merced County. In addition to the above, oil seepages have been reported at several places in the vicinity of Crows Landing, and it is said that the occurrence of oil in sufficient quantities to make the water unfit for drinking has long been known on the Frankheimer Ranch, 9 miles northeast of Oakdale.

QUICKSILVER.

Quicksilver was first discovered in this county in about 1875, on both the north and south forks of Orestimba Creek in the Mount Diablo Range. Since that time several deposits have been opened up and developed to some extent. Nothing of interest has been done there during the past year, and detailed description of the various properties will be found in Bulletin No. 78, "Quicksilver Resources of California."

SILICA.

Deposits of comparatively pure silica, both in ledge formation and as sand, occur in the vicinity of Patterson. These deposits are described in detail in the Fourteenth Report. No development work has as yet been undertaken.

SUTTER COUNTY.

Sutter County is one of the least important mineral-bearing areas of California. The entire county is covered with a deep alluvial soil, with the exception of a circular area about ten miles in diameter, which includes the Marysville Buttes.

CLAY.

Clay beds, none of which have been commercially utilized, occur in the sedimentary strata of the buttes. These beds contain clay, which could be satisfactorily used for the manufacture of brick and pottery, should the demand arise.

COAL.

Thick seams of lignite have been noted in certain of the beds of the Ione formation, lying above the clay deposits just mentioned.

GOLD.

No gold-bearing veins have been found in the Marysville Buttes, but certain coarse gravels occurring in the sedimentary Ione strata have been found to be auriferous. The gravels consist of water-worn pebbles which, no doubt, originated in the Sierra Nevadas.

NATURAL GAS.

Small quantities of gas have been encountered in wells drilled for water at Yuba City. These wells have all been shallow and the gas encountered was in such small quantities that it has not been commercially utilized.

LIMESTONE.

An impure clayey limestone is said to occur just south of South Butte. A spring deposit consisting principally of calcite is reported to occur about 1½ miles southeast of South Butte. Neither of these deposits have been investigated to date.

STONE.

A quarry in the rhyolite rock, three miles northwest of Sutter City, has furnished some building stone, which was used locally. The county has also utilized crushed rock from the Buttes, in the construction of highways.

TULARE COUNTY.

Tulare County, one of the largest counties of the San Joaquin Valley, lies south of Fresno, west of Inyo and north of Kern. The western half of the county extends across the San Joaquin Valley and the eastern half lies in the Sierra Nevadas. The eastern boundary includes Mount Whitney, which is the highest peak in the United States, with an altitude of 14,501 feet.

Tulare County has for several years been the most important source of magnesite in California. In addition to magnesite, many other minerals occur within its boundaries, some of which have been developed and others which are awaiting more favorable transportation facilities and market conditions. The Bureau did no field work in Tulare County during 1920, but interested parties are referred to the Fifteenth Report of the State Mineralogist for details relative to individual mining operations in this district. The following notes on mineral deposits, both developed and undeveloped, are presented as a matter of general information.

ANTIMONY.

The presence of antimony has been noted at various points in Tulare County although the only deposit upon which any development work has been done, is at the Lady Alice Mine near Mineral King on the east fork of the Kaweah River.

ASBESTOS.

In the serpentine area east of Porterville are some small deposits of asbestos, none of which have been prospected. There is also a deposit on the McCann ranch, 1 mile south of White River and another on the James ranch, north of Porterville. Asbestos of unproven quality has been obtained in Frazier Valley, 25 miles southeast of Tulare City. The demand for asbestos is constantly growing and it is understood that the best material now commands a price ranging up to $400 or $500 per ton. These grades are utilized in the manufacture of tapestries, theatre curtains, cloth, etc. The lower quality of asbestos which is unsuitable for weaving and which, of course, commands lower prices, is used in the manufacture of steam packing, furnace linings, wall plasters, paints, tiling, insulating materials, etc. An important development of the asbestos industry is the rapidly increasing demand for the lower grade material on account of the numerous and diversified uses to which such profits are being put in almost every branch of manufacture.

CLAY.

South of Porterville there is a large deposit of fire clay which, from tests made, is reported to produce a fine quality of fire brick. In the neighborhood of Exeter and Visalia there are extensive deposits of brick clay. Six miles east of Porterville there occurs a strata of clay shale about 2000 feet in width. The quality of this material appears to be suitable for the manufacture of tile, sewer pipe and steam products.

CHROMITE.

In the foothills north and southeast of Porterville a number of deposits of chromite of good commercial grade have been developed and considerable production reported. Among the better known properties may be mentioned the Waddell, the Vaughn, Sattlefield and James mines. The principal use of chrome is as a refractory lining in steel and copper furnaces. Smaller amounts are used in the preparation of ferro-chrome and in the making of chromates for tanning and other purposes. The demand for this substance is temporarily slack but it is believed that the situation will not continue indefinitely, particularly as regards material of the higher grade.

COPPER.

In this county there are some very promising copper prospects, but owing to the ruggedness of the country and the distance from transportation, they have been but little explored and very slightly developed. Just east of Porterville there is a belt about five miles wide extending to the Yokohl Valley, in which small veins occur. This area is most clearly defined and characterized by narrow diversified seams or stringers of copper bearing minerals. The largest deposits, however, are in the central portion of the county, thirty miles or so east of Porterville, along the north fork of the middle fork of the Tule River. Copper prospects of possible future value occur high in the Sierras in the extreme northeast corner of the county.

GEMS.

At various places along the foothills of the Sierra Nevadas, extending entirely across Tulare County has been noted a variety of siliceous minerals capable of use in the arts for ornamental purposes, such as rose quartz, garnet, chrysopal, etc. In the past a very active interest was taken in these gem minerals but of late years the demand has fallen off to some extent.

FELDSPAR.

Feldspar is widely distributed throughout this portion of the state, considerable production having been reported from deposits near Three Rivers, Lemon Cove and in the vicinity of Exeter.

GOLD.

The only productive area where gold mining has been carried on to any extent is in the White River district, situated fifteen miles southeast of Porterville. Some very promising prospects have been noted in the Globe district, twelve miles east of Porterville, as well as on Cow Mountain and elsewhere.

GRANITE.

In the foothills east of Porterville and Exeter there are extensive deposits of biotite granite which is suitable for building purposes. Up to the present time only relatively small amounts of development work and production have been undertaken.

GRAPHITE.

So far as the Mining Bureau is informed no graphite has ever been produced in this section although deposits are known to exist in Drum

Valley, north of Auckland and about three miles west of Dunlap. On account of its inaccessibility and resistance to the action of molten metal, graphite is very valuable. It is also largely used in the manufacture of electrical appliances, lubricants, paints, stove polish and in many other ways.

GYPSUM.

Gypsum has been reported to exist in Tulare County, notably in section 21, T. 30 S., R. 22 E., although it is believed that these deposits have not even been prospected. This mineral is used as a fertilizer and also in the manufacture of plaster and cement. In the calcine form as plaster of paris, gypsum plays a very important part in surgical work.

IRON.

Undeveloped deposits of iron ore are located near Mineral King, at an elevation exceeding 10,000 feet. On account of their inaccessibility, we have little definite information regarding their value or extent.

LIMESTONE.

There are extensive deposits of limestone in the foothills and mountainous regions in the eastern part of the county. On the north and south fork of the Tule River there are large belts of limestone and extensive deposits also occur in the vicinity of Three Rivers and on various forks on the Kaweah River in the Mineral King district.

MAGNESITE.

Tulare County is one of the principal magnesite producing sections of California. Magnesite deposits a short distance northeast of Porterville were discovered as early as 1853. Active operations were unimportant until about 1900 and during the past twenty years development has been quite active. The most extensive deposits are east of Porterville, Lindsay and Exeter.

MANGANESE.

Manganese ores have been noted north of Springville and northeast of Lindsay, although little development has been done upon them.

MINERAL WATERS.

Throughout Tulare County in the Sierra Nevada Mountains are large numbers of Hot and Carbonated springs. Among the more important may be mentioned the California Hot Springs, thirty miles southeast of Porterville, on the west bank of Deer Creek, the Coburn Soda Spring at Springville, the Doyle Soda Springs, thirteen miles east of Springville, Little Yosemite Soda Springs in the Kern National Forest, two and one-half miles north of Kern Lake, Nelson Soda Springs, fifteen miles east of Springville and the Tule River Springs, sixteen miles east of Porterville.

ZINC-LEAD ORES.

On the McGuinnis, Empire, White Chief, Lady Franklin and Silver Lake claims, there are valuable deposits of lead and zinc ores. This district was discovered in 1873, the first location being made on the

White Chief Claim, about two and one-half miles south of the town of Mineral King. In 1879 and 1880 there was a rush to this district. Owing to the inaccessibility and the distance from transportation, as well as the complex character of the ores, only spasmodic attempts at mining have been made. More recent discoveries of zinc have been reported on North Alder Creek, sixteen miles northeast of Springville.

YOLO COUNTY.

Yolo County is one of the Central Sacramento Valley group. Its mineral resources are limited in number and but slightly developed. Those products that have been commercially produced are quicksilver, sandstone and miscellaneous stone. Deposits of brick clay, coal, gold, iron, limestone, manganese and quicksilver are known and a number of mineral springs are found in the county.

The location and description of these deposits are given in the Fourteenth Report of the State Mineralogist; the quicksilver mines in the northeastern corner, near the Napa County line, are more particularly described in Bulletin No. 78. When visited during the summer of 1920, **Bufords Spring,** situated along Putah Creek about nine miles west of Winters, was being improved with the idea of making it a resort.

Yolo County—Table of Mineral Production.

Year	Quicksilver		Sandstone		Miscellaneous and unapportioned	Value
	Flasks	Value	Cubic feet	Value		
1873	*905	$79,928				
1874	3,000	315,510				
1875						
1876	965	42,460				
1877	1,516	56,547				
1878	1,640	53,956				
1879	1,110	33,134				
1880	422	13,082				
1881						
1882						
1883						
1884						
1885						
1886						
1887						
1888						
1889						
1890						
1891						
1892						
1893						
1894			2,500	$1,000		
1895			542	1,873		
1896			252	378		
1897						
1898			264	384		
1899			264	384		
1900			908	1,760		
1901			1,540	2,300		
1902			328	450		
1903			280	144		
1904			180	720		
1905			175	200		
1906			160	204		
1907			250	350		
1908			140	1,150		
1909						
1910						
1911						
1912						
1913						
1914	15	736				
1915					Stone, miscellaneous	$1,200
					Other minerals†	810
1916					Stone, miscellaneous	300
1917					Stone, miscellaneous	4,300
					Other minerals†	1,261
1918					Stone, miscellaneous	17,915
					Other minerals†	3,300
1919					Stone, miscellaneous	5,600
					Other minerals†	19,866
Total value to end of 1919						$54,582 $61,262

*Flasks of 76½ pounds.
†Under "Other minerals" to conceal output of a single producer.

LOS ANGELES FIELD DIVISION.

By W. BURLING TUCKER.

Part I.

SCOPE OF MINERAL INDUSTRY.

The Los Angeles district consists of eleven counties, extending from Imperial and San Diego counties on the south, to and including Riverside, San Bernardino, Kern, and Inyo counties on the north; also the counties of Orange, Los Angeles, Ventura, Santa Barbara, and San Luis Obispo along the Pacific Coast of Southern California. The eastern part of the district is made up largely of mountain and desert country, and is highly mineralized, while the western part along the coast range, with foothill and valleys to the east, contains a great variety of commercial minerals, including also most of the structural and industrial materials, as well as metals.

The district contains the largest known and most productive oil fields in the state, the principal producing counties being Kern, Los Angeles, Orange, Santa Barbara, and Ventura.

The most important mineral products are: Asbestos, barytes, bituminous rock, borax, brick and tile, chromite, cement, clay, coal, copper, diatomaceous earth, dolomite, feldspar, fluorspar, gems, gold, granite, graphite, iron, lead, lime, limestone, magnesite, manganese, mineral paint, mineral water, miscellaneous stone, natural gas, niter, petroleum, potash, quicksilver, salt, silica, sodium, sulphate, soapstone, talc, and tungsten.

In order of their value, the several leading products are as follows: Petroleum, natural gas, structural and industrial materials, salines, and metals.

Riverside and San Bernardino counties led all other counties in the state in the variety of minerals commercially produced. Kern, Orange, and Los Angeles counties in the order named led all other counties in the state in mineral production due to the petroleum output.

GENERAL CONDITIONS DURING THE PAST YEAR.

Petroleum.

The production of petroleum increased during the past year, being mainly due to greater oil development in the different oil districts, and of new productive fields, as Montebello, Richfield, and Huntington Beach.

Structural and Industrial Materials.

Due to the increased demand for building material during 1919 the capacity of the different cement plants was somewhat increased, and all the plants were running to capacity.

Crushed rock, stone, and sand were in demand for concrete construction of buildings and pavements, so the different rock plants resumed operations on an increased scale the latter part of the year.

Salines.

American Trona Corporation completed their plant at Trona on Searles Lake, and were large producers of potash.

Two other plants were built during the year by Solvay Process Company and the West End Chemical Company on Searles Lake for

the extraction of potash, and at present writing are on a producing basis.

On Owens Lake, Inyo County, the following companies were large producers of soda: Natural Soda Products Company, California Alkali Company. Both these companies increased the capacity of their plants.

The Consolidated Chemical Company started active operations on the sodium sulphate deposits of Carrizo Plains, San Luis Obispo County.

The Pacific Coast Borax Company were large shippers of borax from their mines near Ryan, Inyo County, and also operated their mill to capacity.

Metals.

Due to the increase in price of silver there was renewed activity in mining in the Silver camps of Inyo and San Bernardino counties.

There was no activity in gold mining in the district during the past year, and what mines were operating during 1918 were compelled to suspend operations on account of increased cost of production.

Due to low metal prices there was very little activity in mining or the production of chromite, manganese, and quicksilver.

GENERAL OUTLOOK FOR THE COMING YEAR.

There should be an increase in production of petroleum, natural gas, and of structural and industrial materials in 1921.

On account of unfavorable market conditions, and the increase in freight rates there will be very little activity in metal mining.

Transportation.

There are four railroad systems, for which Los Angeles is the terminus. Three of these four lines are transcontinental, as follows: Atchison, Topeka and Santa Fe, Southern Pacific, Los Angeles and Salt Lake. These railroads and their feeders pass through the different counties of the district, and afford ample transportation facilities to the different market centers. The Tonopah and Tidewater Railroad, which connects with the Santa Fe system at Ludlow, affords an outlet for northern end of San Bernardino, and the eastern end of Inyo County. The Pacific Electric Railroad operates a system of over 1000 miles, radiating to all points in Southern California.

The steam and electric railroads operating to and from Los Angeles have numerous direct and interchangeable dock, warehouse and track connections with each other throughout the greater part of southern California, as well as shipside connections for loading from shipside to cars at the Port of Los Angeles.

Power.

The district is well supplied with electric power by the Nevada-California Power Company, Southern Sierras Power Company, Pacific Light and Power Company, and Southern California Edison Company.

The Southern Sierras Power Company serves the different mines and plants in Inyo, Kern, and San Bernardino counties, with lines extended from San Bernardino through Riverside to El Centro in Imperial County.

Water.

Throughout certain desert regions of Inyo, Kern, San Bernardino, Riverside, San Diego, and Imperial counties water is scarce, and this lack of water has held back the development of the mineral resources of these counties. In the High Sierras and the Coast Range the supply is ample under normal conditions, and the streams from these ranges furnish sufficient water for power and operation of plants in the counties in close proximity.

Labor.

The supply of labor has been limited during the past year, and what was to be secured was inefficient. During the coming year labor conditions should be much improved, and more plentiful.

Part II.

Los Angeles District: By Counties.

IMPERIAL COUNTY.

Imperial County does not contain a great variety of mineral deposits; however, it contains valuable deposits of clays, gold, gypsum, crystalline limestone, pumice, manganese, salt, and sodium sulphate.

The principal lrawback in mining and developing these materials has been due to lack of transportation. With the completion of the San Diego and Arizona Railroad the possibilities appear bright for the development of the marble and gypsum deposits in the Coyote and Fish Creek mountains.

The recent discovery of sodium sulphate deposits in the Salton Sea Basin, in the neighborhood of Pope Station and Durmit, northwest of Niland, promises to add greatly to the mineral wealth of the county.

GOLD.

The gold deposits of this county are in the southeastern corner, occurring in ranges with northwest trend, between the line of the Southern Pacific Railway and the Colorado River. The chief gold-producing districts have been in the Cargo Muchacho and Pichacho ranges of mountains.

At present, due to the general depression in the mining industry, there is nothing being done in these districts.

Bibl.: Rept. XIV, pp. 724-732.

GYPSUM.

The gypsum of Imperial County occurs mainly in an immense deposit some three miles in length from southeast to southwest, with an area of 800 acres, which occupies a valley among crystalline rocks, in the northwestern edge of Fish Creek Mountains. The gypsum outcrops are in sections 19, 20, 28, 29, T. 13 S., R. 9 E. The gypsum beds have an average thickness of 100 feet. The San Diego and Arizona Railroad passes within 25 miles of the deposit.

Situated on the south slope of the Coyote Mountain Range is a large deposit of gypsum covering the better part of 10 acres. It is exposed over most of this area, has an average depth of 8 feet. Estimated to be 80,000 to 100,000 tons that can be easily mined. This deposit lies about 3 miles northwest of Coyote Wells.

Bibl.: Rept. XIV, pp. 738-740.

GRAPHITE.

Stuart Graphite Deposit. It is situated on the southeast slope of Coyote Mountains, 7 miles north of Coyote Wells, a station on the San Diego and Arizona Railroad. Two claims have been located on the deposit. A vein of amphorous graphite 4 feet wide occurs in a wide belt of schist, which strikes NW. and SE. Croppings can be traced for several hundred feet. Stuart and King of San Diego, owners.

LIME AND LIMESTONE.

On the south slope of Coyote Mountain and at a point 3½ miles southwest of Coyote Wells are great deposits of limestone. It is reported that the limestone carries little or no magnesia, which makes it valuable for cement.

MARBLE.

The chief deposits of this material in the county are in Coyote Mountain, townships 15 and 16 S., R. 9 and 10 E. This mountain is largely formed of crystalline limestone. These deposits are 6 miles north of Coyote Wells, a station on the main line of the San Diego and Arizona Railroad.

The **Creole Marble Deposit.** The Creole group consists of four claims, covering an outcrop of marble about 4500 feet long and averaging 600 feet wide. Practically all development has been done on Creole Claim No. 1. Here are three distinct stratas of marble. The marble has a hardness of 3.5 and the colors range from blue-black, cream-pink, white, mottled black and white, and blue. Deposits are estimated to contain 3,000,000 cubic feet of marble. Three men are employed quarrying marble and hauling by tractor to Coyote Wells. Marble is sawed at the mill of Lyman Onyx and Marble Company of San Diego. Owner, Golden State Mining and Marble Company, C. A. Walker, president; Harry F. Roberts, secretary, 309 Watts Building, San Diego, California.

Bibl.: Rept. XV, pp. 733-736; Bull. 38, p. 107.

Southern California Marble Deposit. The deposit is situated in the Coyote Mountains, 6½ miles north of Coyote Wells, on the main line of the San Diego and Arizona Railroad, and about one mile northwest of the Creole marble deposit. The limestone belt strikes N. 30° E., and has a general dip of 60 to 70 degrees east. The outcrops reach a height of 150 feet to 200 feet above the base exposure and are 100 to 500 feet in width, and between 500 and 1200 feet in length. The exposed surfaces in many places are much jointed and fractured, due to their long exposure to the elements and climatic conditions. Three quarry faces have been opened up along this belt of marble, from 150 feet in length to 30 feet in height, which expose solid faces of marble, which can be quarried in large blocks. All the marbles are of fine texture, hard and admit an excellent polish, as shown by samples taken from the property. As commercial marble they rank with Georgia white and the English vein marble, also with Italian white marble. There are also outcroppings of several colored marbles as yet undeveloped, but of a character similar to Rose Numidian, Noir Veine, and Breccia. It is estimated that these deposits contain several million cubic feet of marble. Holdings consist of 440 acres. Claims are known as the Mammoth, Mammoth Annex, Big 6, and Big 6 Annex No. 1 and No. 2. Located in sections 1 and 2, T. 16 S., R. 9 E., section 35, T. 15 S., R. 9 E.

Five men employed on development work. Southern California Marble and Development Company, J. G. Morley, president; S. E. Lewis, secretary; Jas. S. Fowler, superintendent; offices, 3799 Ibis street, San Diego, California.

MANGANESE.

Deposits of manganese ore occur in Imperial County, in the Palo Verde Mountains about 5 miles west of the wagon road between Palo Verde and Glamis and in the Paymaster district in an outlying spur of the southeastern part of the Chocolate Mountains. The Colorado River is about 4 miles east of the deposits. The Paymaster district is accessible from Glamis, on the Southern Pacific Railroad, by a wagon road 32 miles long.

The deposits of manganese ore in the Palo Verde district are contained in a number of short veins or shear zones that cut basic lava flows. The veins have a general strike of N. 65° E. and are vertical. In the Paymaster district the deposits of manganese ore are contained in fissure veins that cut both the sedimentary and igneous rocks. The veins strike from N. 10° W. to N. 50° E., and dip from 65 degrees E. to vertical. The manganese oxides are dominantly psilomelane, though with increasing depth the softer oxides, manganite and pyrolusite become more abundant.

All the mines in the above mentioned districts are idle, suspending operations in the latter part of 1918, due to the low market price of manganese.

For detailed description of the different deposits see California State Mining Bureau Bulletin No. 76, pp. 34-35; U. S. G. S. Bulletin No. 710-E, pp. 200-208.

PETROLEUM.

There has been a revival of activity throughout Imperial County in drilling for oil, and four wells are now being drilled by different companies.

The present oil excitement in Imperial Valley is not the first of its kind. Numerous attempts have been made to find oil in years past but without success. Among the wells previously drilled were the Harper or Mesquite well, about 850 feet deep, in section 27, T. 12 S., R. 10 E., the Hudson well in township 14 S., R. 10 E., and the Yahu Buttes well. The principal well was the Yahu, section 32, T. 16 S., R. 11 E., drilled by the **Yahu Oil Company.** It reached a depth of 1363 feet, but without result.

At the present time the following oil companies are drilling wells in the county: San Diego and Imperial Valley Oil Company, known as the "James" well, section 9, T. 16 S., R. 10 W. This well is being drilled with a portable steam outfit with Standard derrick. Depth 1000 feet.

The **Imperial Oil and Developing Association** Well No. 1, section 32, T. 11 S., R. 10 E. The well is about 2500 feet deep, having drilled through shale or sandy shale to present depth. Reported gas encountered in this well.

Diamond Bar Oil Company Well No. 1, section 25, T. 11 S., R. 9 E., S. B. B. and M. Depth 2500 feet. Gas showing reported.

104 Oil Company Well No. 1, in section 11, T. 14 S., R. 16 E. Depth of well being about 1000 feet, having drilled through sandy shale.

Quoting from Irving V. Augur's report on Drilling Operations in Imperial Valley in "Summary of Operations California Oil Fields," Vol. 5, No. 10, April, 1920, issued by California State Mining Bureau.

Each of the wells now drilling starts in the younger beds of the Carrizo formation. The San Diego and Imperial Valley well is located on the south flank, and considerably south of a plunging anticline in this formation.

The Imperial Valley Oil and Developing Association well and the Diamond Bar Oil Company's well are located on well-pronounced domes in the Carrizo formation and if able to penetrate to the base of this formation should determine whether or not oil may be found on the west side of the valley. It is evident that the Carrizo formation is the only formation in which oil can be expected, since this formation rests directly upon the basal complex.

A large amount of acreage in the valley has been sold recently by the Southern Pacific Company, and by the state, and thousands of acres of government land have been filed on as placer claims.

The following-named companies are among the many which have been reported as preparing to begin active operations this year:

Salton Basin Oil and Gas Association, Kobarstekeck Oil Company, South Western Petroleum Company, Pacific Gas, Oil and Refining Company, Barbara Worth Oil Company, Canopas Oil Company, H. L. & K. Company, Imperial Valley Oil Syndicate, California Imperial Syndicate, Delta Oil and Gas Company, Mount Signal Oil Company, Colorado Desert Oil Company.

A few of the above-mentioned companies' holdings include patented land, but the larger number are organized to develop government lands. Filing on claims is still very active, although many of the unpatented lands are now under entry. Probably many of the wells which it is proposed to drill will not actually be started unless a definite oil showing is found in one of the wells now drilling or to be drilled in the near future.

For detailed information on the Petroleum Development in Imperial County see "Summary of Operations California Oil Fields" of the State Oil and Gas Supervisor, issued by State Mining Bureau, Vol. 5, No. 10, April, 1920.

PUMICE.

Brand and Stevens Pumice Deposit. It is situated 9¼ miles northwest of Calipatria, in section 32, T. 11 S., R. 13 E., S. B. B. and M. Consists of a group of placer claims covering whole deposit, embracing about ¼ section. A deposit of pumice of undetermined thickness lies on a low, rounded hill about 20 feet high above the surrounding flat, which is in the Salton Sea Sink, 180 feet below sea level. It is evidently the slopes of an old crater which has been filled with sand and ash. The deposit covers probably 100 acres. The work so far done is confined to an open cut, whose face is 250 feet long and about 20 feet in depth. The pumice occurs as broken angular pieces throughout this face, probably 40% of the material being pumice. The remaining material, which forms a filling, is sand and ash. The pumice occurs in pieces varying in size up to 10 inches, the average being probably 1½″ to 4″. Larger pieces are rarer and form a small percentage of the whole. The pumice is silver gray in color and appears to be uniform

in character. Occasional pieces of obsidium are found with it. Large flows of the obsidium lie on two sides of the deposit, forming low, broken hills. Material is mined by pick and shovel. Pumice sorted out by hand, and a team and scraper used to haul away the sand. Pumice is hauled to Calipatria at a cost of $2.50 per ton by 5-ton auto trucks. Four to six men are employed. H. W. Brand and E. E. Stevens, owners, 606 Hibernian Building, Los Angeles, California.

SILICA.

A bedded deposit of silica sand occurs in the Coyote Mountains on the holdings of the Southern California Marble and Development Company.

The deposit is located 7 miles north of Coyote Wells, a station on the San Diego and Arizona Railroad.

The bed of silica is about 50 feet thick, and can be traced for $\frac{1}{4}$ of a mile along a gulch west of No. 3 quarry. The sand is clean and white and would be suitable for making glass.

SILVER AND LEAD.

Silver occurs with lead, 1 mile south of the Colorado River and 5 miles east of Picacho. The ores are lead carbonate and galena, which occur in small veins or pockets. Wm. Swain of Picacho owns a number of claims.

The old Paymaster silver mine, which is located in the northern part of Barren Mountain, is being worked by Malcolm McLeach of San Diego, California. A cyanide plant has been installed and the old tailings and dumps are being treated. Four men employed.

SODIUM SULPHATE.

Deposits of natural sodium sulphate occur in Imperial County, in the Salton Sea Basin, near Bertram and Pope Stations on the Southern Pacific Railroad.

A deposit owned by E. N. Smith of El Centro, California, is situated east of Bertram Station, in township 9 S., R. 12 E., S. B. B. and M.

Beds of sodium sulphate stated to be from 1 to 12 feet thick, and from 50 to 300 feet wide, can be traced for a distance of one mile. Overlying these bedded deposits is an overburden from 6 to 12 feet thick of unconsolidated sand and gravel. It is stated the deposit is very pure, running 95% sodium sulphate ($Na_2 SO_4$). About 5000 tons have been developed, and will be shipped to the glass manufacturers in Los Angeles.

G. E. Miller of Niland owns a deposit southeast of Durmit Station on the Southern Pacific Railroad. It is reported that the beds of sodium sulphate are from one to 8 feet in thickness, with an overburden of sand and gravel. The deposits are reported to have been recently sold to Los Angeles interests.

STRONTIUM.

Deposits of celestite occur in the Fish Creek Mountains, associated with gypsum, in Imperial County.

W. F. Peler and **D. R. Roberts**, of Los Angeles, have several claims on these deposits, which are situated 40 miles west of Brawley, a station

on the Southern Pacific Railway. The celestite beds are underlain by beds of gypsum. The ore is finely crystallized, but generally white in color.

During 1916, 40 tons were shipped from deposit to B. F. Mortimer of Los Angeles, for the manufacture of sodium nitrate.

During the past two years no further developments have been made on these deposits.

INYO COUNTY.

INTRODUCTION.

The field work for this report was carried on during the year 1920, the object being principally to report on the new developments in the mineral resources throughout the county since the Fifteenth Report of the State Mineralogist.

Appreciation is expressed for the courtesy and assistance tendered by the owners and operators of the mines.

LOCATION AND DESCRIPTION.

Inyo County lies along the eastern border of California, and is bounded to the north and south by Mono and San Bernardino counties, respectively. The western boundary extends to the Sierra divide. The county has an area of 10,224 square miles, being the second largest county in California. Independence is the county seat, while Bishop is the center of population.

Within the borders of the county are both the highest point and the lowest point in the United States—Mount Whitney having an elevation of 14,501 feet, while the lowest point in Death Valley, at Salt Flat, is 280 feet below sea level.

TRANSPORTATION.

Mines located in the region of Owens and Amargosa Valleys are easily accessible from the Southern Pacific and the Tonopah and Tidewater railroads. Roads and trails make the interior of the county accessible, but hauling is difficult because of steep grades and deep sands.

POWER.

Electric power, generated in the Sierras west of Bishop, is available in the northern and western parts of the county. The eastern and southeastern and central portions of the county are dependent on internal combustion engines for generating power at the mines.

Two companies at present have hydro-electric plants on Bishop Creek. The Nevada-California Power Company, owning three plants, confines its operations exclusively to the State of Nevada. The Southern Sierras Power Company has three hydro-electric plants on Bishop Creek. Their lines extend from the plants on Bishop Creek down the Owens Valley, with branches to Keeler, to Big Pine, to Palmetto, Nevada, and north to Lundy, Mono County.

ANTIMONY.

Wildrose Mine. Situated in Wildrose district. Lies on western flank of Panamint Mountains, south of Wildrose Cañon, and 45 miles by road north of Trona. Elevation 5000 feet. Irregular veins of stibnite, varying in width from a few inches to over a foot, are deposited in schist. The general trend of the stringers is east and west, and their outcrops can be traced for several thousand feet along ridge. Workings consist of numerous open cuts and a large number of tunnels. Idle.

Owned by the Western Metals Company, Security Building, Los Angeles, California; M. Elsasser, manager.

Bibl.: Repts. XII, p. 21; XV, p. 60.

Williams and Johnson Prospect. Located on eastern slope of Argus Mountains, between Revenue and Shepherd Cañon, 18 miles by road north of Trona. The deposits of stibnite are said to outcrop at intervals over distance of 1500 feet. Owners, Ralph Williams and George Johnson of Bishop, California.

The occurrence of antimony is reported in the east flank of the Panamint Mountains. As the deposits are very inaccessible, they have never been developed, and little is known concerning them.

BORAX.

Borax was first discovered in Inyo County in 1874, in the Playa deposits of Saline Valley. A few years following the discovery in Saline Valley, the marshes in the vicinity of Resting Springs and of Death Valley, north of Furnace Creek, were found to contain borax crust, and were worked until 1890. Some years after this date extensive deposits of colemanite were found in the foothills of the Black Mountains east of Furnace Creek. They extend in narrow belt for many miles, and are owned by the Pacific Coast Borax Company. The southernmost deposit was located seven miles southwest of Death Valley Junction and known as the Lila C. mine. This mine has been a continuous producer from 1907, and is a small producer at present writing.

The **Pacific Coast Borax Company** is at present the only producer of borax in Inyo County and is mining colemanite from the following mines of the company: Upper Biddy, Lower Biddy, Grand View, Lizzie V. Oakley, Played Out, Widow Mines.

The main camp, called Ryan, is at the Biddy McCarty Mine, twenty miles north of west of Death Valley Junction. The Death Valley Railroad, a narrow gauge controlled by the same company, connects Ryan with Death Valley Junction. Ore trains operated by gasoline motors haul ore from the different mines to the main storage bins at Ryan. The borate-bearing beds of this vicinity are a part of a series of tertiary lake beds, which consist of thin-bedded, light-colored shales. Underlying these shales are thick beds of coarse sandstone and tuff. The sandstone exposures form conspicuous bluffs at the camp of Ryan below the upper Biddy workings. The borate-bearing beds are capped with basalt, which forms the crest of the ridge back of the mine.

The colemanite deposits are distinctly bedded and vary in thickness up to 100 feet. The strata have been considerably faulted so there is no great regularity to the deposits.

The purest deposits are usually found nearest the capping. The colemanite occurs massive and more or less crystallized. The crystals occur both in prismatic form, varying from minute size up to a couple of inches in length, and in radiating or plumose structure in the beds. Underlying the purer beds, colemanite is found as stringers in the shale, due to leaching and recrystallization of the upper beds. It is also found mingled with shaly matter which ore is necessarily concentrated. The ore from the different mines is segregated into first and second class ore, the first grade ore is shipped direct to the refineries at Bayonne, New Jersey, or Alameda, California, while second class ore goes to concentration plant at Death Valley Junction.

Biddy McCarty Mine (Upper Biddy). Situated at Ryan, the terminus of the Death Valley Railroad. Elevation 2900 feet. The general trend of the colemanite beds is northwest and southeast with dip of 45 degrees to northeast.

The beds are from 20′ to 100 feet thick, and are worked by means of glory hole, also underground stoping below quarry level. Ore extracted from glory hole and stopes is trammed out through a tunnel 210 feet in length to main storage bins. Recently this main haulage level has been extended east through the hill a distance of 1800 feet, and will be used as main haulage way for ore trains from Grandview, Oakley and Widow Mines. Chute from glory hole is 190 feet from portal of tunnel.

Lower Biddy Mine. This mine is situated ¼ mile northwest of Upper Biddy. The colemanite beds strike N. 50° W., and dip 40

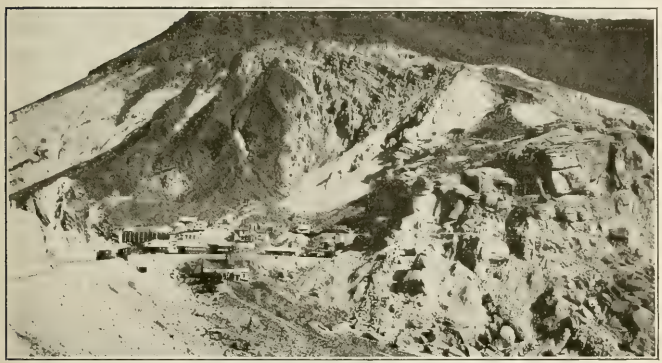


Photo No. 28. Biddy McCarty Mine (Upper Biddy), Ryan, Inyo County. Pacific Coast Borax Company. Photo by W. B. Tucker.

degrees to southwest. The beds have a thickness of 6 to 10 feet. The ore is mined by means of glory hole and a series of tunnels driven in under the ore body at different elevations. Ore from these workings hoisted over incline tramway by 20-h.p. hoist to storage bins, from which which bins is loaded into cars of the Death Valley Railroad.

The main power plant is at the Biddy McCarty mine: 16″ x 9¾″ x 12″ Sullivan compressor driven by 100-h.p. Fairbanks-Morse Semi-Diesel type of engine. Air from this central plant supplies the different properties with power for air drills.

Grand View Mine. This mine is situated about 1 mile south of Ryan, on slope of ridge east of Furnace Cañon. Elevation of 2950 feet.

At the elevation of main haulage track a crosscut tunnel has been driven east, cutting colemanite beds, which strike northwest and southeast and dip to the northeast. The deposit has also been developed by a series of crosscut tunnels at a higher elevation. The colemanite beds

have a thickness of 6 to 20 feet. Ore trammed from workings to storage bins, where loaded into ore train and hauled to main storage bins at Ryan.

Oakley Mine. It is situated south of the Grand View mine and about 1¼ miles south of Ryan, at an elevation of 2800 feet. The main workings on the property are at a lower elevation than the main haulage way from Ryan to the Widow Mines, and are connected with main haulage system by a spur track. The colemanite beds on this property strike northwest and southeast and dip 45 to 50 degrees to northeast. The deposit is developed by a number of crosscut tunnels driven east at different elevations. At a higher elevation are what is known as the upper workings which are now being developed by the company, and some well defined ore bodies have been developed. Ore from this mine is picked up by ore trains and hauled to Ryan to main storage bins.

Played Out Mine. It is situated 2 miles north of Ryan. Elevation 2900 feet. The colemanite beds on this property strike north 50 degrees west and dip 40 degrees northeast. These beds have a thickness of from 10 to 25 feet. Main working tunnel is driven north 50 degrees east, 800 feet, cross cutting belt of sandstone and shale, failing to cut ore body. A raise was then put up 140 feet to ore body on sixth level. A drift has been driven south 30 degrees east, 200 feet in ore which shows a width of 20 feet of colemanite and ulexite.

These beds have been developed by 5 tunnel levels above main haulage level. On No. 1 level or quarry level the ore body is 300 feet long and 20 feet thick. Ore extracted from quarry, drifts and stopes goes to main ore chute and is dropped down to lower tunnel level, then trammed to storage bins on railroad. At these bins the ore passes over a grizzly, and the high grade ore is sorted out.

Widow Mines. They are situated on ridge east of Furnace Creek Wash, at an elevation of 3386 feet. Seven different deposits have been opened up on this property, all of which have been developed in the past year. The strata here has been considerably faulted so there is no regularity to the deposits.

On Widow No. 3 deposit, the colemanite beds strike north 60 degrees east and dip 40 degrees southeast. Thickness of beds being from 20 to 200 feet, with an ore body 300 feet long. Underground workings consist of a cross-cut tunnel driven 1250 feet northeast to ore body, then continued to hanging wall of ore deposit 150 feet. Raise from this level through ore to No. 2 level, a distance of 100 feet, then drift run 700 feet northeast in ore. Raise continued 55 feet to No. 1 level, on this level a cross-cut tunnel has been driven southeast 300 feet in ore. No. 1 tunnel has been driven 200 feet northeast along the footwall of vein. This level connects with glory hole on the surface, the ore from glory hole goes to ore chute that connects with main tunnel level.

No. 7 Widow Deposit.

Crosscut tunnel has been driven 200 feet north to vein, and a drift run southeast 500 feet in ore. The colemanite deposit on this level is 50 to 60 feet thick. Drifts have been driven both on hanging and footwall of vein, and crosscuts run connecting these drifts every 50 feet.

About 70 feet below these workings a main haulage tunnel has been driven northeast 200 feet to ore body. The colemanite bed on this level is over 100 feet in thickness and from 300 to 500 feet in length.

A large tonnage of ore has been developed on this group of claims, and the Widow Mine promises to be the largest producer of any of the properties so far worked by the company.

Ore is loaded in cars direct from chutes in two main lower adit tunnels, and hauled by gasoline motors in trains of ten ore cars, each train hauling 30 tons a distance of 2 miles to main storage bins at Ryan.

Most of the mining is done by hand drilling, but all development work is done with air drills.

About 205 men are employed at the different mines, producing 75 to 100 tons of first class ore, and about 300 tons of second class ore. All second class ore is concentrated at Death Valley Junction.

Concentration Plant.

The ore is fed into a No. 5 gyratory crusher and crushed to pass 2″ ring, and passed through Allis-Chalmers 24″ rolls, spaced so as to crush $\frac{3}{8}$″ size, or finer. A belt conveyor elevates the crushed ore to two large storage tanks (capacity 80 tons each) from which it is automatically fed to six 6′ x 50′ rotary roasters. The roasters are fitted with inner chambers which carry the ore so that the flame does not come in direct contact with the ore. Crude oil used as fuel. The roasting temperature is 1300° F.

The material from roasters passed over double deck shaking screens, top screen being $\frac{1}{4}$ mesh, and lower screen 24 mesh. Minus 24 mesh product is a finished product, and is conveyed by screen conveyors to sacking plant. Plus $\frac{1}{4}$ and on 24 mesh material elevated to bins in concentrating plant. Then fed from bins to 24 mesh trommel screen, oversize from trommel to set rolls—where crushed through $\frac{1}{4}$″ ring. Crushed product from rolls elevated to set of trommels where resized on 24 mesh, oversize going to 6 Hartz jigs, and minus 24 mesh product to six Wilfrey tables, where a finished product is taken off.

Jig concentrates goes to Colorado impact screen for dewatering. Tailings from jigs and tables dewatered by Dorr and Drag classifiers. Tailings from concentrating plant conveyed by belt conveyor 500 feet in length to waste dump.

Jig and table product rough dried on steam plates, then passed through Ruggles-Cole dryer. Finished product from roasters and concentrating plant, averages 42% to 45% B_2O_3, is sacked upon cooling and shipped to the refineries, for the manufacture of boric acid, and borax products.

A recovery of 85% is made by concentration. The plant makes a recovery of 95%. Present capacity of plant is 300 tons per day. At present 285-h.p. Diesel engine supplies power for operating plant. A 500-h.p. Diesel engine is being installed, which will in future furnish the power to operate the plant. Eighty-five men employed. Pacific Coast Borax Company, owner, Syndicate Building, Oakland, California; R. C. Baker, president; W. F. Wemphal, secretary; John Ryan, general manager; Major J. Boyd, mine superintendent; F. W. Corkill, mill superintendent.

Bibl.: Rept. XV, pp. 62-69.

COPPER.

Although there are deposits of copper in many localities in Inyo County, there has been very little production from ore bodies that contain copper as the predominating metal. The greatest production has been that in association with gold, silver and lead ores containing small percentages of copper. Due to the low price of copper since the latter part of 1918 there has been no mining of copper-bearing ores in the county.

There are valuable deposits of copper ores in the following districts: Ubehebe, New Coso, and Greenwater. The ores are principally the oxides and carbonates of copper, with some chrysocolla, and occasionally sulphide. These districts and the mines have been fully described in Report XV, pp. 69 to 74, therefore no attempt will be made to go into a detailed description of the individual properties.

DOLOMITE.

There are extensive deposits of dolomite in Inyo County, but owing to their distance from railroad transportation they are not of commercial value.

The most extensive deposits are situated on the western flank of the Inyo Range of Mountains, near Keeler.

In the Keeler district, north of Swansea, the rock is being quarried and shipped to the soda plants on Owens Lake, where the dolomite is used for generating carbon dioxide.

Badgley Quarry, Swansea (Keeler) district. Four miles north of Keeler, at western base of Inyo Mountains. Eighty acres patented. Marble beds here are folded and shattered. Quarried for use as dolomite. Idle. Owned by W. A. Badgley of Monadnock Building, San Francisco, California.

Bibl.: Report XV, p. 74.

Natural Soda Products Company of Keeler are shipping 100 tons per day of pure white dolomite from their quarry to the soda plant at Keeler. One air compressor furnishes air for drills which are used in quarrying the rock. A spur track of the California and Nevada Railroad to quarry. Worked under contract by Emil Hernandez. Seventeen men are employed.

Bibl.: Report XV, p. 74.

California Alkalai Company of Cartago are shipping about 50 tons of dolomite from company's quarry to the Cartago plant, and the Inyo Development Company's plant. The quarry is situated about 2 miles north of Natural Soda Products Company quarry. Air drills are used in quarrying the rock. Fourteen men are employed by Emil Hernandez, who is mining the rock under contract.

GOLD.

Since the last report issued by the State Mineralogist there has been practically no activity in gold mining in Inyo County. Lack of interest in the development of the gold properties has been mostly due to the fact that cost of material, labor and supplies have risen to such a point that it is no longer profitable for the gold miner to operate his property.

Unless some relief is given the gold industry there will be no incentive for the prospector or the operator to attempt to develop properties.

In Report XV, pp. 75 to 85, a complete description of the different mines is given, so the writer will only attempt to outline what few properties that are operating, and those properties not reported on in previous reports.

MINES.

Black Eagle Mine. (Quartz.) Union district. Situated on west flank of Inyo Range of Mountains, 4 miles east of Kearsarge Station. Elevation 8300 feet. The ore body is a narrow quartz vein on the contact of granite and limestone, but is enclosed principally in the granite. The vein trends N. 70° E. and dips nearly vertical. A shaft has been sunk to depth of 310 feet on the vein and a number of levels run east and west on the vein. It is reported that on the third level there was a shoot of ore developed 400 feet in length. The ore is usually high grade; and by sorting it is said to have averaged $100 per ton in gold. The mine is being reopened by the Inyo-Black Eagle Mining Company, F. W. Cole, president and manager; offices 512 I. W. Hellman Building, Los Angeles, California. Five men are employed on development work.

Bibl.: U. S. G. S. Bull. 540, p. 116. Report XV, p. 75.

Buckeye Mine (Never Rest Mines). Fish Springs district, situated on east slope of Poverty Hills at west edge of Owens Valley, 8 miles south of Big Pine. Ore body occurs at contact of lime shale series and a monzonite porphyry. It is soft decomposed, and so fractured that the ore is easily mined and crushed. The general trend of the ore body is northward and is said to vary up to 60 feet in width. The greatest depth on it is a 150 foot shaft sunk below the present surface workings. Most of the ore milled came from open cuts west of shaft. It is stated ore averages $4 to $5 per ton in gold throughout its width. Mill capacity 250 tons, consisting of one 7″ x 16″ Sampson jaw crusher, 1 shaking screen, 1 set of Standard rolls, 1 Hardindge mill, ore from Hardindge mill passed over amalgamation plates, discharging to one roughing, and 3 Kirk concentrating tables, middlings to Diester slimer. Ore was crushed to 40 mesh. Property was operated the latter part of 1918. Operations were suspended early part of 1919, owing to low grade tenor of the ore. Owners, Buckeye Mining and Smelting Company, W. H. Noyes, president; Geo. W. Abel, secretary, La Salle Street, Chicago, Illinois.

Cinnamon Mine. Beveridge district. It is 10 miles northeast of Mount Whitney Station. Trail to mine from Mount Whitney Station. Elevation 6500 feet. Vein of quartz trends NW. and SE., dip 40 degrees, in granite. Width 2 feet. Two tunnels have been driven on the vein, upper tunnel 150 feet, lower tunnel 350 feet. Ore is reported to carry $30 per ton. Small two-stamp mill on property. Idle. Owners, F. M. Hess, and A. W. Hess, of Lone Pine, California.

Cleveland Mine. Fish Springs district. Situated 6 miles south of Big Pine, on the east slope of low granite hills which are on the western edge of Owens Valley. Series of parallel quartz veins in granite, which have a general trend east and west and dip 80 degrees south. A number of tunnels have been driven on the veins at different elevations. At an elevation of 4800 feet a tunnel has been driven 625 feet west on one of these quartz veins. The ore is free milling gold quartz with

small percentage of iron pyrite and chalcopyrite. Ore milled at small mill on Birch Creek. Property is operated off and on during the year by owner. Owner, Joseph Mear of Big Pine, California.

Cometti Group of Mines. Fish Creek district. Elevation 4500 feet. Situated 6 miles south of Big Pine, on east slope of low granite hills on western edge of Owens Valley. Holdings consist of 5 claims, with 3000 feet on the lode. Two parallel fissures cut the granite. These veins strike east and west, and dip 80 degrees south. These fissures are 6 to 8 feet in width with porphyry filling in center and 12″ to 18″ of quartz on both walls. The quartz is gold bearing, and is said to carry $20 per ton. Developments consist of three tunnels driven west on the south vein. Lower tunnel is 300 feet long, winze 152 feet on vein. About 100 feet above this tunnel, is an intermediate tunnel driven west 800 feet, three shoots of ore were developed on this level 75 feet in length and about 150 feet apart, the first shoot was intersected 100 feet from portal of tunnel. These shoots of ore have been stoped out to the surface, and about 60 feet below the level. It is reported that they produced over $100,000. Five hundred feet north of main vein a cross-cut tunnel has been driven 100 feet, cutting a parallel vein, with a drift west on vein 200 feet. About one mile southeast on Birch Creek, there is a three-stamp mill.

Equipment. Blake crusher, 3 Nissen stamps. Wilfrey concentrator. Impounded in gulch below mill are 2000 tons of tailings, said to average $6 to $7 in gold per ton.

Owner, Morris Albertoli of Big Pine, California.

Kearsarge (Cliff) Mine. Kearsarge district. Situated 12 miles west of Kearsarge, a station on the Southern Pacific Railroad, on east slope of the Sierras, at an elevation of 8000 feet. Veins of quarts 6″ to 12″ wide in granite carrying gold and silver values. Developments consist of a number of shallow shafts and short tunnels. Property has been idle for over forty years. Reopened by Independent Mining Company, Independence, California, E. C. Montgomery of Independence, manager.

Iron Sides Mine. Beveridge district. It is situated 10 miles northeast of Mount Whitney Station. Elevation 8000 feet. The vein follows a limestone porphyry contact 18″ wide. Developments consist of shaft 156 feet, and tunnel 700 feet, about 2000 feet of drifts. Ore milled, stated to carry $20 to $40 per ton.

Equipment. Gasoline hoist, compressor and arrastra. Idle.

Mrs. Kate Wells of Big Pine, owner.

Nellie H. Mine. (Prospect.) Beveridge district. Situated 15 miles northeast of Owenyo, on eastern slope of Inyo Range of mountains. Elevation 8000 feet. Five claims. Vein of quartz 6″ to 24″ wide in granite. Strikes north and south, with dip 80 degrees east. Tunnel on vein 175 feet. Two men employed, on development work. A. M. Strauss and W. Ryman of Lone Pine, California.

Panamint Group of Mines. Panamint district. Situated 8 miles east of Ballarat. Holdings consist of ten claims. Considerable work has been done on the different claims, in the way of tunnels, shafts

and open cuts. There are two groups, one known as gold group, and the other as silver group of claims. On the gold group there are a series of parallel veins in the granite, while on the silver group the deposit occurs in fissures in the limestone. Deepest workings is a shaft 55 feet on the Tecopa Chief Claim. Idle. Owner, Blue Flag Gold Mining Company, 703 Exchange Building, Denver, Colorado; J. F. Erisman, president; W. B. Warren, secretary.

Pine Mountain Group. Property is situated 2 miles north of Payson Cañon on the toll road to Deep Springs Valley. Quartz vein in granite is said to average 4 feet in width and to assay $20 per ton. There are seven claims in the group. Two men employed. Chas. W. Alvord, Big Pine, owner.

Protection Group (Burro Mine). South Park district. This group of mines is situated 35 miles northeast of Trona, in Jail Canyon, at an elevation of 4000 feet. Also about 10 miles north of Ballarat. Series of parallel quartz veins in schist, with general NW. and SE. trend. Veins vary in width from 2 feet to 10 feet. Developments consist of shaft 116 feet deep, tunnel 200 feet in length, also a number of short tunnels and shallow shafts on different veins. These veins are reported to carry from $2.50 to $25 per ton in gold. Idle. H. M. Thurman, Trona, California, owner.

Washington Mine. Is situated on eastern slope of Alabama Hills, about 1 mile west of Lone Pine. A vein of quartz 4 feet in width in granite, which has a general NW. and SE. trend and dips slightly to southwest. Crosscut tunnel driven 700 feet to vein, with a drift 200 feet on vain, which gives a vertical depth at this point of 200 feet below the outcrop. Ore is said to average $20 per ton. Idle. Felix P. Meyson of Lone Pine owner.

Wilshire Bishop Creek Mine. Bishop Creek district, 22 miles southwest of Laws. Holdings consist of 12 patented mining claims, situated on the headwaters of Bishop Creek, 16 miles southwest of Bishop, on eastern slope of the Sierra Nevada Mountains at an elevation of 8500 feet. The ore body occurs in a quartzite dike which cuts the granite in N. 50° W. direction. Its dip is 60 degrees to the south. The dike averages about 800 feet in width. The lode in this dike or reef strikes N. 76° W. and dips 60 degrees north. The lode fracture has no well defined walls, the mineralization occured on lines of fracturing in the quartzite, as shown by quartz stringers in dike. The gold occurs in very fine state in quartzite, associated with iron pyrite, small percentage of arsenical pyrite and pyrrhotite. Evidently most of the gold is contained in the sulphides of iron. The ore shoot developed is about 100 feet in length and about 8 feet wide stated to average $8 to $10 per ton in gold.

The mineralized zone has been developed by means of vertical shaft 300 feet deep, with levels driven at 200 and 300 feet. On 200′ level drift west 140 feet in ore, and drift east 175 feet in ore. On 300′ level, drift west 180 feet, and a drift east 280 feet. Stoping has been carried on the 200′ level about 100 feet east of shaft. Very little stoping has been done on second level. Previous to 1920, ore treatment was by concentration, and cyanidation which proved unsuccessful.

The company is at present remodeling mill, and are planning to use the flotation process in future treatment of the mine ore. Mill equipment: No. 5 gyratory crusher. Allis-Chalmers 4′ x 6′ ball mill, Dorr classifier, oversize from Dorr classifier to 5′ x 16′ tube mill, product from tube mill to K. and K. rougher flotation machine, and 2 K. and K. cleaner machines. Mine equipment: 75-h.p. motor drives single drum hoist. 22″ x 14″ x 18″ compressor driven by 200-h.p. motor. Electric power furnished by Southern Sierras Power Company. Owner, Rocky Point Consolidated Mines Company; president, Gaylord Wilshire; secretary, H. R. Kearns; John V. Richards, manager; offices, 422 Hollingsworth Building, Los Angeles.

Bibl.: Rept. XV, p. 85.

GYPSUM.

Acme Cement and Plaster Company. Resting Springs district. Large deposit of gypsum on China or Morrison Ranch, 1 mile northeast of Acme Station on the Tonopah and Tidewater Railroad. Elevation 1500 feet. The company owns four claims known as the Gypsy Queen group. The gypsum occurs as stringers from 1″ to 2″ in thickness in clay beds. General strike of these beds is east and west, with a dip of 25 to 30 degrees north. These deposits were worked by open cut and tunnels.

Operations were suspended at the property during 1918, but there is a possibility that operations will be resumed early in 1921. Owner, Acme Cement and Plaster Company, 703 Tusco Building, St. Louis, Missouri; Samuel Lazarus, president; H. D. Walker, secretary; C. L. McDonald, West Coast agent; 509 Gasco Building, Portland, Oregon.

Bibl.: Rept. XV, p. 85.

Pacific Coast Borax Company owns an extensive deposit of gypsum in the foothills of the Black Mountains, 1 mile from Death Valley railroad. Undeveloped. Idle.

Bibl.: Rept. XV, p. 87.

IRON.

J. C. Roper and **John Amick,** of Independence, own a deposit of iron in Inyo Mountains, 7 miles east of Kearsarge Station. Ore is hematite. No production. Idle.

Bibl.: Rept. XV, p. 87.

Coso Copper Claims. Large deposits of hematite occur on the claims of Dr. I. J. Woodin, Walter Moore, and Adolph Rominger. Idle.

Bibl.: Rept. XV, p. 87.

LEAD, SILVER, ZINC.

Since the last report issued by the State Mineralogist, there has been renewed activity in the mining of lead-silver ores due to the increase in value of these metals. A large number of mines which suspended operations during the European war were reopened the early part of 1919. This proved the case in the following districts: Cerro Gordo, Darwin, and Tecopa. In the Fifteenth Report, pp. 87, 88, and the U. S. G. S. Bulls. Nos 540 and 580 A, by Adolph Knopf, a full descrip-

tion of these districts is given, so no attempt will be made by the writer except to describe those mines under operation with regard to new developments since the above reports were issued.

MINES.

Argus-Sterling Mine. (Lead-silver.) Darwin district. Situated 12 miles south of Darwin in Argus Range of mountains. Ore occurs as irregular masses in vein, which cuts the limestone. Lead carbonate and sulphate associated with iron jasper forms the vein filling material. Unoxidized ore consists of galena. Vein averages 3 feet in width. Shaft sunk on vein to depth of 155 feet, with levels at 90′ and 155′. Drift on 155′ level 245 feet, 140 feet of which is in ore. Shipment made from this ore shoot carried $110 per ton, the lead content being 47%. Six men employed. Owner, Argus-Sterling Mining Company; president, A. C. Taylor; secretary, J. A. Calder, 505 Security Building, Los Angeles.

Baxter Mine. (Lead-silver.) Resting Springs district. Four miles east of Evelyn, a station on the Tonopah and Tidewater Railroad, and on the slope of Resting Springs Mountain. Idle. Owner, J. P. Madison, Shoshone, California.

Bibl.: Rept. XV, p. 88.

Belmont Mine. (Lead-silver.) Situated in the Keeler district, 11 miles northeast of Keeler, and 3 miles by trail southeast of Cerro Gordo mine. Argentiferous quartz veins traversing a crystalline rock of granitoid texture. Ore is chiefly silver with small percentage of lead. Silver minerals contained are tetrahedrite, argentite and stephanite. Vein varies from 8 inches to 6 feet in width. Strike is N. 75° W. Dip 60° to 70° SW. Developments consist of a tunnel 400 feet and shaft 150 feet deep. There is about 3600 feet of tunnels and drifts on the property. Shipments from the mine carried $60 to $100 per ton. Property has a production of $500,000. Worked by leasers. Owner, W. L. Hunter Estate, James S. Hunter of Keeler, California, agent.

Blue Dick Mine. (Lead, silver, zinc.) Situated in Kingston Mountains, southeast of Tecopa. Idle. Owner, Henry Lang, Tecopa, California.

Bibl.: Rept. XV, p. 89.

Bunker Hill Mine. It is 35 miles northeast of Big Pine. Elevation 5500 feet. Formation is limestone. Irregular lenses of galena and lead carbonate ore occur in the limestone or on contact of limestone and porphyry. The company is developing two properties, working a crew of about 16 men at the Bunker Hill mine, sinking a shaft. Present depth is 400 feet. On the Redcliff claim, 3½ miles above the Bunker Hill, a crosscut tunnel is being driven, which is now over 400 feet in length. Owner, Inyo Bunker Hill Mines Company; president, Howard R. Link; secretary, Earl C. Peck, 421 Title Insurance Building, Los Angeles.

Carbonate Mine. (Lead-silver.) Situated in Carbonate district, 42 miles northwest of Zabriskie. Idle. Owned by Carbonate Lead Mines Company, John Salisbury, president, San Francisco, California.

Bibl.: Rept. XV, pp. 89, 90.

Cerro Gordo Mine. (Lead, silver, zinc.) Cerro Gordo district. Situated near the summit of Cerro Gordo Peak, 8 miles east of Keeler. Elevation 8500 feet. Idle. Cerro Gordo Mines Company, San Jose, California, owners.

Bibl.: U. S. G. S. Bull. 540, pp. 97-109. Prof. Paper No. 110, pp. 106-116. Rept. XV, pp. 90-92.

Chalmers Mine. (Lead-silver.) Deep Springs district. Situated 16 miles northeast of Big Pine, in Inyo Range of mountains, near Antelope Springs. Ore occurs on contact between limestone and quartz diorite. Vein 2 to 4 feet wide, strikes NW. and SE. Dip 45° SW. Ore is carbonate of lead and galena. Tunnel 70 feet in length, and an open cut on vein. Ore reported to carry high grade silver values. Idle. Sam Chalmers of Big Pine, owner.

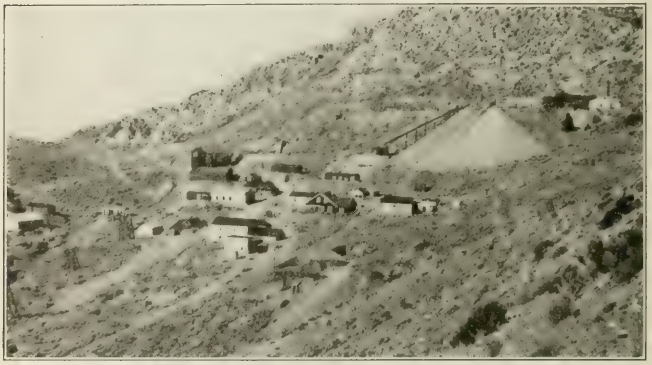


Photo No. 29. Cerro Gordo Mine, Keeler, Inyo County; Cerro Gordo Mines Company, owner.

Christmas Gift Mine. (Lead-silver.) Darwin district, 2 miles north of Darwin. Elevation 5300 feet. Holdings consist of five claims. The country rock in the vicinity of mine consists of white lime-silicate rocks pierced by small intrusions of augite diorite porphyry. The lime silicate rocks are distinctly stratified, and strike N. 30° W. and dip 25° W. Dikes and small masses of porphyry penetrate the lime-silicate strata in the surrounding area, especially west and southwest of the mine. The vein strikes N. 40° E. and dips 75° SE. In width ranges from 2 to 8 feet, averaging 4 feet. The ore forms in irregular masses in vein. Lead carbonate and sulphate associated with iron jasper form the vein filling material. The unoxidized ore consists of galena. Fluorite, abundant elsewhere in the district, is exceedingly rare as a gangue material. Developments: Incline shaft sunk on vein to depth of 250 feet. On 250′ level a drift has been driven 200′ SW. of shaft, and at this point an incline winze has been sunk to depth of 200′, on angle of 45 degrees. At this level a drift is being driven southwest on vein, with the idea of picking up the shoot of ore that

was so productive about the 250-foot level. This shoot of ore trended to the south. The mine has produced about $550,000, all of which came from above the 250′ level and 300 feet along the vein. Ore carries 20 to 30 oz. silver, and 15 to 30% lead with $2 in gold.

Equipment, 15-h.p. gas engine hoist; 10″ x 12″ Sullivan compressor driven by 40-h.p. Fairbanks-Morse engine. Property under lease to Natural Soda Products Company, Keeler, California; W. W. Waterson of Bishop, manager. Development work is under supervision of James McIvar. Six men are employed. Owners, Christmas Gift Mining Company, L. D. Skinner, president; Mrs. Charlotte Skinner, secretary, Lone Pine, California.

Bibl.: Rept. VIII, p. 226; X, p. 211. Rept. of the Director of the Mint, Precious Metals in U. S., 1883-1884, U. S. G. S. Bull. 580-A, pp. 10-12.

Cliff Mine. (Silver.) Situated 5 miles south of Oasis, Mono County, in the White Mountains of Inyo County. Idle.

Bibl.: Rept. XV, p. 93.

Columbia Mine. (Lead-silver.) Darwin district. Idle. Owner, Darwin Silver Company, 1416 South Dearborn street, Chicago, Illinois.

Bibl.: U. S. G. S. Bull. 580, pp. 17, 18.

Custer Mine (Lead,silver,gold.) Darwin district, 1 mile east of Darwin. The ore, principally lead carbonate and galena, is found in bunches in a large irregular body of coarsely crystalline calcite. The developments consist of incline shaft 400 feet deep, with levels at 100′, 200′, 300′ and 400′. Ore recently shipped averaged 100 ozs. per ton in silver, 10% lead and $4 in gold per ton. The mine is said to have produced over $250,000 to depth of 400 feet. Four men are employed on development. Drifting on the 400′ level. The mine is under lease to Frank H. Long and Charles Grimes of Pasadena; John H. Thorndike, manager.

Bibl.: U. S. G. S. Bull. 580, pp. 15-16. Rept. XV, p. 94.

Daisy Mine. (Lead-silver.) Situated 26 miles southeast of Big Pine in the Waucoba district, on the east flank of Inyo Mountains. Elevation 7575 feet. Idle. Owners, Hercules Mining Company, Wallace, Idaho.

Defiance Mine. (Lead-silver.) Darwin district. Recently purchased by Darwin Silver Company, 1416 South Dearborn street, Chicago, Illinois. The company is planning to reopen and develop the mine. It is reported that there is a large tonnage of ore in the mine that will carry 8 to 10 ozs. silver with 12% lead. The ore body occurs as irregular lenses of lead carbonate on contact of diorite and lime-silicate rock. The ore body is 20 to 40 feet thick. On the hanging wall, which was the ore that was stoped, the ore occurred as galena in heavy calcite, below the footwall is lead-carbonate ore with some galena. Developments consist of incline shaft sunk on an angle of 35 degrees to development of 380 feet, at bottom of incline on fifth level a winze was sunk 100 feet in ore. Four men employed. A. G. Kirby, manager.

Bibl.: Report of the Director of the Mint, Precious Metals in U. S., 1883-1884. Repts. VIII, p. 226; X, p. 211; XII, p. 24. U. S. G. S. Bull. 580-A.

Estelle Group of Mines, Cerro Gordo district, are 5 miles east of Keeler, on western slope of Cerro Gordo Mountain. Holdings consist of 11 claims. Ore bodies consist of lenticular masses of lead-carbonate ore, the ore being enclosed in marbleized limestone. The ore is principally reddish yellow lead-carbonate and galena. Troeger tunnel has been driven 7300 feet, crosscutting the limestone formation with the idea of cutting the San Felipe vein 2500 feet below the Cerro Gordo mine.

In driving the tunnel the following veins were cut: West Contact, Jefferson, Union and Bull Run, all of which were productive on the surface but in the tunnel showed very little ore. Tunnel which is driven N. 60° E. intersects carboniferous rocks, mainly limestone, a considerable number of fault zones have been encountered, most extensive being 200 feet wide. About 500 feet remains to be driven to strike the San Felipe or Morning Star vein. At 5500 feet from portal of tunnel, cut wide belt of carboniferous slates which dip 50 degrees west. A series of monzonite intrusions were also cut, so far only one small shoot of ore was developed in tunnel. A few quartz veins cut contained tetrahedrite, galena sphalerite and pyrite, said to carry 10 to 20 ozs. silver. The veins strike N. 35° W. to N. 45° W., with dips varying from 50° to 80° southwest. The only development being done is on the Morning Star claim. The mine is situated at an elevation of 8000 feet. Developments consist of a crosscut tunnel driven N. 40° E. 450 feet, where cut ore deposit. Winze sunk on ore to depth of 225 feet, with levels at 40′, 70′, 120′ and 220′. Ore forms in series of chamber deposits 12′ to 40′ wide. Strike N. 30° W., dip 75 degrees west. Heavy galena and carbonate ore being mined, carrying 35 ozs. silver, 10 to 12% lead with gold values. Ore is transported over an aerial tramway 7000 feet long to terminal below Troeger tunnel. From terminal bins loaded in trucks and hauled to Keeler. Shipping 20 to 30 tons per day to smelter at Midvale, Utah. Twenty men are employed. Owner, Estelle Mining Company; president, R. C. Troeger; secretary, A. H. McAdoo; R. C. Troeger, Jr., superintendent.

Bibl.: Adolph Knopf, U. S. G. S., Bull. 540, p. 110. Rept. XV, pp. 108-109.

Gibraltar Mine. (Lead-silver.) South Park district, southeast of Ballarat, in the Panamint Mountains. Elevation approximately 7000 feet. Idle. Owned by Domingo and Clairen, Ballarat, California.

Gunsite Mine. (Lead-silver.) Resting Springs district, 7 miles east of Tecopa. Elevation 2350 feet. Spur track of the Tonopah and Tidewater Railroad to the mine from Tecopa. The country rock is dolomite, overlying quartzite. The ore occurs in irregular lenses along a fissure in the dolomite. Strike N. 45° W., dip W. 35° to 50° E. Width of ore bodies 20 to 30 feet. The ore is principally carbonate of lead, with some galena. The vein matter is decomposed lime with iron oxides. Developments consist of incline shaft sunk to depth of 1000 feet. Crosscut tunnel 800 feet to vein, with drift south 900 feet on vein. Then winze sunk from this level (7th level) to the 1000-foot level. The ore that averages 15 to 20% lead, and 6 to 10 ozs. silver, shipped to smelter of American Smelting and Refining Company, Garfield, Utah. Ore running from 3 to 6 ozs. silver and 5% lead goes to

concentration plant at Tecopa. All mining is done by hand. Fifteen men employed. Adjoins the Noonday Mine, owned and operated by the same company.

Owners, Tecopa Consolidated Mining Company, L. D. Godschall, vice president and general manager.

Bibl.: Report of the Director of the Mint, Precious Metals in U. S., 1883, p. 166. Rept. XV, pp. 95-96.

Ibex Mine or **Arcturas.** (Lead, silver, zinc.) Situated in the Black Mountains, 16 miles southwest of Zabriskie and 6 miles north of Saratoga Springs. Elevation 1300 feet. Idle. Owner, Ibex Spring Mining Company; president, J. F. Kent; secretary, C. W. Kent, 431 Security Building, Los Angeles, California.

Bibl.: Report XV.

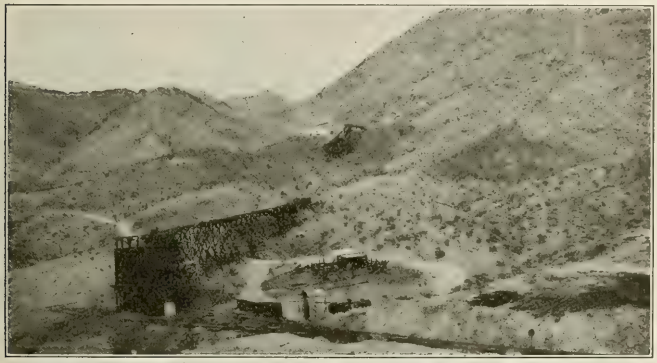


Photo No. 30. Gunsite Mine, Tecopa Consolidated Mining Company, Tecopa, Inyo County. View of workings, tramway and loading bins.

Ignacio Mine. (Lead-silver.) Cerro Gordo district, 6 miles east of Keeler. Elevation 7800 feet. Idle. Ignacio Mining Company; president, P. M. Price, San Diego, California.

Bibl.: R. W. Raymond, Mineral Resources West of Rocky Mountains, 1870, p. 17. Rept. XV, pp. 97-98.

Independence Mine. (Lead-silver.) Darwin district; adjoins the Defiance mine. The ore body is situated at the contact of lime-silicate rocks with quartz-diorite, which is the northward extension of the belt forming the footwall of the Defiance ore deposit. The most interesting feature of the Independence ore body is the fact that the galena and its alteration products are in a garnet gangue. Ore is a carbonate of lead, carried 12 to 15% lead, 6 to 8 ozs. silver. Trend of ore body is N. 45° W., dip 25° SW. 6 to 12 feet thick. Developments consist of two tunnels, upper tunnel 200 ft., lower tunnel 150 ft. Reported a large tonnage of ore developed. Recently purchased by Darwin Silver Com-

pany, 1416 South Dearborn street, Chicago, Illinois. A. G. Kirby, general manager.

Bibl.: Report of Director of Mint, Precious Metals in U. S., 1883, p. 1 4, 1884, p. 103. State Mineralogist Repts. VIII, p. 226; X, p. 211. U. S. G. S. Bull. 580, pp. 14, 15.

Jackass Mine. (Lead-silver.) Darwin district; is 1 mile northeast of Darwin; adjoins the Lane mine. Contact metamorphic deposit, mineralized zone 45 feet wide in lime silicate rocks. The zone strikes NW. and SE., dips 70 degrees southwest. Ore is galena, carbonate of lead with some sphalerite. Ore carries 12 to 15 ozs. silver and 4 to 6% lead. Some high grade ore has recently been shipped from the mine. Mine developed by incline shaft to depth of 140 feet, with drifts north and south on the vein. Elevation of shaft is 5000 feet, about 900 feet



Photo No. 31. Eastern slope of Darwin Hills. Showing location of Jackass, Custer and Defiance Mines, Darwin, Inyo County.

above Lane mill. Ore is transported over aerial tram to mill in ½-ton buckets a distance of 2500 feet.

Mill has been leased from the Darwin Silver Company. Mill 4″ x 6″ Ball mill, one K. and K. flotation machine, one Diester table. An 80-h.p. gas engine furnishes power to run mill. Company plans to treat ore by flotation and concentration. Six men employed. Owner, Black Metal Mining Company; president, J. J. Seaman; S. E. Porter, secretary, 630 H. W. Hellman Building, Los Angeles, California; J. J. Seaman, manager.

Lane Mine. (Lead-silver.) Darwin district, 2 miles northeast of Darwin on east flank of Darwin Hills. Elevation 4100 feet. Idle. Owners, Darwin Silver Company, 1416 South Dearborn street, Chicago, Illinois; A. G. Kirby, general manager.

Bibl.: Repts. XII, p. 24; XIII, p. 32; XV, pp. 98-99. U. S. G. S. Bull. 580-A.

Lee Mine (Emigrant Mine). (Lead, silver, zinc.) Lee district, east of Cerro Gordo, 26 miles from Keeler. Idle. Owned by Dr. I. J. Woodin and William Skinner of Independence, California.

Bibl.: Report of Director of Mint, Precious Metals in U. S., 1883, p. 163. Rept. XV, pp. 99-105.

Lincoln Mine. (Silver.) Deep Springs district. Situated 25 miles northeast of Big Pine, and about 4 miles north of Deep Springs ranch, on the Midland trail. Elevation 6200 feet. Holdings consist of 10 claims. Series narrow fissure veins, with widths varying from 6″ to 12″, cutting granite. These veins strike east and west with dip of 65 degrees north. Some ore sorted and shipped from the property during the early part of 1920, is reported to have carried 100 ozs. silver per ton. Developments consist of three shafts sunk on the veins to depths of 75 to 100 feet, also a number of short tunnels. The discovery of high

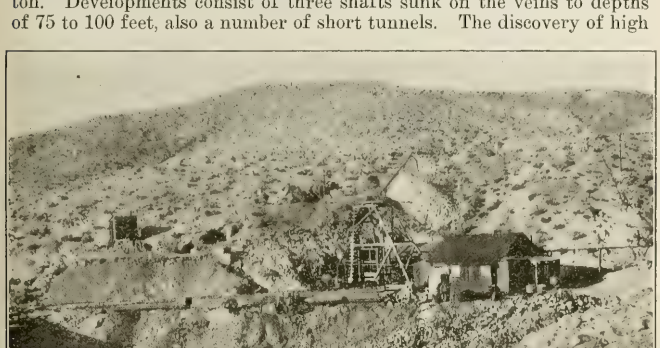


Photo No. 32. Lucky Jim Shaft, Darwin Silver Company, Darwin, Inyo County. View shows outcrop and workings on vein.

grade silver ore on this property caused some excitement and a large amount of the surrounding country was located. Idle. V. Richardson, Gustave Hansen, Magines Strand of Big Pine, owners.

Lucky Jim Mine. (Lead-silver.) Darwin district, 2 miles north of Darwin; adjoins the Christmas Gift mine, 24 miles southeast of Keeler. The country rock is limestone with intrusions of monzonite. The vein cuts across the lime beds striking N. 50° E. and dipping 65 to 80 degrees west. The consists principally of the oxidized ores of lead carrying silver values. Galena occurs in bunches in the vein. Vein is 4 to 6 feet wide. Ore carries 10 to 12 ozs. silver and 6 to 8% lead. The mine is operated by a 300 foot vertical shaft. On 300′ level 515 feet SW. of shaft an incline winze 450 feet deep to 750 foot level. Two well defined faults were cut south of Lucky Jim shaft; these faults strike N. 45° W., dip 80° SW. and are parallel; they are about 500 feet apart.

On 200′ level struck No. 1 fault 500′ south of shaft. Vein faulted 63 feet south. On 300′ level cut fault 515′ from shaft. Vein being faulted 63 feet to SE., a drift was driven on fault 300 feet to northwest. Incline winze sunk on fault 300′ level to 400′. On 500′ level cut main vein 265 feet SW. of winze, showing ore shoot 10′ to 20′ wide, ore carries 25 ozs. silver, 12% lead. No. 2 fault was cut on 500′ level 365′ south of winze, the vein being faulted SE. 40 feet. Ore shoot developed at this point 240′ long, vein dips 80 degrees NW., has a width of 4 feet. On 650′ level cut a cross vein striking N. and S. dips 50° W., showing 2 feet of ore. All ore shoots have a general trend to SW. of 30 degrees. Footwall vein intersects main vein on 750′ level.

The mine is being extensively developed under the supervision. A. G. Kirby, manager, and the plans of the company are to install a concentration plant to treat the ores from this mine, also from Independence and Defiance properties.

Equipment. At Lucky Jim shaft, 25-h.p. gas engine hoist; at winze on 300′ level, 25-h.p. electric hoist. Central power plant equipment: 100-h.p. 2-cyl. Semi-Diesel-Fairbanks Morse engine; 25-h.p. Auxiliary Fairbanks Morse gas engine; 2-Way Ingersoll-Rand compressor cylinders (15″ x 12″, 9″ x 12″), 25-h.p. electric generator, 2 Duplex trucks. Company owns water line from Coso Mountains to Darwin, a distance of 8 miles. All water for plant and domestic use hauled by trucks from town of Darwin. Mine was reopened during January, 1920. The total production of this mine is $1,500,000.

Owners, Darwin Silver Company; president, E. W. Wagner; secretary, E. N. Schroth, 1416 South Dearborn street, Chicago, Illinois; A. G. Kirby, general manager; A. A. Belin, superintendent.

Bibl.: Mining Resources West of Rocky Mountains, 1876, p. 25; Report of Director of Mint. Precious Metals in U. S., 1883, p. 163. State Min. Bur. Repts. VIII, p. 226; X, p. 211; XII, p. 24; XV, pp. 100-101. U. S. G. S. Bull. 580, pp 12, 18.

Minneatta Mine. (Lead, silver, zinc.) Located in the Lookout district 28 miles north of Trona. East slope of Argus Mountains. Elevation 3000 feet. Idle. Owned by J. J. Gunn, Independence, California.

Bibl.: R. W. Raymond, Mining Resources West of Rocky Mountains, 1876, p. 32. Rept. X, p. 212.

Modoc Mine (Lead-silver.) Lookout district, 30 miles north of Trona, 2 miles north of Minneatta mine. Elevation 3500 ft. Idle.

Bibl.: Repts. XII, p. 24; XIII, p. 32. Report of Director of Mint, Precious Metals in U. S., 1883, p. 164; 1884, p. 104.

Monster Mine. (Lead-silver.) Situated on east slope of Inyo Mountains, northwest of Saline Valley. Located in 1907. Idle. Owners, Frank Butler and Sam Watson of Big Pine, California.

Bibl.: Adolph Knopf, U. S. G. S. Bull. 540, p. 111.

Montezuma Mine. (Lead-silver.) Situated 10 miles southeast of Big Pine on the western slope of the Inyo Range. Elevation 4700 feet. The country rock is limestone and slates, which have been greatly shattered and faulted. Ore forms in irregular lenses along a fault between the limestone and clay slates. Ore is of argentiferous galena, lead carbonate, enclosed in iron oxide. Content varies from 12 to 18% lead, with 12 to 10 ozs. silver. Developments consist of three crosscut tunnels: Lower tunnel 1400 feet, Intermediate 400′, Upper 200′. Most ore shipped has come from two upper tunnels. Expect to cut ore body shortly in lower tunnel, which will give 514 feet of backs. Sulphide ore body developed on upper tunnel level is 30′ wide and 50 feet in length carrying 14 ozs. silver with 6 to 10% lead. Carbonate ore body developed between intermediate and upper tunnel 200′ long by 50′ wide with values of 8 to 10 ozs. silver and 8% lead. Shipping ore from these workings.

Mine equipment, Sullivan compressor; 50-h.p. semi-Diesel gas engine. Mill, Blake crusher, Marcy ball mill, 4 Wilfley tables, K. and K. flotation machine; 25-h.p. gas engine.

Owner, Montezuma Mining Company; president A. W. Hildebrand; secretary, W. F. Ainsworth; No. 1 Broadway, New York City, New York. Henry Mitchell, manager.

Bibl.: Report of Director of Mint, Precious Metals in U. S., 1883, p. 158; 1884, p. 100; State Min. Bur. Rept. XIII, p. 32. U. S. G. S. Bull. 540, pp. 109, 110. State Min. Bur. Rept. XV, p. 102.

Nancy Hanks. (Lead-silver.) Located in the Waucoba district, 28 miles by road southeast of Big Pine, on east flank of Inyo Mountains. Elevation 8250 feet. Idle. Owned by George B. Warren of Big Pine, California.

Bibl.: Rept. XV, p. 102.

Noonday and Grant Mines. (Lead, silver, zinc.) Located in Resting Springs district, 9 miles southeast of Tecopa and 2 miles southeast of the Gunsite mine. Elevation 2880 feet. Spur track of the Tonopah and Tidewater Railroad to mine from Tecopa. The deposit is a continuation of Gunsite vein, striking N. 40° W., dip 45° NE. Main ore bodies are formed along a series of parallel north and south fault fractures in dolomitic limestone. Ore is carbonate of lead with some unoxidized galena. Average ore mined carries 3 ozs. silver and 4 to 5% lead. Zinc carbonate ore found in upper levels. Developments consist of incline shaft sunk on angle of 45 degrees to depth of 400 feet. Ore hoisted through this shaft from lower workings. Main tunnel (200′ level) driven south 1800 feet through hill. About 600 feet south of shaft on this level, a winze has been sunk on incline to depth of 250 feet. At depth of 200 feet in this winze ore was cut off by fault slip, which dips 45 degrees west. This ore body has recently been picked up about 50 feet above this level. Ore reported to carry high silver and lead values. Ore hoisted from winze by 15-h.p. gas engine, then trammed to ore pocket in main shaft on tunnel level. Hoisted by 20-h.p. gas engine. Ore carrying values of 8 to 10 ozs. silver and 15 to 20% lead shipped to American Smelting and Refining Company's Smelter at Murray, Utah.

Second class ore, 4 to 5% lead and 4 to 6 ozs. silver goes to concentration plant at Tecopa. Thirty-five men are employed at mine.

Mill capacity 100 tons per day. Treating 60 tons.

Flow sheet, 200-ton Blake crusher driven by 20-h.p. gas engine. Ore from crusher conveyed by belt conveyor to mill bins. From bins ore passes over Colorado impact screen and screened to 8 mesh. Oversize

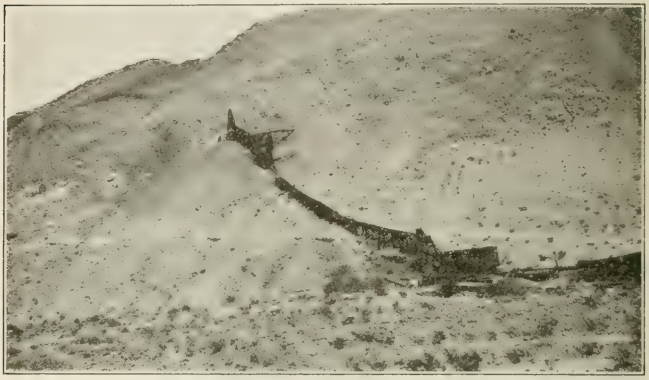


Photo No. 33. Noonday Mine, Tecopa Consolidated Mining Company, Tecopa, California.

goes to 4″ x 6″ Ball mill, while through size (8 mesh) goes to main launder. Oversize reground in ball mill to pass through 8-mesh screen, then to 3. Richards hydraulic classifiers, where classified so that approximately 40 tons of 8 to 12 mesh material treated by Bert-chart table, and material from 20 mesh to slimes by 6 Wilfley tables. Overflow from classifiers to 8-foot callow cone. Spigot product from cone to No. 6 Wilfley table, overflow from cone used as wash water. Mill making a recovery of 85%.



Photo No. 34. 100-Ton Concentration Mill, Tecopa Consolidated Mining Company, Tecopa, California.

Approximate average anaylsis of ore treated:

Au.	Ag.	Pb.	Insol.	Fe	CaO	S.	Mg O and Magnesia
.045 ozs.	5.9 ozs.	4.7%	5.1%	9.15%	22.15%	.3	20–30%

Concentrates produced being 10 to 15 tons per day, carrying 22 ozs. silver and 26% lead. Mill driven by 50-h.p. semi-Diesel Fairbanks-Morse gas engine. six men employed in mill. Owners, Tecopa Consolidated Mining Company; L. D. Godschall, vice president and general manager; William Godschall, superintendent.

Bibl.: Rept. XV, pp. 103, 104.

Opal Mine. (Lead-silver.) Waucoba district, 26 miles southeast of Bishop, and adjoining Daisy mine. Idle. Owned by Walter Bird and Russel Steward, Big Pine.

Bibl.: Rept. XV, p. 104.

Ophir Mine (Lead, silver, zinc.) Situated 10 miles northeast of Trona, at the base of the Slate Range. Idle. Owners, T. Thorkildsen and T. H. Rosenberg, 320 Trust and Savings Building, Los Angeles.

Paddy Pride Mine. (Lead-silver.) Situated 9 miles west of Zabriskie, a station on the Tonopah and Tidewater Railroad in limestone hills at southern end of Funeral Range of mountains. Holdings consist of 5 claims. Irregular lenticular deposits of lead-carbonate ore in limestone.

General strike of vein is NW. and SE.; dip of 60° to 70° SW. Width of vein 4 feet to 8 feet. Developments consist of a tunnel 150 feet in length. A lower tunnel is being driven that will cut the vein at a depth of 500 feet below outcrop. Two carloads of ore have been shipped from property assaying 0.10 ozs. gold, 24.4 ozs. silver, and 45% lead. Six men are employed. Owner, Paddy Pride Silver Mining Company; president, John T. Overbury, Tecopa, California.

Pennsylvania Mine. (Lead-silver.) Swansea district. Situated 3½ miles northwest of Keeler, on western slope of Inyo Range of mountains, at Swansea. Elevation 4000 feet. Irregular bunches of galena and lead carbonate in fissure in limestone. Vein strikes N. 30° W. and dips 38 degrees east. Width of vein 8″ to 2′. Shaft 150 feet deep, also number of shallow shafts and short tunnels on different claims. Ore stated to assay from 20 to 90 ozs. silver and 12 to 50% lead. Four men employed in sinking the shaft. Owner, Pennsylvania Mining Company; president, A. A. Irish, Grosse Building, Los Angeles, California; George A. Hill, superintendent.

Raven Mine. (Lead-silver.) Ubehebe district, 60 miles southwest of Bonnie Claire, Nevada, and 5 miles north of Dodds Springs. Elevation 3800 feet. Idle. Owned by J. Crook and A. Farrington of Big Pine, California.

Bibl.: Rept. XV, p. 106.

Redwing Mine. (Lead and zinc.) Resting Springs district, 4 miles northeast of Shoshone, on west slope of Resting Springs Mountain. Idle. Owned by R. J. Fairbanks of Shoshone, California.

Bibl.: Rept. XV, p. 106.

Royal Group (Spear Mine). (Lead, silver and zinc.) Cerro Gordo district, 1 mile north of Cerro Gordo mine, along top of ridge 8 miles east of Keeler. Elevation 8400 feet. Idle. Owned by R. C. Spear of Lone Pine, California.

Bibl.: Rept. XV, p. 106.

Rip Van Winkle Group. (Lead-silver.) Darwin district, 1 mile north of Darwin, adjoining Independence and Defiance mines. Vein strikes NE. and SW. Dip 45° to 80° N. Formation limestone. Ore, lead-carbonate with occasional bunches of galena, with gangue of spar and calcite. Shipping ore that runs about $100 per ton. Mine worked through 250-foot shaft with levels at 100′, 150′ and 200′. Winze from 200′ level 150 feet deep in ore. Equipment, 15-h.p. gasoline hoist. Three men employed. Owner, M. J. Summers of Darwin, California.

Santa Rosa Mine (Lead-silver.) Lee district, east of Cerro Gordo, and 26 miles by road from Keeler. Elevation 7000 feet. Six men leasing on property. William Parr, superintendent; owners, Independent Lead Silver Mining Company, Syndicate Building, Oakland, California.

Bibl.: Rept. XV, pp. 107-108.

Silver Reef Mine. (Lead-silver.) South Park district, 6 miles east of Ballarat, near summit of Panamint Range. Idle. Owner, J. A. Gilliam, Ballarat, California.

Bibl.: Rept. XV, p. 108.

Swansea Chief Mine. (Lead-silver.) Cerro Gordo district. It is situated 4 miles northeast of Keeler, on southwest slope of Inyo Range of mountains. Elevation 4600 feet. Two claims: Swansea Chief and Swansea Chief No. 1. Lead carbonate ore with occasional bunches of galena, occurs in lenses along a north and south fissure in limestone. Also at a point of intersection of this north and south fissure with an east and west fissure. Vein 2 to 4 feet wide. Developments consist of incline shafts sunk on north and south vein to depth of 150 feet. Ore is stated to carry 20 ozs. silver and 8 to 10% lead. Idle. Owner, Inyo Cerro Gordo Mines and Power Company; C. H. Berryhill, secretary, San Jose, California.

Ubehebe Mine. (Lead-silver.) Ubehebe district, 52 miles by road southwest of Bonnie Claire, Nevada. Elevation 3930 feet. Idle. Arch Farington of Bishop, California, owner.

Bibl.: Rept. XV, p. 109.

Utacala Mine. (Zinc.) Darwin district. Situated 9 miles northeast of Darwin, on the north end of the Argus Range of mountains. Large deposit of zinc carbonate ore occurs along a north and south fracture in the limestone. Deposit is from 8 to 10 feet wide. Stated to assay from 40% to 45% zinc. Ore calcined at the mine and then hauled 34 miles to Keeler. Six men are employed on development work. During 1918 the mine was one of the largest producers of zinc ore in Inyo County. Was operated part of the time by Western Ore Purchasing

Company of Reno, Nevada. Owners, Utacala Exploration Company; president, J. Kirk; secretary, C. P. McDonald, Newhouse Building, Salt Lake, Utah.

Ventura Mine. (Lead-silver.) Cerro Gordo district, 6¼ miles by road east of Keeler. Situated on western flank of Inyo Mountains, below Cerro Gordo mine. Elevation 7800 feet. Idle. Owners, Ventura Mining Company of New York.

Bibl.: Rept. XV, p. 110.

MARBLE.

The marble deposits of Inyo County occur on the southwestern flank of the Inyo Range and extend for 6 miles northeastward from Swansea Station. The marble outcropping along the base of this range shows a thickness of at least 500 feet. The beds are tilted at a high angle, dipping northwestward into the mountain. The marble is dolomitic, fine grained and hard. The quarries which have been opened represent only a fractional portion of the material which extends both northwest and southeast for several miles, and which have been undeveloped. About three miles south of Inyo quarries, and about half a mile southeast of Swansea, shows a vertical stratum of pure white dolomite marble, estimated to be over 100 feet in thickness. The white marble beds extend from here to the northeast of Inyo quarry, some three miles, but they are much shattered by cross faulting in places. The marbleized beds are of vast thickness and continuity, both in depth and extent. Four varieties of marble are found, a pure white marble, a beautiful yellow marble and a variegated marble of white ground mass, penetrated by dendridic markings of manganese. Chemically these marbles are a very pure dolomite, close grained and compact, and equally well adapted for exterior and interior work.

Inyo Marble Company, president, D. H. Dunn; secretary, Robert H. Tune; offices 1014 Hibernian Building, Los Angeles, California, have filed locations on twenty-four 160-acre claims, along the total length of marble outcrops; including the property of the Old Inyo Marble Company. Installing machinery for sawing and polishing marble, which is to be shipped to Minneapolis. Warehouses and spur track have been built to property. Six men employed. L. H. Dapprich, superintendent.

Bibl.: Repts. X, 215; XII, 392; XIII, 628; Bull. 50, pp. 99, 100. Mining and Scientific Press, July 20, 1912. Rept. XV, p. 111.

MOLYBDENUM.

Lucky Boy Prospect. Union district, 7 miles east of Kearsarge Station on the east flank of the Inyo Mountains. Elevation 7000 feet. Molybdenum occurs scattered through a quartz vein along contact between granite and limestone. H. M. Myers and J. E. Brown of Independence, California, owners.

Occurrence of molybdenite is reported by **F. A. Campbell** of Lone Pine on the upper part of Lone Pine Creek. The molybdenite occurs as small flakes in quartz gangue.

Pine Creek Molybdenum Deposit. The deposit is situated 45 miles by road northwest of Laws Station, on the south slope of Mount Morgan in Sierra Nevada range of mountains at an elevation of 11,200 feet. High grade stringer of molybdenite ore occurs on contact of granite hanging wall and the tungsten ore body, striking N. 50° E., and standing almost vertical. The stringer is 6″ to 8″ wide, and the molybdenite is disseminated in the footwall to a depth of 3 to 4 feet. The rich stringer runs as high as 95% molybdenite. Two hundred pounds were sacked from this stringer, said to have average of 90%. The deposit was developed in a small way incidental to mining the tungsten deposit. Idle. Owner, Pine Creek Tungsten Company; president, E. Cooper Shapley; secretary, H. M. Pancost, Philadelphia, Pennsylvania.

NITER.

The niter beds are situated in the southeastern part of Inyo County, extending across the boundary line into northern part of San Bernardino County. The principal deposits are known as the Confidence Beds, situated along the south side of Death Valley at the "narrows" northwest of Saratoga Springs. Owners, California Nitrate Company, 40 California street, San Francisco.

The Upper Canon Beds. Resting Springs district. Situated along both sides of the Amargosa River on the Morrison Ranch and extending into San Bernardino County. Owned by the Pacific Nitrate Company, Consolidated Realty Building, Los Angeles.

Bibl.: Bull. 24, 165-174. "The Saline Deposits of California," issued by California State Mining Bureau. Rept. XV, pp. 117-119.

PUMICE.

Deposits of pumice reported 6 miles northeast of Little Lake. C. W. Wicklund of 540 South Hope street, Los Angeles, California, has located a number of claims, also shipped a number of cars in early part of 1920. Hauled by wagon to Marble siding on Tonopah and Tidewater Railroad.

POTASH.

The production of potash on a commercial basis from the waters of Owens Lake in Inyo County is contemplated by Natural Soda Products Company, and the California Alkali Company. These companies are operating soda plants on the shores of Owens Lake. Potash also occurs in small amounts in the saline deposits of Death Valley, Saline Valley and Deep Springs Valley. These deposits are fully described in U. S. G. S. Bulls. Nos. 540, 580.

Inyo Chemical Company, Detroit, Michigan. Planning to install a plant at Deep Springs Valley Lake for extraction of soda and potash from the lake brines. Ten men employed on construction, and in hauling material and supplies for plant. Charles Trumble, superintendent; home office, Big Pine, California.

SALT.

Sodium chloride is deposited as a major ingredient in the saline crusts of Death Valley, Saline Valley, and Salt Wells Valley, and in the waters of Owens Lake. It occurs in smaller amounts in the niter beds that border the Amargosa River. The only production in the county is now from the Saline Valley deposits.

Bibl.: Bull. 24, "The Saline Deposits of California."

Owens Valley Salt Company's Deposit. It is 12 miles in airline northeast of Swansea, where company's mill is situated. The deposit is in the lowest depression of Saline Valley. The deposit is worked during the summer months, and a sufficient supply is harvested to operate the mill during the year. Under lease to Taylor Milling Company, 1520 San Fernando road, Los Angeles, California; G. W. Russell, superintendent.

Bibl.: U. S. G. S. Bull. 540, pp. 416-420.

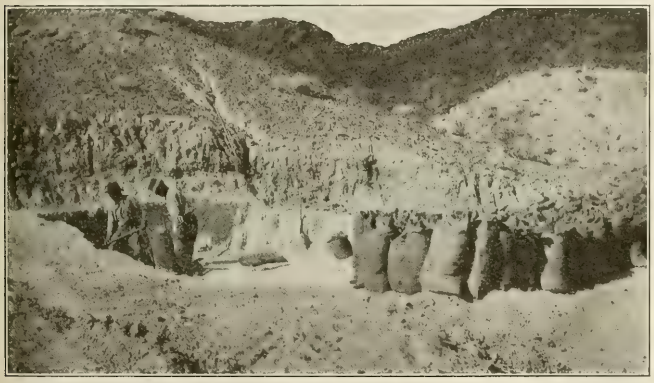


Photo No. 35. Bed of silica 8 feet thick near Shoshone, Inyo County. Associated Oil Company's deposit. Photo by T. P. Henderson.

SILICA.

Shoshone Silica Deposit. The deposit is situated ¼ mile west of Shoshone, a station on the Tonopah and Tidewater Railroad.

Holdings consist of two placer claims, 320 acres, recently purchased from R. J. Fairbanks of Shoshone. Elevation 1,700 feet. In low hills on the western edge of Amargosa Valley, beds of silica 8 feet thick occur in the Pleistocene sediments. The deposit has been developed and prospected by a series of pits. Its extent has been proven 1,000 feet in north and south direction, and about 800 feet in an eastern direction. In working, the deposit is first stripped of its clay overburden, which is from 2 to 10 feet thick. Material is sacked and shipped to the Associated Oil Company's refining plant. It is used for filtering and puri-

fying oils. Twenty men employed. Owners, Associated Oil Company, San Francisco, California.

Lucky Boy and Separator Silica Deposit. Lies north of the Shoshone deposit. Beds of silica 6 feet thick, strike north and south. Overlain by clay overburden. A number of openings have been made on the outcrop. Holdings consist of 280 acres. It is estimated there is 50,000 tons of the material. Owners, W. S. Baylis and associates of Los Angeles, California.

SODA.

The only soda produced in the county is derived from the waters of Owens Lake. This lake lies between the Sierra Nevada Mountains on the west and the Inyo Range on the east and has no outlet. It covers an area of 97.2 square miles. The water is a dense brine, containing common salt, soda, borax and other soluble salts. These soluble salts were evidently derived by the slow accumulation and concentration of the waters of the Owens River, which enters the basin from the north. Three plants are under operation on the shores of Owens Lake extract-



Photo No. 36. View of Owens Lake and California Alkali Company's Soda Plant, Cartago, Inyo County, California.

ing the soda from the lake waters. The capacity of two of these plants have been greatly increased during the past year, and are operating to capacity.

California Alkali Company. The plant is situated at Cartago, a station on Owenyo branch of the Southern Pacific Railroad, on the western shore of Owens Lake. Plant has been in continuous operation since September, 1917. Producing about 100 tons daily of dense soda ash.

Process. Lake water is concentrated in clay vats by solar evaporation, and the concentrated brine pumped into eight large wooden tanks. Carbon dioxide generated from dolomite is passed through these cylindrical tanks, precipitating the soda. The latter is drawn from the bottom of the tank, passed through filters, then introduced into rotary furnaces, where the material is thoroughly dried. Subsequently it is introduced into a large brick furnace, resembling a muffle kiln, to reduce it to the carbonate. An air blast at the furnace discharge cools the ash, which is then conveyed to rolls and pulverized. Sacked and stored in warehouse for shipment. One hundred men are employed. Owners,

California Alkali Company; president, Mortimer Fleishhacker; Secretary, John F. Bush; John F. Bush, vice president and general manager.

Chemical Production Company. Plant is situated 9 miles south of Lone Pine, on west shore of Owens Lake, north of California Alkali Company's plant. Plant has a capacity of 20 tons of soda ash per day. Plant operated two months in 1918, but process proved a failure. Idle. Owners, Chemical Production Company; president, Lafayett M. Hughes, 612 Majestic Building, Denver, Colorado.

Inyo Development Company. The plant is situated 1 mile northwest of Keeler, on the eastern shore of Owens Lake. Plant recently purchased by the California Alkali Company.

Process. The lake water is pumped into large clay vats, varying in size from one acre to 20 acres, to a depth of from 6″ to 8″. It is concentrated by solar evaporation until the carbonates are precipitated. Trona harvested once a year, in crust about $\frac{3}{4}$″ thick. Introduced into oil burning furnace where bicarbonate is reduced. After leaving furnace is carried by conveyor to a Williams rolls, where it is pulverized and sacked for shipment. Producing 20 tons of soda ash per day. Employ 20 to 150 men. J. S. Hunter, superintendent.

Bibl.: Repts. VIII, p. 226; XII, p. 409; XIII, p. 646; XV, p. 124-125.

Natural Soda Products Company. Plant situated on east shore of Owens Lake, 2 miles south of Keeler. This company is producing bicarbonate of soda, as well as soda ash, and shipping 10,000 tons of trona yearly. Plant capacity has been increased to 120 tons of dense soda ash per day.

Process. Water from lake evaporated in large solar tanks until a concentrated solution is obtained, then pumped to two 1000-gallon settling tanks, from which it is pumped into four 16-feet diameter and seventeen 8′ diameter carbonator tanks. Carbon dioxide generated by burning dolomite in four carbonate towers (40′ high by 8′ diam.) is passed up through the bottom of these tanks under pressure, which are divided by 8 screens to break up the CO_2 and and precipitates Na CO_3. The CO_2 cooks the solution, changing it from mono-carbonate to bicarbonate of soda. The soda is drawn from bottom of tanks and filters through two Oliver filters. Fresh water being sprayed on cake to remove Na Cl which is soluble. From filters material goes to nine 12′ x 25′ Hill furnaces (capacity 20 tons each) reduced to soda ash. The soda ash ground in two Williams swing-hammer pulverizers. Sacked or placed in barrels for shipment. Recently the company has made large shipments of soda ash to Japan and Sweden.

Power plant equipment. Two 80-h.p. boilers, five 18″ x 12″ Gardner compressors; three batteries of Nash hydro-turbine vacuum pumps, driven by one 100-h.p. motor and one 150-h.p. motor. Compressors are driven by 110-h.p. motors. Total horsepower of plant is 2,230. One hundred men employed. Owners, Natural Soda Products Company; president, W. W. Waterson; secretary, J. S. Henderson; Paul Waterson, superintendent, Keeler, California.

SULPHUR.

Small deposits of sulphur are reported 1 mile southwest of Coso Hot Springs and in the mountains east of Big Pine.

Deposits of sulphur are also reported on the west slope of Last Chance Range of Mountains, 10 miles southeast of the Loretta Copper Mine.

Sulphide Sulphur Group of Claims. Situated on west slope of Lookout Mountain in Last Chance Range of Mountains and 10 miles southeast of Loretta Mine. Sulphur deposited in fractures in limestone. Outcrop reported to be 30 feet wide. Sulphur content stated to be 96%. Developments consist of series of open cuts at different points along outcrop. Owner, James Jacoby, 2364 Birch street, Denver, Colorado.

Sunshine Sulphur Mine. Situated 13 miles due east of Loretta Mine, in Last Chance Range of Mountains. Sulphur deposited in fissures in limestone. Reported to be 5 feet thick and several hundred feet in length. Samples taken reported to run 98%. Owned by W. H. Murray and associates, 921 Wright-Callender Building, Los Angeles, California.

TALC.

California Mineral Corporation Talc Deposit. The deposit is 8 miles southwest of Zabriskie. The talc is pure white, occurring along the contact of limestone and diorite. The deposit is irregular and varies up to 12 feet width. Developments consist of series of open cuts. Idle.

Bibl.: Rept. XV, p. 126.

Simonds Talc Mine. Darwin district, 17 miles by road southwest of Keeler. Elevation 5850 feet. The deposit occurs in a crushed zone in impure limestone, close to or in contact with an igneous intrusion. Strike of deposit N. 30° to 45° W., dip 60° to vertical. Outcrop can be traced for 3000 feet. The color varies from gray to pure white, and is hard and slippery. It is foliated and shattered, as is the inclosing limestone beds. The deposit is developed by a number of tunnels and open cuts. The main working tunnel is driven southeast 260 feet through limestone. From tunnel a series of raises into ore body, which shows a thickness of 70 feet on this level. Raise from this level connects with main glory hole near crest of hill. To east of these workings along the crushed zone, a number of lenses of talc of good quality have been developed which show widths of 20 to 60 feet. Talc mined from glory hole and stopes above tunnel level is trammed to ore bins. Hauled by trucks and teams from mine to grinding plant at Keeler.

Grinding plant. Crude talc passes through Jaw crusher to pass 1″ ring, then ground in Raymond mill to pass 200-mesh screen. Capacity 30 tons per day.

Shipping 1000 tons of ground talc per month, for manufacture of talcum powder, soaps, and to paper mills. From blocky talc make insulators for Edison Electric Appliance Company. Seven men employed at mine, and 12 men in mill. Property was purchased from

the California Talc Company in 1918, and has been under steady operation to date. Owners, Inyo Talc Company; president, P. H. Booth; secretary, Franklin Booth; M. A. Best, superintendent; Equitable Bank Building, Los Angeles, California.

Bibl.: Rept. XV, pp. 126-127.

Tramway Talc Mine. Keeler district. It is situated 3½ miles northwest of Keeler, at the base of the Inyo Mountains, near the mill of the Saline Valley Salt Company. Elevation 3800 feet. Bed of talc, greenish gray to black, exposed for thickness of about 8 feet in limestone. Idle. James Henry, George Brown, Lone Pine, California, owners.

Bibl.: Rept. XV, pp. 127-128.

TUNGSTEN.

There has been no activity in the mining of tungsten ores in Inyo County during the past two years due to low market and prices for tungsten concentrates. The known deposits are as follows:

In Tungsten Hills west of Bishop, Round Valley, Pine Creek deposits on south slope of Mount Morgan in the Sierra Nevada Range of mountains; Deep Springs Valley deposits and the Ubehebe district. The ores occur as scheelite.

MINES.

Deep Springs Valley Deposits. These deposits are situated 22 miles northeast of Zurich, a station on Southern Pacific Railroad, on the east slope of the White Mountains at the north edge of Deep Springs Valley. Eleven claims were located February, 1918, by D. F. Shively of Pig Pine. Series of parallel quartz veins containing scheelite, varying in width from mere seams to 4 feet. The veins are well defined quartz fissures in granite. General strike of these fissure veins is NE. and SW., dip about 25 degrees SE. On the Oversight claim a strong vein of quartz containing crystals of salmon colored scheelite up to 2″ in diameter, outcrops can be traced for full length of claim. The different veins have been exposed by open cuts and trenches, and judging from extent of croppings a large tonnage of milling ore can be developed. Idle. Owners, D. F. Shively and W. A. Sanger of Big Pine.

Pine Creek Tungsten Mine. Situated 45 miles by road northwest of Laws, on south slope of Mount Morgan, in Sierra Nevada Range. Elevation 11,200 feet. Holdings consist of five claims. Located in January, 1918. Contact metamorphic deposit, between dolomite footwall and granite hanging. Ore occurs as scheelite in minute crystals disseminated in a garnetiferous gangue. Ore carries from 0.6% to 1.28% WO_3.

Deposit strikes N. 50° E. and is 100 to 150 feet wide, and proven to have a length of 250 feet. The general trend of the formation is N. 40° W., but at the mine it is faulted and broken over, so that the strike is at right angles. The ore body is very similar to those at Bishop, scheelite in minute crystals being disseminated through gangue of

epidote, quartz, calcite and garnet. Adit tunnel driven 250 feet at 700 feet depth below outcrop. Ore mined by means of glory hole. Ore from bins at tunnel transported to mill over gravity tram 2200 feet in length.

Mill, 250-ton concentrating plant; 10" x 20" Blake crusher, two 5' x 4' Ball mills; two Colorado impact screens, 4' x 4' dewatering cone; 9' diameter settling cone; 1 Overstrom slime table, 2 Overstrom Universal sand tables, 2 Overstrom finishing tables. Average mill heads run 1% WO_3; tails 0.13%. Extraction 70 to 75% producing a concentrate assaying 65% WO_3. Mill was put in operation the latter part of 1918 and operated until April, 1919, when forced to suspend operations on account of low market prices of ore. Pine Creek Tungsten Company; president, E. Cooper Shapley; secretary, H. M. Pancost, Philadelphia, Pennsylvania.

Round Valley Tungsten Mine. Situated 11 miles northwest of Bishop, on north slope of Tungsten Hills, at the edge of Round Valley. Elevation 5350 feet. Located as Noble mine in 1916, purchased by the

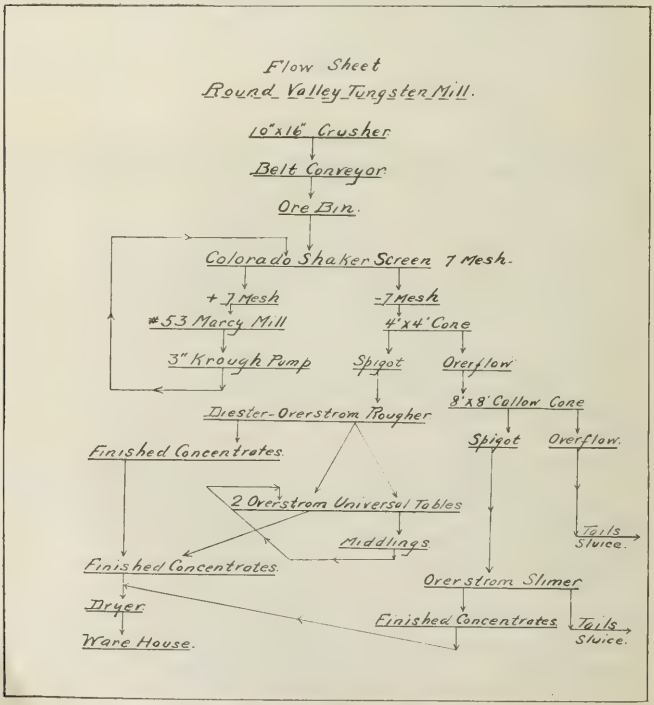


Plate IV. Flow Sheet, Round Valley Tungsten Mill.

company in 1917, started milling operations August, 1917. Contact metamorphic deposit. Ore body has white granite hanging wall and a footwall of marbleized or metamorphic limestone. The distance between two walls varies from 75 to 250 feet and the course of the ore body follows very closely the general trend of these walls. Scheelite occurs in a roughly banded rock composed chiefly of dark mica, epidote, quartz, and apatite. In the ore bearing formations are found parallel bodies of ore separated by stratas of metamorphosed limestone and lime silicate rock. Main ore body is 90 feet long and ranges in thickness from 25 to 35 feet and averages 1% WO_3.

Mine developed through 2 main adits, 50 feet apart vertically. Lower adit is 250 feet below uppermost croppings and is the main haulage way through which all ore is trammed to mill. Ore body trends NE. and SW., and stands at an angle of 45 degrees following the stratification of the enclosing rocks. Mining is carried on by the shrinkage system in the stopes and the glory hole method on the surface.

Mill, 100 ton capacity concentration plant equipped with 10″ x 16″ Climax rock crusher; No. 53 Marcy ball mill; Colorado shaker screen; (7 mesh) discharge from mill elevated by sand pump back over screen, then to 4′ x 4′ cone, overflow to 8′ x 8′ callow cone. Overflow from callow to tailings launder. Discharge to Overstrom slime table. Spigot discharge from shall cone to Deister-Overstrom rougher, concentrate cut, tails being treated on two Overstrom-Universal tables for final concentrate. Average mill heads ran 0.6%, tails 0.1% WO_3. Extraction 65 to 70%-60% WO_3 concentrate produced. See flow sheet. Idle.

Owner, Round Valley Tungsten Company; president, E. Cooper Shapley; secretary, H. M. Pancost, Philadelphia.

Bibl.: Adolph Knopf, U. S. G. S., Bull. 640*b*.

Standard Tungsten Company. This property, formerly known as **Aeroplane Group,** is situated 8 miles west of Bishop in Tungsten Hills. Elevation 5500 feet. Contact metamorphic deposit between granitic rocks and highly altered sediment. Main deposit on Aeroplane claim, about 600 feet above mill. Strikes north and south, dips vertically. Main adit tunnel driven S. 40° E. 270 feet to ore. Ore mined through glory hole is dropped through grizzly into chute on main tunnel, from where it is trammed to incline. About 3000 feet west of Aeroplane workings is Brockman claim. Here tunnel has been driven 108 feet to cut an ore body striking east and west, width 8′ to 10 feet. Ore from Brockman and Greenhole claims trammed 2000 feet to mill. Reduction equipment, 100 ton concentration mill, equipped with one 10″ x 20″ Jaw crusher, 1 Marcy ball mill, 5 mesh impact screen, 3 Diester baffle classifiers, 6 Overstrom tables; 1 Wilfley table. Ore treated varied from 0.4% to 0.6% WO_3. 60% extraction. Idle.

Owner, Standard Tungsten Company; president, A. B. Clark; secretary and manager, L. E. Porter, H. W. Hellman building, Los Angeles, California.

Bibl.: Adolph Knopf, U. S. G. S., Bull. 640b. Rept. XV, pp. 129-130.

Tungsten Mines Company. Formerly known as **Little Sister** and **Jack Rabbit** group of mines, situated 8 miles west of Bishop in Tungsten hill. Discovery made April, 1916, started mining May, 1916, mill erected during the summer, and milling operations started the first of

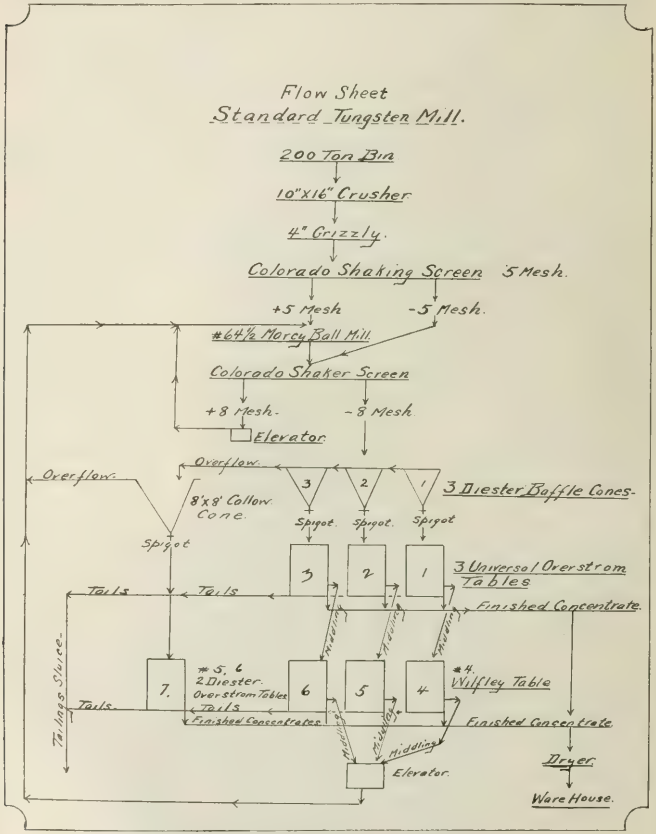


Plate V. Flow Sheet, Standard Tungsten Mill.

January, 1917. Holdings consist of 14 claims. Formation is granite. Contact metamorphic deposit, the ore consisting of scheelite associated mainly with garnet, epidote, and quartz. The main ore body, Little Sister claim, is near east margin of a large mass of metamorphosed sedimentary rocks embedded in quartz-diorite. These rocks consist of

limestone, quartzite, siliceous conglomerate, and metamorphic shales. Ore is said to average from 0.4 to 0.6% WO_3. Deposit strikes N. 40° W. and is 80 to 90 feet wide and about 280 feet in length.

Mine worked through adit tunnel 300 feet in length, which cut ore body 200′ vertically below outcrop. This adit is connected with glory hole by raise 35 feet above level. Glory hole is about 200 feet long, 80 feet wide and 165 feet deep. The ore body on NW. end is cut off by granite, and on SE. end by fault striking S. 80° W. Ore mined in glory hole goes through raise to two grizzlies, then dropped through to chutes on adit tunnel, and trammed to mill.

Mine equipment, (17″ x 10″) (14″ x 10″) Ingersoll Rand compressor operated by 20-h.p. motor.



Photo No. 37. View of Tungsten City and Mill of Tungsten Mines Company.

Concentration mill, capacity 250 tons daily. No. 5 Gates Gyratory crusher, 15″ x 40″ Allis Chalmers rolls, to 2-mesh Colorado impact screen, then to 15″ x 40″ rolls. Elevated to three 5-mesh impact screens, through size to 4 Isbel tables, oversize to 15″ x 30″ rolls; then to finishing tables, classifiers, etc. See flow sheet.

Mill made a recovery of 70%. Average product produced carried 63% WO_3. Ore reported to carry 3% to 6% WO_3. Idle.

Owners, Tunsten Mines Company; president, F. M. Townsend; secretary, F. W. Griffin; office, 301 Holbrook Building, San Francisco, California.

Bibl.: Adolph Knopf, U. S. G. S. Bull. 640b. Rept. XV, p. 133.

KERN COUNTY.

INTRODUCTION.

Kern County, because of its immensely productive oil fields, is the leading mineral producing county of California. The mineral production for 1919 being $67,153,361.00. This is larger by nearly forty million dollars than the succeeding county on the list. This figure also is approximately four times the value of the total gold output of the entire state for 1919. It is the third largest county in the state and is bounded on the north by Tulare, Kings and Inyo, on the south by Los Angeles and Ventura, on the east by San Bernardino, and on the west by San Luis Obispo. Outside of oil and gas development, mining is very inactive throughout the county. This being especially true of gold mining, which in the past has been the leading industry in the county, but on account of the increase in production costs, most of the producing mines suspended operations in the latter part of 1918.

Among the mineral resources developed and undeveloped of this section are: antimony, asphalt, borax, clay, copper, fullers earth, gems, gold, gypsum, iron, lead, limestone, magnesite, marble, mineral paint, natural gas, petroleum, potash, salt, soapstone, soda, sulphur and tungsten.

A brief outline will be made of the above minerals according to the activity displayed in mining the same, and only those that are being developed or have not been reported upon in previous reports will be discussed in this report.

ANTIMONY.

Antimony is found on a spur of the mountain bordering San Emigdio Cañon, in sections 10 and 15, T. 9 N., R. 21 W., S. B. M., also on Erskine Creek, 4 miles south of Hot Springs, in section 23, T. 27 S., R. 33 E., M. D. M., 10 miles west of Koehn in sections 5 and 6, T. 30 S., R. 36 E., M. D. M. and 7 miles east of Bodfish, T. 27 S., R. 34 E., M. D. M. There has been no activity in the mining of antimony for sometime past, therefore for detailed descriptions of different mines and occurrences in the county, see Reports VIII, p. 680; X, pp. 225, 237; XIV, pp. 475-476.

ASBESTOS.

A serpentine belt cutting Jawbone Cañon carries asbestos in the form of chrysolite, the most noteworthy occurrence being in section 7, T. 30 S., R. 36 E., M. D. M., about 23 miles north of Mojave. However, there have been no deposits of commercial value found in the county.

Bibl.: Rept. XIV, p. 476.

ASPHALT.

Deposits of natural asphalt are found in the Buena Vista and Sunset Oil districts.

Bibl.: Rept. XII, pp. 26-28; Bull. 3, pp. 41-53.

BORAX AND POTASH.

The Mojave Desert contains a large number of dry lakes and sinks, which are the source of many salines, especially borax, potash, soda, and salt.

Bibl.: Bull. 24, p. 50. The Saline Deposits of California, issued by State Mining Bureau.

BRICK AND CLAY.

The clay deposits in the vicinity of Bakersfield, the county seat of Kern County, furnish excellent material for manufacture of brick.

An unusually good grade of pottery clay has been obtained from a large deposit in section 11, T. 9 N., R. 13 W., S. B. M., about 5 miles northwest of Rosamond.

The following companies are operating brick plants: Bakersfield Sandstone Brick Company, Bakersfield, California. Kern County Brick Company, Bakersfield, California.

Bibl.: Rept. XIV, pp. 477-478. State Mining Bureau Preliminary Report No. 7, p. 48; "Clay Industry in California," Bull. No. 38, p. 212.

CEMENT.

Los Angeles Aqueduct Cement Plant. Situated at Monolith, a station on Southern Pacific Railroad, and 3 miles east of the town of Tehachapi. Holdings consist of 120 acres, located in section 14, T. 32 S., R. 33 E., M. D. M. The limestone deposit is located north of the plant. There are also clay deposits on ground near the plant.

The plant has not been operated since the completion of the Los Angeles Aqueduct. The capacity of plant when operating was 1250 tons, and was operated by electric power furnished by the Pacific Light and Power Corporation. The plant has been recently leased by the city to the United States Potash Company of Los Angeles, California, primarily for the manufacture of potash, but it is also stated that the company will manufacture cement.

COPPER.

The occurrence of copper ores in the county are few and widely separated; there are, however, valuable deposits of copper near Woody, north of Randsburg, in the Garlock District; on the northern end of the Mojave Desert; and on the southeastern slope of the Sierras, in sections 7, 18, 19 and 30, T. 28 S., R. 40 E., M. D. M. and in sections 12, 13, and 24, T. 28 S., R. 39 E. Due to the present market price of copper there is no activity in the mining or development of copper mines in the above mentioned districts. Only those properties that have been developed since Report XIV of the State Mineralogist was issued will be mentioned in this report; for detailed description of the copper mines of the county see Report XIV, pp. 479-480, and Bull. No. 50, p. 297.

Greenback Copper Mine. It is the largest copper mine in Kern County; is located in sections 1, 2, 3, 4 and 10, T. 26 S., R. 29 E., in the town of Woody, 32 miles northeast of Bakersfield. Holdings of 500

acres. Was located in 1890 by present owner, and operated from 1916 until August, 1917. Six parallel veins occur in granodiorite, and are about 600 feet apart; average width 30 feet; strike northeast and southwest, dip 60 degrees north. Oxide zone extends to a depth of 60 feet, where sulphide zone was encountered. Ore consisting of chalcopyrite, chalcocite associated with iron pyrite occurs disseminated throughout the granodiorite. Ore stated to average 2% copper. Workings consist of an incline shaft 200 feet deep, and a vertical shaft 240 feet deep, with levels at 100′, 140′, and 200′. 1200 feet of drifting has been done on the 200 foot level. A winze 200 feet deep has been sunk on main ore body from the 200′ level on an incline of 45 degrees. Mine equipment consists of 30-h.p. Western gas engine hoist, 85 h.p. Western gas engine drives Ingersoll-Rand compressor. Mill flow sheet 100-ton concentration mill. Ore mined crushed to 1½″ product by 12″ x 20″ Wheeling jaw crusher. The crushed ore is discharged on 12″ belt conveyor which carries it up a 12° incline to mill bin. Then fed by Challenge feeder 6″ x 22″ Hardinge ball mill, from ball mill the product goes to Dorr duplex classifier which operates in close circuit with the ball mill, the oversize being returned to the feed box of the ball mill by a screw conveyor while fines go direct to 2-K. and K. flotation machines. The concentrates are collected in a wide launder with a steep slope, and elevated by means of a Krogh pump into Dorr thickener. A 5′ x 4′ Oliver filter is used to dewater the concentrates. The mill made a recovery of 75 per cent. It is stated that 100,000 tons of 2% copper ore has been developed in the mine. Idle.

Owner, Weringer Mines Company; I Weringer, president, Woody, California.

Bibl.: Bull. 50, p. 297; Rept. XIV, pp. 479-480.

Layman Group of Copper Mines. These mines are situated in the Goler Mining district, 6 miles northwest of Garlock, a station on the Southern Pacific Railroad. Holdings consist of 34 claims. A series of quartz veins cut the schist, which carry chalcopyrite associated with iron pyrite, the ore bodies form in lenses in the schist. Veins strike north and south, dip 45 to 60 degrees east. Width 3 to 6 feet. Development consists of an incline shaft 104 feet deep, sunk on an angle of 60 degrees, besides there are a number of prospect shafts and short tunnels. The ore is reported to carry from 3 to 6% copper with values in gold and silver. Owner, James M. Layman of Los Angeles, California; W. J. Walsh of Randsburg, California, agent.

Walsh and McClaude Group of Claims. Situated in the Goler district adjoining the Layman Group, 5 miles northwest of Garlock. Elevation, 3600 feet. Ore occurs as lenses in a mineralized schist carrying chalcopyrite with iron pyrite. There being a series of parallel quartzite veins in schist. Strike NW. and SE., dip 60° E. Width 3 to 6 feet. Developments consist of a number of prospect shafts and short tunnels. Idle. Owner, W. J. Walsh, J. McClaude of Garlock, California.

Walsh Group of Claims. Situated in the Goler mining district, 8 miles northwest of Garlock. Holdings 20 claims. Ore occurs along a series of NW. and SE. quartzite croppings in schist, on the north side of Sweet Home Cañon. Ore is chalcopyrite associated with iron pyrite

in a mineralized schist. Developments: Series of shafts 50 to 100 feet deep and tunnel 100 feet in length. Ore said to carry 6% copper with values in gold and silver. Idle. Owner, W. J. Walsh of Randsburg, California.

FULLERS EARTH.

California Fullers Earth Company. Mrs. H. L. Packard and Son, Bakersfield, owners, control 140 acres in section 14, T. 27 S., R. 28 E., about 18 miles north of Bakersfield. The deposit covers many acres and varies in thickness from 15 to 50 feet. Some material was shipped in 1919.

Bibl.: Bull. 38, p. 275; Report XIV, pp. 480-481.

The Eight Oil Company, with a small grinding plant at Bakersfield, were shippers in 1919 and 1920.

GOLD.

During years 1919 and 1920 there practically was no activity in mining gold ores in the county, most of the mines throughout the county suspending operations the latter part of 1918, on account of increased cost of production. The principal gold mining districts of Kern County are: Amalie, Clear, Creek, Cove, Green Horn, Green Mountain, Keys, Long Tom, Mojave, Pioneer, Rand, Tehachapi, Woody and Valley View. The only district that is active being the Randsburg district, where a few of the mines are operating that produce some high grade ore.

The following properties operating on a small scale in the county are:

Amalie Mine. It is located in section 22, T. 30 S., R. 33 E., M. D. M., about 18 miles northeast of Caliente, in the Amalie mining district. Recently purchased by the Hamilton Mining and Smelting Company of New York. Active development campaign planned on the property. A. J. Chapman of Caliente, manager.

Bibl.: Repts. XII, p. 141; XIII, p. 605.

Black Hawk Mine, 2½ miles south of Johannesburg, in Rand mining district, D. E. Blue of Randsburg, owner.

Bibl.: Rept. XIV, p. 489.

Blue Mountain Mine. Woody district. Owned by Blue Mountain Mining Company, J. W. Howard, president; Rodney McCormick, secretary, Bakersfield, California.

True fissure vein in granodiorite. Width 12″ to 2′. Developments, shaft 500 feet with drifts on 100′, 200′, 300′, 400′ levels. It is reported that 20,000 tons of ore have been developed. Company planning to install a mill. Twelve men employed.

Consolidated Mines Company (Good Hope Mine), 413 H. W. Hellman Building, Los Angeles. Mines are situated at Randsburg, in Rand mining district.

Bibl.: Rept. XIV, p. 496.

Keyes Mine. It is situated in section 26, T. 26 S., R 32 E., M. D. M., in Keyes district, about 3 miles southeast of Isabella, at an elevation of 3600 feet. Tunnel has been extended 1200 feet. Five-stamp mill operated part of the time, when they have a tonnage of high grade ore developed. Operated by the Keyes Mining and Milling Company of San Diego, California. A. M. Arnold, superintendent.

Bibl.: Repts. XII, p. 145; XIII, p. 191; XIV, p. 499. U. S. G. S. Mineral Resources of U. S.

Tropico Mining and Milling Company (formerly known as **Big Three Mining Company),** 448 Wilcox Building, Los Angeles; O. S. Richardson, president; S. E. Brown, secretary; E. A. Cochran, manager. Owns a group of mines in the Mojave Mining District, 4 miles east of Rosamond, a station on the Southern Pacific Railroad. Elevation 2300 feet. Holdings consist of sixteen claims. Four parallel veins occur in quartz-porphyry. Strike northeast and southwest, dip 68° south. Width of veins varies from 3 feet to 80 feet. Ore shoots developed on these veins run from a few feet up to 250 feet long, with an average width of 3 feet. Workings consist of shaft 540 feet deep, with levels at 100′, 200′, 300′, 400′ and 500′. There are 2350 feet of drifts on main vein, on No. 1 vein 350′, No. 2, 160′, and Lida vein 450′. Crosscuts total 3200 feet.

Equipment, 45-h.p. electric motor hoist; 320 cu. ft. compressor; 10-stamp mill and cyanide plant. Mine and mill were operated until February 1, 1920. Twenty-five men were employed. H. C. Burton, superintendent.

Shipsey Mine. (King Solomon Consolidated Mines). Situated ¾ mile west of Johannesburg, in Rand district. Operated by leasers. Five-stamp mill. Three men employed. Owner, Shipsey Mining Company, 530 South Spring street, Los Angeles, California.

Yellow Aster Mine, the largest gold producer in southern California, and one of the noted mines of the state, suspended operations on February 1, 1920, on account of increased cost of production. The mine is situated at Randsburg, in the Rand mining district. Yellow Aster Mining Company of Los Angeles, California, owner.

Bibl.: Rept. XIV, p. 514.

GYPSUM.

Gypsum deposits of varying quality occur for many miles along the lower foothills of the Sierra Nevada, reaching from Caliente on the south nearly to Porterville on the north.

In the valley of Cottonwood Creek 5 miles north of Pampa station, on the Southern Pacific Railroad, the beds are rather extensive and a number of mines have been opened. The gypsum occurs both as a crust on the surface and as interstratified beds.

Gypsite deposits occur in about 6 miles southeast of Dudley, Kings County, in the Sunflower Valley, Kern County, in township 25 S., R. 18 E.

Deposits of gypsite are found in the Lost Hills in the San Joaquin Valley, a few miles south of Tulare Lake and about 25 miles west of Wasco, a station on the Santa Fe Railroad, the most extensive occurrence being in section 30, T. 26 S., R. 21 E. The beds in this locality are very extensive, being about 2 feet in thickness, and are said to extend 6 to 7 miles along the hills. The deposits occur in Tertiary sandstones and shales. Deposits of gypsite are found in many places in the neighborhood of McKittrick in the Tertiary sandstones and shales, located in sections 21 and 30, T. 30 S., R. 22 E. In what was the bed of Kern Lake, but is now a part of a large ranch belonging to the Kern County Land Company, gypsite has been exposed in sections 26 and 27, T. 32 S., R. 27 E. The deposit is about 20 miles southwest of Bakersfield, but only 5 miles from the railroad station known as Conner.

Gypsite is also reported from a point one-half mile farther south. The gypsite on the above mentioned ranch is reported to be 4 feet thick.



Photo No. 38. Open Cut, Bissell Magnesite Mine, Bissell, Kern County.

Gypsum deposits also occur near Cave Springs about 25 miles northeast of Mojave and 3½ miles southeast of Cave Springs and Cantil, on the line of the Southern Pacific Railroad, joining Mojave and Randsburg. Gypsite is exposed at the surface over an area covering nearly one square mile. The thickest beds lie in section 28, T. 30 S., R. 38 E., and reach a depth of 10 feet. In the country closely adjacent to Maricopa, known as the Sunset district, are a number of small areas carrying thin deposits of gypsite associated with shales.

Bibl.: Repts. X, p. 223; XI, p. 233; XII, p. 324. U. S. G. S. Bull. 223, p. 121; Bull. 413, pp. 16-20; Bull. 430, pp. 145-146; Bull. 697, pp. 64-73.

W. A. Fauntleroy owns a deposit in sections 21, 27, 28, 29, T. 29 S., R. 30 E., M. D. M., on both sides of Cottonwood Creek.

California Gypsum and Mineral Company. The property of the California Gypsum and Mineral Company is located on the north slope of a rather low hill in the S. ½ of section 20, T. 30 S., R. 22 E., about ½ mile from McKittrick railway station.

The gypsite is overlain by 6 inches to 2½ feet of soil and is a buff color. It has been mined in a number of places at a depth of 2 feet. Several hundred tons of gypsite for use as land plaster has been shipped from the deposit, and there is a small plant on the property for the preparation of the material.

Ebbott and Hickox own a deposit in section 30, T. 30 S., R 32 E., about 2½ miles southwest of McKittrick. The deposit that has been worked is about 500 feet long, 200 feet wide. The gypsite is from 2 to 4 feet thick and is overlain by soil 2 feet thick in places. About 4000 to 5000 tons have been shipped.

IRON.

Deposits of iron ore occur at Woody in sections 10 and 15, T. 26 S., R. 29 E., M. D. M. At foot of Mount Breckinridge in section 4, T. 29 S., and near San Emidio in section 17, T. 9 N., and R. 21 W., S. B. M. These deposits are small, and their commercial value is doubtful on account of high cost of transportation.

Bibl.: Rept. XIV, p. 516.

LIME AND LIMESTONE.

The lime industry is a large and important one at Tehachapi on the Southern Pacific and Santa Fe railroads.

Extensive deposits of crystalline limestone occur at many points in this area, also at Keene, and along Erskine Creek, some 30 miles north of Caliente.

The deposits of the Jameson Lime Company, situated in the west half of section 14, T. 32 S., R. 33 E., M. D. M., about 2 miles east of Tehachapi have recently been taken over by the Blue Diamond Plaster Company, 2200 East Sixteenth street, Los Angeles, California; J. W. Jameson, president; W. C. Hay, vice president; B. E. Dequine, secretary; Howard Booker, manager. The plans of the company are to operate the property on a large scale.

Bibl.: Bull. No. 38, p. 70; Rept. XIV, pp. 516-518.

Summit Lime Company, owns 640 acres, patented in section 35, T. 12 N., R. 15 W., S. B. M., about 3 miles south of Tehachapi. F. O. Wyman, president; A. M. North, secretary; offices, 708-709 Marsh-Strong Building, Los Angeles, California. The company is operating the quarry and lime kilns to capacity. Present capacity of plant being 560 barrels per day. About 40 to 50 men are employed.

Bibl.: Rept. XIII, p. 628; Bull. 38, p. 71; Rept. XIV, p. 518.

MAGNESITE.

Bissell Magnesite Deposit. It is situated 1½ miles north of Bissell Station on the Santa Fe Railroad and 11 miles southeast of Mojave. Holdings consist of 40 acres on railroad land. Recently purchased by

International Magnesite Company, Dr. R. Shiffman, president, Chamber of Commerce Building, Pasadena, California.

It is said to be the only occurrence of magnesite of sedimentary origin that has been reported in the United States. The magnesite occurs in beds interstratified with clay, clay shales, the whole having a width of 300 feet and can be traced for a distance of 2500 feet. General strike of beds is east and west, dipping 29 degrees south. The magnesite stratas vary from mere seams up to 4 feet thick.

Developments consist of open cuts 2200 feet in length, two shafts, No. 1 and No. 2. No. 1 shaft is 100 feet deep with a drift 400 feet west and 200 feet east on the 100 foot level. Series of raises from this level cutting the different stratas. No. 2 shaft is 50 feet deep. Most of the magnesite mined has come from open cuts and was worked by means of a dragline scraper first removing the overburden and working the stratas separately. During 1917 shipped to the International Refractories Company at San Diego, California, from 300 to 500 tons of magnesite, stated to carry 80 to 85% Mg CO_3, 7% Si O_2 2 to 4% Ca CO_3. Idle.

Bibl.: U. S. G. S. Bull. 540, pp. 512, 516.

MARBLE.

Marble occurs near Neenach, on the south slope of the Tehachapi range in Brights Valley, in the San Emigdio Cañon and along Erskine Creek. The Neenach deposit is the only one that has been worked.

Bibl.: Repts. VI, Part I, p. 23; VIII, p. 629; XIV, p. 520; Bull. 38, p. 100.

MINERAL SPRINGS.

Kern County has a number of mineral springs, especially along Kern River.

Bibl.: U. S. G. S. Water Supply Paper No. 338; Rept. XIV, p. 520.

PETROLEUM AND NATURAL GAS.

Kern County produces more petroleum than any other county in California. Petroleum production of the county for 1919 amounted to 47,734,035 bbls., valued at $64,440,947.

The production of natural gas in 1919 amounted to 25,363,739 M. cu. ft., valued at $1,618,913. The principal oil and gas producing districts are as follows:

Kern River, McKittrick, Midway-Sunset, Lost Hills, Belridge, Coalinga, Elk Hills and Devils Den.

The notable gas development in 1919 in California was the bringing in of two large dry-gas producers by the Standard Oil Company in the Elk Hills in western Kern County. The largest natural gas field of commercial importance thus far developed in California is in the Midway district. The area of proved oil land in Kern County is about 58,371 acres, with 5324 producing wells, far greater than any other county in the state.

For detailed description of the different oil producing districts, see Bulletin 69, and "Summary of Operations of California Oil Fields," Sixth Annual Report of the State Oil and Gas Supervisor, issued by the California State Mining Bureau.

QUICKSILVER.

Quicksilver production in Kern County began in 1916, following the discovery of cinnabar in workable quantities close to the Tehachapi Loop of the Southern Pacific Railroad, near the town of Tehachapi.

Cuddeback Cinnabar Mine. J. P. Cuddeback, Tehachapi, owner; Cuddeback Cinnabar Company, lessee, Tehachapi; A. J. Blackley, president. The mine is on land owned under an agricultural patent, being in section 27, T. 31 S., R. 32 E., M. D. M., 3 miles from Woodford Station on the Southern Pacific, and a half mile by road from the main county road at the Loop.

The country rock for several miles around is granite, and the white rhyolite dike traversing the granite with a nearly EW. strike is plainly visible, though the outcrop is not a bold one. The dip is N., about 45°; and the width is about 60 feet. Cinnabar crystals are disseminated through this dike material. The richer accumulations of ore appear to be associated with certain cross-fissures in the dike which are marked by the presence of brown clay seams. The mineralized portion of the dike is about $\frac{1}{2}$ of a mile long. The development work consists of several short adits, drifts, small stopes and open cuts, and when visited a depth of about 50 feet below the outcrop had been obtained from the gulch. However, most of the work has been entirely confined to open cuts along the outcrop. Since property was visited a crosscut tunnel has been driven to cut the dike at a lower elevation below the glory hole. Reduction equipment consists of a 12-pipe Johnson-McKay retort, oil-fired. Idle.

Bibl.: Bull. 78, pp. 47-48; issued by State Mining Bureau.

Fickert-Durnal Mine. J. P. Cuddeback, Tehachapi, owner; Phillip Fickert, Bakersfield, and J. A. Durnal, Tehachapi, lessees. This prospect is on the Cuddeback Ranch property, being a mile southeast, in SW. $\frac{1}{4}$ of SW.$\frac{1}{4}$ of section 26, T. 31 S., R. 32 E., M. D. M., 4 miles from Woodford, and about 7 miles from Tehachapi. The ores occur in an altered igneous dike rock, traversing the granite with a NW.-SE. strike, and a dip NE. The cinnabar is in part disseminated and in part in seams in the altered dike material. There is a little associated pyrite. Developments consisted of 3 short adit drifts and a 25-foot shaft near bed of ravine. A 6-pipe Johnson-McKay retort on the property. Idle.

Bibl.: Bull. 87, "Quicksilver Resources of California," pp. 47-49.

SANDSTONE.

A large quantity of sandstone is found a few miles south of Tehachapi and in San Emigdio Cañon.

Bibl.: Bull. 38, pp. 128 and 370; Rept. XIV, p. 522.

SALT.

Consolidated Salt Company, 528 Los Angeles Investment Building, Los Angeles; J. R. Burns, president. This company is working a deposit of rock salt in an old lake bed at Saltdale, a station on the Southern Pacific Railroad, and 35 miles NE. of Mojave. The mill is located at Saltdale. Six to ten men are employed. Capacity of plant is about 200 tons monthly.

SILVER-LEAD.

Bee Hive Mine. It is situated 3 miles northwest of Rand, a station on the Southern Pacific Railroad, in the Goler mining district. Holdings consist of four claims. Vein occurs on contact of limestone and granite, with a width of 12″ to 18″, can be traced on surface for ½ mile. Developments consist of shaft about 100 feet deep. Ore extracted from vein in the shaft is reported to assay: Silver, 25 ozs., lead 20 to 50%. Three men employed. Owner, M. J. Lovett, of Randsburg, California.

TUNGSTEN.

Scheelite, the principal tungsten mineral of the state is found in the Amalie, Keys, Rand and Stringer districts where it is usually associated with gold bearing veins. There is no activity in the mining in these districts due to the low market price of tungsten ores. Since the fourteenth Report was issued a number of deposits were developed which will be described:

Bald Mountain Group of Tungsten Claims. These claims are situated on the northeast slope of Bald Mountain, in section 14, T. 27 S., R. 32 E., 5 miles southwest of Isabella. Elevation 3600 feet. Holdings consist of 12 claims. Scheelite occurs in two parallel quartz veins which strike NE. and SW. and have a slight dip to the SE. Scheelite crystals occur disseminated through the quartz associated with iron pyrite. The outcroppings of the veins can be traced for 3000 feet, showing a width of 6 feet. The two veins known as the Buckeye and Buena Vista are about 500 feet apart and cut a biotite granite. Developments consist of a number of adits and shallow open cuts. It is reported that the ore mined carried from 0.5% to 1% WO_3. Two tons of ore concentrated from the Buena Vista claim produced 380 lbs. of concentrates assaying 67% WO_3, while 6 tons from the Buckeye vein produced 240 lbs. of concentrates, 60% WO_3. Sulphur content being 0.18%. Idle. Owners, C. B. Ross, John Ross and Henry Ross, Bodfish, California.

Howe Group of Claims. Situated 3 miles northeast of Havilah, on southwest slope of Bald Mountain. Scheelite occurs in quartz veins in a biotite granite, associated with iron pyrite. Holdings consist of six claims. Owner, J. C. Howe of Havilah, California.

King Tungsten Mine. The mine is situated 2½ miles northeast of Havilah, on the southeast slope of Bald Mountain, and 25 miles northeast of Caliente. Elevation 3200 ft. Scheelite occurs in quartz veins in a biotite granite, associated with iron pyrite. There are two parallel veins, from 3 to 5 feet in width, and about 25 feet apart. Strike N.

40° W., dip 70° SE. Developments consist of a crosscut tunnel 115 feet to vein, with 75-foot raise to the surface, also a number of open cuts on the two veins.

Mill, twenty-five ton capacity, 8″ x 10″ Blake crusher, Ball mill, and two Eccelson concentrators. Ore milled is reported to have carried 1.14% WO_3. Idle. Owner, King Tungsten Mining Company, 627 National Bank Building, Los Angeles, California; Frank Potts, president; Albert Grem, secretary.

Ophir-Zuck Group of Tungsten Claims. A. D. Zuck of Havilah, California, owns a group of claims, 5 miles south of Havilah, situated on what is known as the Red Hills. Minute crystals of scheelite occur in a garnetiferous dike on contact of limestone and schist. The scheelite occurs associated with quartz, garnets, and epidote. In one of the quartz outcrops, some high grade crystals of scheelite were extracted. Crystals being from ½″ to 4″ in size. Idle. Owner, A. D. Zuck of Havilah, California.

Ratcliffe Mine. The mine is situated on main highway between Atolia and Randsburg, in the Rand mining district. Elevation 3700 feet. Scheelite occurs in a narrow vein in schist, striking east and west, with a general dip south. It lies east of a prominent diorite dike, striking N. and S., and which forms the division between the Stringer and Rand districts. Mine is opened by a 150-foot vertical shaft, with levels driven on the vein east and west at 65′, 100′, and 150′. The mill on the property has a capacity of 25 tons. Idle. Owner, J. H. Ratcliffe, Randsburg, California.

Royal Bohee Group of Mines. It is situated 7 miles east of Garlock Station, on Southern Pacific Railroad, on the west slope of Rand Mountains. Elevation 4000 feet. Scheelite occurs in stringers of quartz, varying in width from a knife blade up to 6″ in a green amphibolite schist. The zone in which the stringers occur is about ½ mile, running north and south. There are two systems of fissuring: Main system, striking N. 50° E. and a series of parallel fissures breaking off of the main fissures, striking due east and west. Main working consists of a tunnel driven 240 feet N. 75° E. on a cross fissure. Dip of ore body here is 65 degrees south. Width of stringer drifted on being 4″, and said to carry 4 to 6% WO_3. Several other tunnels and drifts have been made on other stringers. Idle. Owner, Al Powell of Randsburg, California.

Sunset Group of Mines. The group consists of nine claims situated 6 miles southeast of Garlock, a station on Southern Pacific Railroad, on a low isolated hill at west border of the Rand Mountains. Elevation 2800 feet. Deposit consists of narrow quartz stringers 2″ to 6″ wide in a belt of limestone carrying scheelite. The gangue is quartz and calcite. The deepest working is a shaft sunk 35 feet on a stringer. Other work consists of several small cuts and trenches. A strong vein of calcite, carrying scheelite occurs at contact of limestone and schist, striking N. and S. This vein is about 6″ wide and its outcrop can be traced for over a thousand feet. When mine was operating the ore was milled at the Ratcliffe mill. Owners, M. J. Lovett, W. M. Price and associates of Randsburg, California.

LOS ANGELES COUNTY.

There is only a small production of metals in Los Angeles county, its principal wealth being in structural and industrial materials, also petroleum and natural gas, which in 1919 amounted in value to $23,606,381. Its output of brick and tile was over a million dollars, and that of petroleum amounted to over twenty million dollars.

The great increase in population of the City of Los Angeles, and the expansion of the city, industrially and commercially, has brought into prominence the possibilities of its being the great manufacturing center of the Pacific Coast, with an assured market for manufactured products.

Among its mineral resources may be noted asphalt, barytes, borax, brick, clay, fuller's earth, gems, gold, gypsum, infusorial earth, limestone, marble, mineral paint, mineral water, natural gas, petroleum, salt, glass-sand, sandstone, serpentine, silver, soapstone, and miscellaneous stone.

This report will be confined entirely to mineral deposits that are under active operation or have not been described in previous reports of the State Mining Bureau.

BARITES.

San Dimas Cañon Barytes Deposit. It is situated 8 miles northwest of San Dimas, in section 23, T. 1 N., R. 9 W., in the west fork of San Dimas Cañon. A massive outcrop of baryte occurs on the west side of the cañon, having a width of 6 to 8 feet, and is about 50 feet in length. The general strike of the outcrop is NE. and SW. with slight dip to the southeast. On the ridge above this outcrop are also several small lenses of baryte. The baryte is white in color, and said to carry from 85% to 87% barium sulphate. Idle. Owners, W. G. Fields, H. E. Howard, C. Fairbanks of San Dimas, California.

BORAX.

The **Sterling Borax Company** of 320 Trust and Savings Building, Los Angeles; Thos. Thorkildson, president. Operated mine and mill to capacity during the past year. Fifty men are employed. The mine is 5 miles north of Lang in Tick Cañon.

CLAYS.

The brick clay deposits within the limits of Los Angeles and vicinity consist principally of loam (clay in which there is a considerable proportion of sand) which contains numerous inclusions of pebbles. In Chavez Cañon in the northern part of the city, a bank of clay shale is used. West of Los Angeles near Santa Monica is found the best clay for the manufacture of brick and tile. No high grade clays are produced in the county, those used being shipped in from Amador, Placer and Riverside Counties. For description of different brick and tile plants under operation see Preliminary Report No. 7, pp. 49-63, "Clay Industry in California;" Report XV, pp. 488-499.

COPPER.

There are no producing copper mines in Los Angeles county, but a number of interesting deposits of complex ores, carrying antimony, copper, nickel, cobalt, lead and zinc occur in Pacoima Cañon, which are worthy of mentioning.

Denver Mining and Milling Company, Prof. R. L. Fraisher, president, Cecile Peabody, San Fernando, California, secretary, own 28 claims, 12 miles northeast of San Fernando, in Pacoima Cañon, and about 9 miles from the entrance of the cañon. Elevation 2610 feet. The principal claims are known as: Denver, Chance, Fenner, Indicator and Red Ledge. There are a series of parallel quartz veins traversing a country rock of schist and gneiss, striking N. 80° E., dipping 60 to 80 degrees south. The veins vary in width from 2 to 4 feet, with the exception of the Red Ledge vein which in places is 20 to 50 feet wide. The ore is a complex sulphide, carrying massive pyrrhotite, chalcopyrite, galena, sphalerite, and stated to carry traces of nickel, cobalt and antimony. These sulphides occur in lenticular masses in the different quartz veins. Developments consist of a number of shallow shafts, and tunnels on the different veins. The principal claims that have been developed to any extent are: Denver, Chance, and Fenner. Three men are employed. W. S. McGrew of San Fernando, California, manager.

GRAPHITE.

American Graphite Company. Home office of company, Milliken Building, Decatur, Illinois; Dr. J. W. Sanders, president; Dr. Kuick Sanders, secretary. Local office, 211 Grant Building, Los Angeles, California; Albert Maltman, general manager. The company is developing a deposit of graphite in Kagel Cañon, 8 miles east of San Fernando, California. Holdings consist of five claims. The graphite occurs disseminated in very small flakes through an outcrop of schist 10 to 20 feet wide. Nearly all the graphite is in flakes 0.25 millimeter in diameter or less. The other minerals in the graphite schist are quartz feldspar and small quantities of pyrite. The ore is reported to carry from 7% to 15% graphite. The vein can be traced for a distance of 4000 feet, and outcrops through 3 full claims. The course of the vein is N. 30° W. and dips 70° east. A tunnel 60 feet long has been driven on the vein at an elevation of 2400 feet. About 200 feet south of tunnel at top of ridge an open cut on the outcrop exposes the vein for a width of 20 feet. About 4000 feet south of the tunnel there is a large open cut on the vein which exposure shows width of 20 to 30 feet. Six men are employed on construction of 50 ton concentration mill: Crusher, rolls, Marks pulverizer, tube mill, 2-Allingham flotation machines, and Oliver filter.

California Graphite Company, O. M. Souden, president; A. R. Plumb, secretary; Los Angeles office, 402 Bryson Building, Los Angeles, California.

This company has two groups of claims in sections 11 and 12, T. 6 N., R. 15 W., S. B. M., 18 miles NE. of Saugus, in a branch of San Fran-

cisquito Cañon. Graphite occurs disseminated in very small flakes through a schist which is very much decomposed on the surface. Nearly all the graphite is in flakes of 0.25 millimeter in diameter or less. This vein of graphite schist is 8 to 25 feet wide in a granitic country rock, striking north of east and dipping at a steep angle. The outcrop can be traced on the surface for the length of five full claims. The principal mineral of the graphite schist is the aluminum silicate sillimanite, other minerals are quartz, feldspar and small quantities of pyrite. Analysis by U. S. G. Survey of graphite schist ran from 7.29% to 17.48% graphite. A new vein has been developed on the property which in places shows a width of 50 feet. Workings consist of series of tunnels and open cuts. New concentration plant has been installed on the property having a capacity of 50 tons. The concentrates supply the local market for foundry facings, and also paint and lubricants. The property has been operating continuously during the past two years.

Bibl.: Rept. XV, pp. 501-504.

Verduga Mountain Graphite Deposit. It is situated 12 miles northeast of Los Angeles, and 2½ miles northwest of Montrose, in section 29, T. 2 N., R. 13 W. A stratum of graphite schist occurs in granite on the northeast slope of Verduga hills. It is exposed only in two places—the main exposure being in an open cut about 130 feet above the floor of the valley. The face of the cut exposes a deposit 20 to 30 feet wide and at least 30 feet high. The graphite is more or less weathered here, and mixed to a small extent with the decomposed country rock. The graphite appears to be crystalline, but in small flakes, and very little or no mica is associated with it, other gangue being principally quartz and feldspar. The strike of the vein appears to be to the southwest, and dips steeply to the southeast. About 80 feet higher up the mountain and along the strike of the deposit, a shallow pit 3 feet in diameter exposes the vein.

Developments: At an elevation of 1350′, a tunnel has been driven southwest a distance of 60 feet, and is 70 feet below the floor of the open cut. In the face of this tunnel a vein 5 feet wide was cut, which strikes southwest, and with a dip of 45 degrees southeast. Some ore was mined from the deposit during 1920, being milled in Los Angeles. The graphite is suitable for paint, lubricants, and foundry facings. Idle.

Owner, J. E. Hostetter, 917 Washington Building, Los Angeles, California.

Bibl.: Rept. XV, p. 504.

INFUSORIAL OR DIATOMACEOUS EARTH.

Deposits of this important material occur in Los Angeles county, but there has been no commercial production. However a deposit is being developed near Covina, on the Chaffey ranch, in the hills south of the Masonic Home, by D. F. Meikeljohn and Robert Burhans, Jr. of Pasadena. Ten men are employed, opening up a quarry face.

MANGANESE.

Amargosa Group of Claims. The deposit is situated 5 miles by road west of Palmdale, in township 6 N., Rs. 12 and 13 W., S. B. M. Holdings consist of 9 claims. Irregular kidneys of manganese occur along siliceous outcrops in schist.

The most extensive outcroppings are 1 mile north of the Palmdale road. Here the manganese outcrops along an east and west strike, at intervals for about 150 feet. Varies in width from 2 to 5 feet. The silica content is high.

Developments consist of a number of open cuts, tunnels and shallow shafts. During 1917 the Llewellyn Iron Company operated the property. Idle.

Owner, Llewellyn Iron Company of Los Angeles, California.

PETROLEUM AND NATURAL GAS.

The production of petroleum in Los Angeles County increased approximately 5,000,000 bbls., or 50%, in 1919. The increase was largely due to the Montebello field. The county ranks third in the state as a mineral producer in 1919, passing Fresno County, which was fourth in 1918. The advance being due to the large increase in the petroleum output and valuation. Petroleum produced was 15,076,633 bbls., valued at $20,805,754.

The production of natural gas was 4,148,476 M. cu. ft., valued at $458,812. For detailed description of the different oil fields see Bulletin No. 69, "Petroleum Industry of California," also Annual Reports of the State Oil and Gas Supervisor, issued by the State Mining Bureau.

SILICA.

Silica occurs quite abundantly in this county, and has been worked to a moderate extent in the past. Large quartz veins of high purity are frequent, but at present none of the deposits is being worked. Most of the silica for use in the glass factories comes from Amador, Riverside, and San Diego counties.

Hermosa Beach Glass Company manufactures window and automobile windshield glass. Office of the plant is at Hermosa Beach. Adolph Wuchner, president and manager. The plant has a daily capacity of 600 boxes of window glass. Limestone is secured from Riverside County, and silica sand comes from San Diego County.

Torrance Window Glass Company, manufacturers of window glass, Torrance, California. Office of plant, Torrance. Julius Conrad, president. Charles L. Bisbee, secretary. The original plant was destroyed by fire on July 27, 1919, but the new plant has been built and is operating to capacity. The capacity of present plant is 12,000 boxes of glass per month. Silica sand comes from La Jolla, San Diego County, sulphate of soda from San Luis Obispo County, lime from near Crestone, Riverside County. Three hundred twenty-five men are employed at the plant. E. P. King, manager.

SOAPSTONE AND TALC.

Deposits of soapstone and talc occur on the ridges on both sides of Boquet Cañon, 13 miles west of Palmdale and 16 miles northeast of Saugus.

Boquet Canyon Talc Mine. The deposit is situated 13 miles west of Palmdale, on a steep hillside about 1000 feet above the floor of the valley. Six claims have been located. A body of greenish colored talc occurs at contact of chloritic schist and serpentine. The extent of the deposit is unknown, owing to overburden. Outcrop on the surface on one of the claims for 200 feet, shows a width of 14 feet. General strike is NW. and SE. The talc is much broken at the surface, but appears to be more solid in depth. Developments consist of a tunnel 70 feet in length, giving a depth of 75 feet below outcrop. The talc is suitable for making crayons for metal workers, also for use in tires, but does not grind white, therefore not high grade enough material for talcum powder. H. F. Nelles, 1308 Huntington drive, South Pasadena, California, owner.

Commack Talc Deposit. The deposit is situated on the north side of Boquet Cañon, 16 miles northeast of Saugus. Six claims have been located. Elevation 2500 feet. Body of greenish talc 7 to 10 feet wide, on contact between chloritic schist and quartzite. Formation strikes NE. and SW. Dip 60 degrees NW. A number of open cuts made on this belt of talc show some fair grade material, but it is much shattered, and so far no solid masses have been developed. Owner, J. R. Commack, 1943 Wilcox avenue, Hollywood, California.

Soda Products Company. This company owns a deposit of talc, 13½ miles northeast of Saugus on steep hillside about 1000 feet above the floor of the valley, on southeast side of Boquet Cañon. Body of greenish colored talc at contact of chloritic schist and serpentine. The talc is much broken on surface, but appears more solid in depth. Several open cuts have been made along the outcrops, which expose talc of good quality. The talc is suitable for making crayons for metal workers, and is said to conform to U. S. specifications as to strength tests.

Owners, J. L. Clark, E. S. Gates and associates, 1724 Highland avenue, Los Angeles, California.

Debney Talc Mine. It adjoins the Commack mine and is 16 miles northeast of Saugus, on slope of ridge northwest of Boquet Cañon. Body of greenish talc 25 to 50 feet wide in chloritic schist. Strike NE. and SW. Dip 60° to NW. Open cut on the talc body, exposing some fair grade material. Some material was hauled from this deposit and shipped to Los Angeles. Owner, C. G. Dabney, 1749 North Cahuenga, Hollywood, California.

STONE INDUSTRY.

The extended and ever increasing use of concrete for building and pavements makes the supply of crushed stone a matter of importance.

The stone chiefly crushed in this county for concrete is granite, of which boulders and cobblestones in immense numbers are distributed widely over the river washes which form where the mountain streams

emerge from their rocky cañons, bearing along in their torrential flow great quantities of fragments from the cañon walls. Five crushing plants are operated on the Pacoima, Tejunga, Arroyo Seco, and San Gabriel washes by the Union Rock Company, 2644 Compton avenue, Los Angeles, California; H. L. Hodges, president; A. C. Stone, secretary.

The Union Rock Company has taken over the Los Angeles Stone Company's quarry and plant, located on the east slope of Brush Cañon, near Hollywood, California. Capacity 500 tons per day. Twenty men employed.

Also the Los Angeles Stone Company's plant near Roscoe station, in township 5 N., R. 14 W. Output of sand and gravel and crushed stone being 1500 tons per day.

The Russell-Greene Foell Company's Baldwin Park plant is also operated by the same company. Capacity 2000 tons per day.

The two plants of the Pacific Rock and Gravel Company located on the San Gabriel Wash near Azusa are operated by the Union Rock Company. Capacity of each plant being 2000 tons of crushed rock, sand and gravel per day.

In Los Angeles a rock crushing plant is operated on the gravels of the Arroyo Seco by the Los Angeles Rock and Gravel Company at Avenue 35 and Pasadena avenue. Ten men employed.

For detailed description of quarries and plants see Report XV, pp. 481-488.

ORANGE COUNTY.

Orange County stood second in the list of mineral producing counties of California for the year 1919, due to its highly productive oil fields.

Other items yielding in commercial quantities are: Clay products, natural gas and miscellaneous stone.

Aside from the substances actually produced it contains deposits of coal, gold, gypsum, iron, infusorial earth, sandstone, silver-lead, and tourmaline.

CLAY.

On the west side of the Santa Ana Range are deposits of clay which are the equal of those of the Temescal Valley in quality and commercial value.

The brick plants under operation in the county were: La Bolsa Tile Company, office and works at Smeltzer; Santa Ana Brick Works, in Santa Ana.

The Los Angeles Pressed Brick Company shipped clay from the company's deposit near Prado, a station on the Santa Fe Railroad, to the Los Angeles plant.

Bibl.: Preliminary Report No. 7, pp. 66-67, "The Clay Industry in California."

PETROLEUM AND NATURAL GAS.

Orange County production of petroleum for year 1919 amounted to 14,458,722 bbls., valued at $26,893,223. In addition to this, natural gas was reported to amount to 12,039,355 M. cu. ft., valued at $837,439.

Since the Fifteenth Report of the State Mineralogist was published two new and productive oil fields have been discovered in Orange County, namely, Richfield and Huntington Beach. The last being the most recent and important oil discovery in California, as the nearest producing field is in the Coyote Hills, 17 miles to the north. Several very productive wells have ben completed and a dozen or more wells are in the process of drilling within an area some ten miles long and two to three miles wide.

For detailed description of the different oil fields of the county see Bulletin No. 69, "Petroleum Industry of California"; also State Oil and Gas Supervisor's Annual Reports Nos. 1, 2, 3, 4, 5, and 6.

References: Bull. 19, pp. 57–61, 79–82, 77, 180; Bull. 32, p. 20; Bull. 63, p. 334; Bull. 69, pp. 118, 308, 350, 366, 503.

SILVER-LEAD.

Silverado Mine. It is situated in Silverado Cañon, 20 miles east of Santa Ana. Elevation 2300 feet. Claims: Dunlap, Blue Light, Harvey-Blue Light and Flannagan Blue Light. The vein occurs in metamorphoric rocks. Width 2 to 4 feet. The ore is silver-bearing galena, associated with zinc-blende and iron pyrite. Developments consist of a series of adits on the vein. The ore milled is stated to carry .06 ozs. gold, 12.6 ozs. silver, 3% lead and 14% zinc. Some development work was done on the property and a 50-ton concentration plant was installed. Idle. Owner, Blue Light Mining Company; W. H. Tharp, 746 South Bonnie Brae street, Los Angeles, California.

RIVERSIDE COUNTY.

Riverside is the fourth county in the state in size and the thirteenth in regard to the total value of the mineral output for 1919. Within its borders are included mountain, desert and agricultural land. Its mineral resources include metals, structural and industrial materials and salines. In point of variety Riverside County led all others with nineteen different minerals commercially produced in 1919, surpassing San Bernardino County. The total commercial production for the year was valued at $2,578,250.

Since the Fifteenth Report of the State Mineralogist was issued there has been very little activity in metal mining in the county, and most of its production has been from structural and industrial materials. The work covered in this report has been in visiting the districts throughout the county during the years 1919-1920 that have been active in development in industrial materials. Therefore only those deposits that were under active operation or which have not been reported on in previous reports will be discussed in detail.

ANTIMONY.

Crowell Mine. Five miles southwest of Corona, at elevation, at 1700 feet. The ore, stibnite, occurs in irregular bunches in a mass of shallow rock. J. Crowell, owner.

Bibl.: Report XIII, p. 31.

ASBESTOS.

The occurrence of asbestos is also reported 15 miles south of Palm Springs, in the Santa Rosa Mountains.

Bibl.: Fifteenth Report.

CEMENT.

Riverside Portland Cement Company. Tyler Henshaw, president; W. H. Metcalf, secretary; corporation office, Mills Building, San Fran-



Photo No. 39. Quarry, Riverside Portland Cement Company, Riverside County, California.

cisco, California; John Treanor, manager; business office, Title Insurance Building, Los Angeles, California.

Quarry and plant 5 miles northwest of Riverside. The limestone is in two beds separated by quartzite. The strike is northeast and dip is 25 degrees SE. Limestone coarsely crystalline, said to be high grade, running 98% pure. Underlying limestone is a mica diorite, which is quarried to supply the aluminous material for the cement. Besides output of cement, company also produces potash.

Cement plant is being operated to capacity. Capacity of plant 2,000,000 bbls. yearly. Seven hundred men are employed.

Bibl.: Rept. XV, pp. 553-559.

CLAY.

Brick clays, in this county as elsewhere, occur locally at many points, and are not of great commercial importance, but the most prominent member of the nonmetallic group is found in the plastic clay of the Temescal Valley.

Plastic Clays of Riverside County. In western Riverside County, extending along the Temescal Valley for 10 miles, from Elsinore on the southeast to and beyond Corona on the northwest, is a zone of plastic clays of superior quality. The extent and thickness of these clays, together with the great plasticity of some and high refractory quality of others, give them much importance, and these deposits will grow in commercial prominence as the population of Southern California increases and the transportation lines are further developed. Many openings have been made in these beds at different points from which, during a number of years, clay has been taken for factories at Alberhill, Elsinore, Corona and Los Angeles.

Alberhill Coal and Clay Company, J. H. Hill, president; G. C. Hill, secretary; office, Equitable Bank Building, Los Angeles, is the largest producer of different varieties of clays in the county.

The greatest amount of the clays produced is being mined in the main tunnel pit by the Los Angeles Pressed Brick Company for its plant at Alberhill. The production from this property amounts to 70,000 to 75,000 tons yearly.

For detailed description of the different deposits see Report XV, pp. 559-574. Also, Preliminary Report No. 7, "The Clay Industry in California," pp. 74-91.

COAL.

Alberhill Coal and Clay Company shipped some coal from its holdings at Alberhill in past years. The coal beds have recently been reopened and a small amount mined. However, work is confined almost entirely to mining clay. Report XV, p. 574.

There is a deposit of coal on Hoag Ranch, south of Corona, west of Joseph Cañon. The vein is 4 ft. wide.

COPPER.

This metal is rather widely distributed in Riverside County, and the principal deposits, which lie eastward towards the Colorado River, are in the Ironwood or McCoy Mountains.

Ironwood or McCoy Mountain District. This district contains a mineralized zone of copper, silver, gold and lead ores. High grade sulphide deposits exist, principally in the form of lenses or kidneys. Besides these, native copper is occasionally found. The district is 22 miles from the Colorado River and about 20 miles southwest of Blythe Junction on the Santa Fe Railroad.

Copper ores also occur in the Palen Mountains, and a number of promising looking prospects are being developed. There ore is principally the oxides of copper, which carry values in gold and silver.

See Report XV, pp. 524-527.

GOLD.

This precious metal is sparsely and widely distributed in Riverside County, and many gold mining districts have been recorded; few of them, however, with any large production. The principal occurrence of gold-bearing quartz veins are found in the region near Perris and Elsinore, and in the eastern desert area between the San Bernardino Range and the Colorado River.

There is no activity throughout the county in gold mining, due principally to the high cost of labor and material.

Bibl.: Rept. XV, pp. 527-544.

GYPSUM.

Gypsite occurs in several small areas on both sides of Gypsum Cañon, about 2 miles south of Corona. The larger deposits are on the east side of the Cañon, a short distance from its mouth. Other small deposits are said to occur in neighboring cañons west and southwest of Corona. This material is used in orchards as a fertilizer, and to prevent disease. The deposits have not been worked for the past two years.

Extensive deposits of gypsum occur in the northeastern desert section of the county, in the Palen Mountains, and Maria Mountains.

Palen Mountain Deposits. Extensive deposits of gypsum occur in the Palen Mountains, north of Packards well, and 15 miles southwest of the Parker cut-off of Atchison, Topeka and Santa Fe Railroad. The gypsum is very pure, occurring in extensive layers interbedded with limestone. Most of it is finely crystalline and compact and varies in color from transparent white to slightly reddish. The beds have a maximum thickness of several hundred feet, with little or no interbedded limestone; the entire series of interbedded limestone and gypsum is probably several thousand feet in thickness. The belt of gypsum and limestone is about 3 miles long and one mile wide. It runs across the Palen Mountains in a general east and west direction, and disappears under the unconsolidated desert deposits on both sides.

The gypsum beds are the largest and most abundant in the southern part of the belt. The strike of the beds range east to northeast and dip north at different angles. A dark igneous rock occurs extensively as an intrusive within the area of gypsum and limestone, being especially abundant in the northern half of the belt. Reported that these deposits are to be developed by Joe Montgomery, and associates, of

Los Angeles Investment Building, Los Angeles, California. The company will be known as the Standard Gypsum Company.

Bibl.: U. S. G. S. Bull. 430, pp. 407-416, 1910. U. S. G. S. Bull. 697, pp. 78. (Footnote extracts made from these reports.)

Maria Mountains Deposits. These deposits are located in the Maria Mountains about 17 miles south of Blythe Junction, a station on the Parker cut-off of the Santa Fe Railroad. The principal deposits are owned by the United States Gypsum Company, 200 Monroe Street, Chicago, Illinois; president, S. L. Avery.

The gypsum claims of the company are in the southwest corner of township 3 S., R. 21 E., and the northwest and southeast corners of township 4 S., R. 21 E., S. B. M. The gypsum occurs in beds that have a general east and west course and a northerly dip, which ranges at the outcrop from 20 degrees to almost vertical.

The gypsum beds range in thickness from 10 to more than 100 feet, and are interbedded with limestone or shaly material. They occur in two bands of four beds each. The thickness of limestone between the gypsum beds is from 100 to several hundred feet. Most of the gypsum is snowy white; some of it, however, has a grayish tint. Shafts and numerous drill holes have been put down by the United States Gypsum Company to determine thickness of beds.

Bibl.: Spurr Gordon. Gypsum in the Maria Mountains, Riverside County. Mining World, Vol. 34, pp. 787-790, 1911. Bull. U. S. G. S., 697, p. 79.

IRON.

The largest and most important deposit of iron ore in the state occurs in Riverside County. These deposits are in the northern part of Eagle Mountains, in the central part of the county, township 4 S., A. 14 E., about 40 miles northeast of Mecca, on the Southern Pacific Railroad, also 45 miles south of Cadiz, on the main line of the Santa Fe Railroad. The ore is mostly hematite, but here and there consists of magnetite. A considerable percentage of the iron ores of these deposits are said to be very pure, containing from 62% to 67% metallic iron. For detailed description of these deposits see U. S. G. S. Bulletin No. 503, by E. C. Harder, 1909.

MAGNESITE.

Hemet Magnesite Mine. The mine is situated 3½ miles north of Winchester in section 31, T. 5 S., R. 1 W. Magnesite occurs as a stock work of veins in a zone of serpentine about 200 feet wide, extending northwestward for probably 1000 feet. The deposit is developed by large open cut, or glory hole. A crosscut tunnel at lower elevation is connected with glory hole by a series of raises. Ore from tunnel level is carried by system of belt conveyors to a sorting plant equipped with a 36-foot belt, 3 feet wide. Magnesite conveyed to a screen where it is washed and the fines rejected. Washed magnesite burned in a 6′ x 60′ rotary calciner, then distributed to cooling bins by a drag conveyor. Finally ground to pass 100 mesh screen. Capacity of plant 30

tons per day. When operating, 35 men are employed. Idle. Owner, Magnesco Refractory Products Company; Wellman Lewis Company, Hibernian Bank Building, Los Angeles, California.

Bibl.: U. S. G. S. Bull. 355, pp. 38-39.

MANGANESE.

Manganese deposits occur in a small area in the northern part of the Ironwood Mountains, and in the west end of the Maria Mountains, in Riverside County, both areas in the Ironwood district.

The deposits in the Ironwood Mountains are included in the Black Jack, Melville and the Social Claim groups.

In the Maria Mountains ore has been produced from the Dioxide, but adjoining are a number of undeveloped claims.

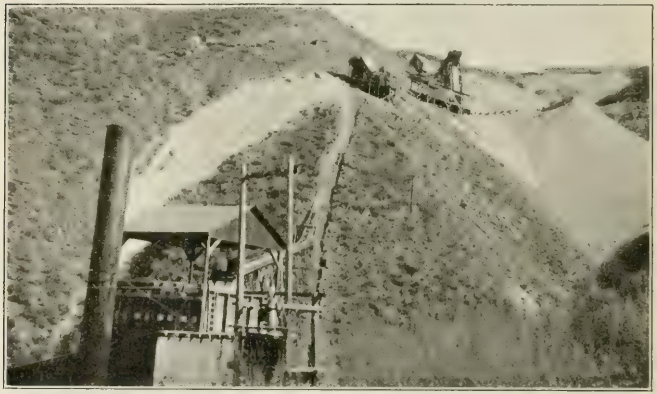


Photo No. 40. Hemet Magnesite Mine, Winchester, Riverside County.

A group of claims of the United States Gypsum Company lies north of the Dioxide group. The deposits are accessible by roads that lead from Brown's and from English Siding, points on the Southern California Railroad.

The deposits in the Ironwood Mountains are 10 miles west of Brown's Siding; those in the Maria Mountains are 5 miles west of English Siding.

Most of the ore shipped in this district in 1917 and 1918 contained over 40 per cent. manganese, from 0.5 to 2 per cent. of iron, and from 3 to 8 per cent. of silica. The manganese deposits of the Ironwood Mountains are contained in veins or shear zones that cut a sheared and intrusive igneous rock. Veins strike north and south and have steep dips.

The manganese deposits in the Little Maria Mountains are contained in a wide zone of brecciation in massive limestone and in quartzite. The zone of brecciation strikes N. 60° W.

The manganese deposits consist of the oxides psilomelane, and pyrolusite. Calcite occurs in all the deposits, but is more abundant in some of the veins than others.

For full description of the different deposits see Cal. State Min. Bur. Bulletin No. 76, pp. 54-59, "Manganese and Chromium," U. S. G. S. Bulletin 710-E. pp. 193-200.

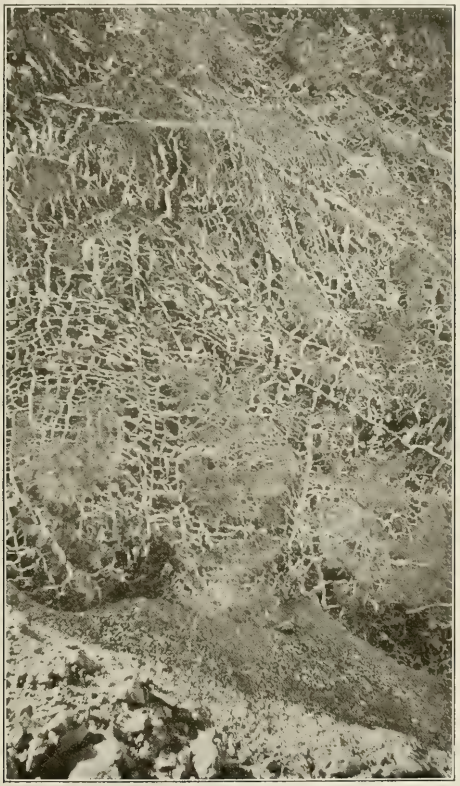


Photo No. 41. Hemet magnesite mine, showing stockwork of veinlets of magnesite. This whole face is mined and the magnesite hand-sorted on a picking belt.

MINERAL SPRINGS.

Among the natural resources of Riverside County, are a number of mineral springs, which are of commercial importance, owing to their curative properties. The most noted being at Glen Ivy, Elsinore, and Murrietta.

For detailed description of the various mineral springs throughout the county, see U. S. G. S. Water Supply Paper No. 338, by Gerald Waring, 1915.

SALINE DEPOSITS.

Borax is known to occur in the eastern end of Riverside County, in the Salton Sea basin. But no deposits of commercial importance have been developed in this area.

SALT.

The salt beds of Salton Sea area near Salton are of commercial importance, and in the past have produced large amounts of very pure salt. Sodium chloride 94.68 to 97.76%, and free from organic matter.

See Bulletin No. 24, "Saline Deposits of California," by Gilbert E. Bailey, pp. 122-126.

SILICA AND FELDSPAR.

There are extensive deposits of silica and feldspar throughout Riverside County, the most important being in the neighborhood of Hemet, Lakeview, Nuevo, Perris and Murrietta. The commercial importance of these deposits has been recently augmented by increased demand for these materials by the clay manufacturers, and Glass Works of Los Angeles, California.

Silica and feldspar are described together, as they are as a rule associated together in the different deposits mentioned.

Hemet Silica Mine. The mine is situated 2½ miles south of Hemet, on the southwest slope of Polly Butte, in section 27, T. 5 S., R. 1 W. Elevation 1850 feet.

A massive outcrop of quartz occurs in the granite on the southwest slope of low granite hills. There are also a series of lenses of quartz in the granite. The general strike of these lenses is north and south with a dip of 80 degrees east; the massive outcrops can be traced on the surface for 500 to 1000 feet. The main lens of quartz is 75 to 125 feet wide. There is an open cut on this lens on north slope of hill, 25 feet by 50 feet in length, exposing 75 feet of pure white quartz. At an elevation of 1850 feet a tunnel is driven under the massive outcrop of quartz, a distance of 200 feet. About 30 feet from the portal of the tunnel, a lens of quartz was cut 40 feet in thickness; it lies parallel to main quartz lens, there being a belt of granite between these deposits. The silica so far developed on these deposits is very white and pure, but shows in places a small amount of iron stain and some mica. A large tonnage has been developed, and the owners plan to build a grinding plant at Hemet.

Owner, Hemet Silica Company, H. H. Spaulding, president; Benjamin Oakford, secretary; William G. Preston, manager; Offices, Los Angeles Investment Building, Los Angeles, California.

Nuevo Silica Mine. The deposit is situated 4 miles south of Lakeview on the Santa Fe Railroad.

A large outcrop of silica and feldspar occurs in the low lying granite hills south of Lakeview Valley. The strike of the outcrop is NW. and

SE. dip 60 degrees SW. On the surface the outcrop of silica and feldspar is 150 feet wide, and can be traced for a length of 200 feet. Intermixture of silica and feldspar occur together which can be mined separately, as the dividing line of demarcation is very distinct. In an open cut 150 feet wide by 45 feet in length, there is a capping of feldspar 30 feet thick overlying 15 feet of silica. The feldspar is of fine quality containing 11% potash. The silica is clear and white. Four men are employed. A large tonnage is being shipped to the company's plant in Vernon. Owner, American Encaustic Tiling Company, Los Angeles, California.

Warren Feldspar and Silica Deposit. The deposits are located on the Warren Ranch, 3 miles east of Lakeview. Series of parallel ledges of feldspar and silica occur in the granite. These veins of quartz have a general northerly and southerly strike, and can be traced on the surface for a distance of ¾ of a mile. On the northern part of the ranch there are four parallel veins. Only a small amount of surface prospecting has been done on the different outcrops, consisting mostly of shallow cuts. The feldspar and silica are of good grade, show only a small amount of impurities. Reported that the feldspar will carry 10% potash. Silica runs 98% pure. From surface indication a large tonnage of both materials can be developed. The deposits lie 2 miles east of the American Encaustic Tile Company's Nuevo deposit, and the mode of occurrence is similar. Owner, George R. Warren, 1173 West Tenth street, Riverside, California.

M. L. Cambern and **A. Schneider** of Elsinore own a feldspar and silica deposit 3½ miles northeast of Murrietta. Massive quartz outcrop in granite, stated to have a width of 25 feet. The silica and feldspar are associated together. Silica pure white, with only small amount of impurities. Feldspar of good quality and said to have a potash content of 10%.

E. T. Green of San Jacinto owns a silica deposit in Bautiste Cañon, 8 miles southeast of San Jacinto. Outcrop stated to be 12 feet wide. Silica is white in color, and said to analyze 98% pure.

STONE INDUSTRY.

Granite is widely distributed over Riverside County. It has been quarried on a large scale, at Casa Blanca, for rubble, and for building and ornamental purposes at Corona, Riverside, and Temecula. At Porphyry and Riverside it has been quarried for broken stone.

The Corona granite is used to some extent for building stone, and in considerable quantities for monumental work.

A number of quarries are being reopened near Corona, Temecula, and Perris on account of the increased demand for building material.

For detailed description of deposits see Report XV, pp. 584, 585, 586.

CRUSHED ROCK.

Temescal Rock Quarry. The quarry is located in Temescal Cañon, 4 miles southeast of Corona. The material that is being crushed is a rhyolitic porphyry, and is very hard and sharp. The quarry has been recently purchased by the Blue Diamond Plaster Co., offices 2200 East

Sixteenth street, Los Angeles. W. H. Hay, president and general manager. This company plans to operate the quarry on a large scale.

For detailed description see Report XV, pp. 586, 587.

SLATE.

Rainbow Mining and Mineral Products Company. M. L. Cambern, president; A. Weinman, secretary; A. Hart, general manager; offices, H. W. Hellman Building, Los Angeles, California. Are mining and crushing green and red slates for roofing purposes. The property is known as the Rainbow group of mines, and is situated 3 miles north of Elsinore.

The general strike of the dark siliceous slate belt is N. 40° W. dip 50° SW. In this belt are a series of parallel veins of green slates which have an average width of 6 to 8 feet. On the northwest end of the property are found belts of brown, red and yellow colored slates. It is stated that 12 different colored products can be made for roofing purposes. Developments consist of tunnels and open cuts on the different veins.

A 20-ton grinding plant has been installed on the property. Ore from different openings goes to 12″ x 16″ Wheeling crusher, where crushed to ¼ mesh. The product from crusher passes through a 10-mesh rotary screen with a dust jacket of 20 mesh. Oversize from this screen returned to 12″ x 20″ Stearns-Rogers rolls, while through size passes over Newago screen of 20 mesh. Then product goes to storage bins. 10 on 20 mesh product is shipped to Los Angeles for roofing purposes. Company is at present shipping 5 cars per week. Capacity of mill is 30 tons per day. Ten men are employed.

TIN.

The **Temescal Tin Mine** is located in the western part of Sobrante de San Jacinto grant, and about 5 miles southeast of Corona. These deposits have not been worked for a number of years.

Detailed descriptions of these deposits are given in the following reports: Reports IV, p. 120; XI, pp. 111–113. Also in American Journal of Science, 4th Series, Vol. IV, pp. 39–42.

Other references will be found in Mineral Resources of the United States, U. S. G. Survey, 1882, p. 434; 1891, p. 161. Also, U. S. G. S. Bull. 260, and U. S. G. S. Sixteenth Annual Report, 1894, Part III, p. 536.

ZINC.

Palisade Zinc Mine. It is located 25 miles north of Blythe in Maria Mountains, about 2 miles from English siding on California Southern Railroad. Deposit of zinc carbonate ore, associated with copper and lead, is being developed. Shaft 100 feet deep. A. W. Hansen and A. Villman of Blythe, owners.

SAN BERNARDINO COUNTY.

San Bernardino County, by far the largest county in the state, in area, has more diversified mineral wealth than any other portion of California. San Bernardino for several years led all other counties in the state in point of variety of minerals produced. Although its area is comprised largely of rugged mountains and desert waste, it is highly mineralized, the following being included among its mineral resources: Asbestos, barytes, borax, brick, cement, clay, copper, gems, gold, granite, gypsum, iron, lead, limestone, manganese, marble, niter, potash, salt, glass-sand, soapstone, soda, strontium, talc, tungsten, vanadium, and zinc.

Within its borders are found a wide range of geological formation from Paleozoic to Tertiary, and a great variety of rocks of igneous origin.

The mines are scattered all over its thousands of square miles of territory, and have already added millions of dollars to the wealth of the state. Many of the mines are of phenominal richness, and were it not for the expense and extreme difficulty attending transportation in the desert, San Bernardino County would undoubtedly take first place in adding to the mineral wealth of California.

TRANSPORTATION.

The county has the advantage of direct communication with the principal trade centers by means of the Santa Fe, the Salt Lake, the Southern Pacific, and the Tonopah and Tidewater railroads. From the different railroad points there are automobile and wagon roads to the various mining districts. Transportation difficulties on this desert country have been greatly facilitated by use of automobiles and trucks.

MINERAL RESOURCES.

Since the Fifteenth Report of the State Mineralogist the most noteworthy developments that have taken place in the county are the completion of three large plants on Searles Lake for the extraction of potash from the brines of the lake.

With the increase in the price of silver there has been renewed activity in the old silver camps of the county, this especially being true of the Calico mining district. However, the most important development was the discovery of high-grade silver ore in the Rand mining district, near Atolia, by John W. Kelley, H. Williams, and Jack Nosser. These parties opened up and developed the California-Rand silver mine, commencing operations in May, 1919. Since that date the property has produced in the neighborhood of $1,000,000.

Owing to the present low market price for tungsten, all the mines in the Atolia district were compelled to close down during the latter part of 1918. Practically all the gold mines throughout the county have suspended operations due to the high cost of material and labor.

In the following report on the mineral resources of the county only the mines and deposits that are in active operation, or which were not previously reported on, will be discussed:

ASBESTOS.

The occurrence of asbestos is reported about 4 miles west of Cottonwood, a station on the Santa Fe Railway. The asbestos is stated to occur in a seam in a shale country rock, about 4 feet wide.

Bibl.: Bull. 38, p. 263.

BARITES.

Barium Queen Mine. It is situated 5 miles northeast of Barstow, on south slope of low range of hills north of Mojave River, in township 10 N., R. 1 W. Holdings consist of three claims—Barium Queen, White House, and White House Extension. Barite occurs in series of parallel veins, which strike N. 30 W., and dip 70 degrees NE., cutting quartzite and schist. The main vein can be traced on the surface for 4500 feet, is 4 to 5 feet wide. It has been developed along its strike by a number of open cuts and prospect holes. At an elevation of 2950 feet, a tunnel has been driven on the vein for a distance of 200 feet; in this tunnel the vein has an average width of 4 feet. Barytes is white in color, but slightly iron stained on the surface. Samples taken from vein in the tunnel reported to assay 85% barium sulphate, no lime, and the balance of the gangue being principally silica. Possible to develop a large tonnage of barytes on the property. Idle. Owners, Ellis Mallery, and Chas. Mushrush, 214 H. W. Hellman Building, Los Angeles, California.

Foshay Pass Barite Deposit. The deposit is located in Foshay Pass, 26 miles southeast of Kelso, a station on the Salt Lake Railroad. Elevation, 3900 feet. Holdings consist of 8 claims, three claims in length along the deposit. Series of parallel veins of barite occur in the granite, general strike of the veins being NE. and SW., with vertical dips. Width of veins being from mere stringers to 12 inches. Reported to assay 85% barium sulphate, low in silica, with some lime present. The barite is pure white in color, showing no iron present. Idle. Owners, Thomas Gannon, and A. A. Irish of Fenner, California.

Mansfield Barite Deposit. The deposit is six miles north of Barstow. The barite is deposited in a vein averaging 3 feet wide in limestone. The vein can be traced for 2000 feet. Developments consist of a number of prospect holes sunk at different points along the outcrop. The barite is white in color, but slightly stained with iron. Several other deposits are reported in that vicinity, none of which have been developed. Idle.

Bibl.: 38, p. 264. XV Report, p. 853.

J. H. Massen is opening up a deposit of barite, 2 miles southeast of Afton, a station on the San Pedro and Salt Lake Railroad. Small stringers of barite occur on the contact of limestone and schist. Width 2″ to 6″. Barite is of good quality.

M. Pluth, of Daggett, owns a deposit of barite 4 miles north of Daggett; barite is deposited in vein 4 feet wide. Color white, and free from iron.

A. C. Pierce, of Long Beach, California, owns a group of claims twelve miles east of Victorville. On east and west fracture in limestone barite occurs as filling stained with copper.

BORAX.

The production of borax in San Bernardino County was for many years its leading industry, but with the exhaustion of the colemanite mines of the Pacific Coast Borax Company near Calico in 1904 it practically ceased.

At present writing borax is being shipped from the Neil borate mine by D. D. Connell of Yermo, California, who is working the property under contract. About 200 tons per month is being shipped to the refinery at Bayonne, New Jersey, from Daggett.

Bibl.: Repts. IX, p. 225; XI, p. 345; XII, p. 35; XIII, p. 46; XV, p. 853. Bull. 24, pp. 56-60.

Union Borax Company, 328 I. W. Hellman Building, Los Angeles, M. Blumenthal, president; Harry F. Miller, secretary, are opening a borax deposit adjoining the Neil borate mine, 8 miles northeast of Yermo, a station on the Salt Lake Railroad. The company is sinking a shaft, with the idea of developing the same ore body that proved so productive on the Neil borate mine.

There are many other deposits, most of which are low grade, marsh or playa deposits which could not compete with the colemanite deposits of Inyo, Los Angeles, and Ventura counties, and there has been no recent work done on them.

Bibl.: Repts. IX, p. 225; XI, p. 345; XXII, p. 35; XIII, p. 46; XV, pp. 853-856. Bull. 24, pp. 56-60.

Borax is being produced as a by-product by the different potash plants on Searles Lake; otherwise there is no development being done on the borax beds of the lake.

Bibl.: Rept. X, pp. 534-539. Bull. 24, pp. 63-65. U. S. G. S. Bull. 580-L. Rept. XV, pp. 853, 854.

CEMENT.

Colton Cement Plant, in sections 19, and 30, T. 1 S., R. 4 W., S. B. B. and M. The plant is operated by the California Portland Cement Company, Douglas Building, Los Angeles; Dan Murphy, president; T. J. Fleming, secretary and general manager; E. J. Strock, superintendent at plant.

The works are about $1\frac{1}{4}$ miles west of Colton, at the north end of Slover Mountain, south of the Southern Pacific Railroad.

Slover Mountain is a knoll of crystalline limestone, about a mile long, more than half a mile wide, and 500 feet high. Analysis of the limestone shows it to be very nearly pure carbonate of lime. One analysis gave:

Lime	55.216%
Carbon dioxide	43.384%
Silica	0.550%
Alumina and Iron Oxide	0.850%

The composition of the stone in quarry is said to be very uniform. A tunnel has been driven through the mountain from the level of the quarry floor to a point directly above the old cement works, and the broken rock is trammed through the tunnel and dumped into a rock

crusher. After crushing, goes to Griffin mill, where finely pulverized, then thoroughly mixed with clay in a mixer. The mixed product is fed into eight rotary kilns, where it is burned to a clinker with an oil fire. The clinker is spread out and sprinkled with water, for the double purpose of cooling and seasoning it. It is then ground in Griffin mills and tube mills and sacked for shipment. Besides cement, the company produces crushed stone, lime, potash, and marble dust for making carbon dioxide gas for soda fountains. Capacity of plant is at present writing about 600 bbls. per day; 75 to 100 men are employed.

Bibl.: Repts. XII, p. 380; XV, pp. 857, 858.

Golden State Portland Cement Company, F. O. Wyman, president; C. W. Russell, secretary and general manager; J. A. Wilson, superintendent; offices, 915 Marsh-Strong Building, Los Angeles. The plant is at Oro Grande, and the quarries are four miles east of plant. The rock is transported from the quarries to the plant over a railway owned by the company. Method of treatment is by the dry process. Limestone from quarries goes to No. 7 gyratory crusher, while shale rock from the shale quarry (on the company's holdings) goes to 11″ x 22″ Blake crusher. Crushed shale and limestone elevated to separate bins (capacity of shale bins 700 tons, bins for limestone having a capacity of 1300 tons). Material from bins passes through two 40′ x 4′ rotary kilns (one for shale, the other for limestone), where the moisture is driven off. From these kilns the product goes to preliminary ball mills, two mills used for grinding lime rock and one for shale. The ground product from these mills elevated to separate bins. Drawn off from these bins, weighed and mixed. The mixed product goes to two 16′ x 8′ tube mills, where ground so that 90% will pass 200-mesh screen. The mixed product is fed into a rotary kiln (125 feet long by 8 feet in diameter), where it is burned to clinker with an oil fire. The clinker from kiln is spread out and sprinkled with water, then conveyed to storage bins having a capacity of 70,000 bbls. Clinker is ground in two ball mills, the product from ball mills is fed to 3 tube mills (16′ long by 8′ diam.), where reground so that 99% will pass through 100 mesh. This finished product goes to Bates sacker machine, and sacked for shipment. Capacity of plant is 600 barrels of cement per day. Twenty-four men are employed at the quarries, and 54 men at the plant. Electric power is furnished by the Southern Sierras Power Company. Combined horsepower of plant is 1800 h.p.

This plant resumed operations after a long shutdown, and are now operating to full capacity.

Bibl.: Rept. XV, pp. 858, 859.

Riverside Portland Cement Company, office, Title Insurance Building, Los Angeles, owns extensive deposits of limestone, shales and silica, said to be suitable for the manufacture of Portland cement, in the vicinity of Oro Grande and Victorville, which will ultimately be worked when their Riverside deposits are exhausted.

Bibl.: Rept. XV, p. 859.

Southwestern Portland Cement Company, C. Leonard, president; O. J. Benford, secretary; general office, H. W. Hellman Building, Los Angeles; L. D. Robinson, superintendent at plant; Frank Arnold, quarry superintendent. The company owns a deposit of limestone, shales and silica covering about 250 acres, 6 miles northeast of Victorville. The belt of limestone strikes N. 30° W., and dips 50° north overlying shales. The silica occurs as massive intrusions. The main quarry face has been opened for a length of 1500 feet, with a height of 300 to 400 feet. The rock is quarried by drilling with Keystone drills and blasting after springing round of holes, broken rock is handled with two Bucyrus steam shovels, loaded into trains of 6 cars, and hauled over the Mojave Northern Railroad to the plant near Victorville.

Plant. Lime rock and shale dumped direct from cars into Allis-Chalmers Fremont rolls, which have a capacity of 1000 tons per 10 hrs. crushed to pass 10″ ring. Product from rolls to No. 7 Jumbo-Williams mill, is crushed to pass a 2½″ ring. The product from Williams mill elevated to four compartment storage bins (capacity 2000 tons). From these bins conveyed to bins over main grinding plant. Material fed by automatic feeders to one double tube mill (26′ long by 7′ diameter), crushed wet so that 90% of product will pass 200-mesh screen; other unit consists of 8′ x 5′ Ball mill, product from this ball mill to 18′ x 6′ tube mill. Material after passing through tube mills elevated and fed to 12 slurry tanks, then agitated with air to give the proper mix. The mixture from tanks goes to two rotary kilns. No. 1 kiln is 200′ long by 9′ diameter. No. 2 kiln is 200′ long by 9′ diameter at feed end, and 10.6′ at burning end, where it is burned to clinker with an oil fire. The gases generated in burning material pass through kilns at the rate of 1000 feet per minute. The gases after passage through kilns pass through dust chambers and then out through stack 187 feet high. The dust from dust chambers drawn off by screw conveyors and returned to kilns. Clinker from two kilns drops into hopper below the kilns, where water is added to cool the material, also set the cement. Clinker then elevated to storage bins, where distributed by Brown crane hoist into large storage bins. From these storage bins the clinker is elevated to top of plant, where gypsum is added, then passes through 18′ x 6′ tube mill for regrinding, the ground product from this mill is elevated to an Emerick separator, finished product is separated out, and goes to four concrete storage tanks (capacity 8000 barrels each), oversize returned to tube mill and ground so that 87% passes through 200-mesh screen. From storage tanks finished product goes to Bates packer machines, where sacked and stored in warehouse for shipment. The capacity of the plant is 2000 barrels per day. One hundred men are employed at the plant, with 20 men at quarries. The plant is operated by electric power supplied by the Southern Sierras Power Company. The plant is built entirely of reinforced concrete, and is the most up-to-date cement plant on the Pacific Coast. The wet process is used in the manufacture of cement, which is much more economical than the dry process.

Bibl.: Rept. XV, pp. 859, 860.

CLAY.

There are extensive deposits of brick and high-grade clays in the county, most of which have never been developed, owing to their distance from manufacturing centers. During 1920, owing to the demand for clay suitable for use in filtering and purifying oils, there has been quite an interest created in looking for clays suitable for this purpose, also a demand for high-grade kaolin for pottery.

From four to ten miles east of Oro Grande and Victorville are a number of undeveloped deposits of clay and kaolin. See Report XV, pp. 860-861; Bull. 38, pp. 126-7.

G. J. Lingenfelder and **R. H. Grear**, Daggett, own a bed of clay, 12 miles northeast of Barstow.

Bibl.: Rept. XV, p. 861.

California Master Products Company, 5826 South Main street, Los Angeles, are developing a clay deposit, in section 6, T. 11 N., R. 3 W., about 1¼ miles northeast of Daggett. The clay is white in color and said to be high in aluminum, having soapy feel. Probably a halloysite. Beds are reported to be from 4 to 10 feet thick. Six claims have been located. One car has been shipped. The material is said to be suitable as a base for cleaning compounds.

M. Mulcahy and **Mrs. M. Falconer**, Daggett, own a deposit of clay in Calico district, 6 miles by road north of Daggett. Idle.

Bibl.: Rept. XV, p. 861.

Velvet White Filler Company, 615 Brockman Building, Los Angeles; A. L. Beardsley, president; A. B. Clark, secretary. This company owns a deposit of clay in the Silver Mountain district, 3½ miles east of Oro Grande. The deposit consists of seams of white silica, talc and kaolin in an igneous formation. A plant has been built at Bryman Siding on the Santa Fe Railroad for treating the clay. The process is as follows: It is washed in tanks, and an inverted screw separates the clay from the sand, the clay floats into settling tanks, then into presses. It is subsequently dried by steam-heated dryers, reground and sacked. It is used for paint filler, sizing paper and some porcelain work. The quarry is operated in the winter months, while the plant is only operated during the summer months. The present capacity of this plant is about 15 tons per day. The company is planning to double the capacity of the plant. Five men are employed. E. H. Taylor, superintendent.

Bibl.: Rept. XV, pp. 861, 862.

COPPER.

Copper is widely distributed throughout the mountain ranges which traverse the Mojave Desert in this county.

The most important mining districts where copper ores have been mined in the past, are as follows: Ivanpah, Ibex, Old Dad Mountain, Ord Mountain, Signal, Silver Mountain, and Whipple. Due to low market prices there is practically no activity in mining of copper ores, and all the mines have suspended operations. Therefore only

those properties will be discussed that were operating since the Fifteenth Report of the State Mineralogist was published. The largest amount of copper produced has been from the Copper World mine in the Ivanpah district, and the Pacific Mines Corporation properties, seven miles south of Ludlow. Both of these properties operated until the latter part of 1918.

For information on the different copper mines of the county, see Bull. No. 50, pp. 326-339; Fifteenth Report, pp. 784-791.

Copper Bell Group, Monumental district, 12 miles northwest of Drennan Station on Arizona and California Railroad, 1 mile from Monumental Peak. Eight claims. Developments consist of over 1000 feet of tunnels, crosscuts on Copper Bell claim. Quartz veins in granite. Ore, copper with gold and silver values.

Copper World Mine, Ivanpah district, is in the Clark Mountains, 20 miles northwest of South Ivanpah, the terminus of a branch line of the Atchison, Topeka and Santa Fe Railroad, leaving the main line at Goffs. The elevation at the mine is 5180 feet.

The property, which includes four claims, was taken over by the Ivanpah Copper Company, and mining operations started in May, 1916, and was a steady producer until the early part of 1919, when forced to suspend operations on account of low market price of copper. The ore occurs in a broad mineralized zone at contact of porphyry and limestone. The porphyry is an intrusive into hard gray colored limestone, and the copper ores are found through the porphyry for a considerable distance from the contacts. The mineral bearing zone is about 200 feet wide in places. It consists of iron, silica, lime, decomposed portions of the inclosing rocks and veinlets of copper ore, mostly brown oxides, with occasional bunches of malachite and azurite. Very little sulphide ore has yet been encountered, occasionally small bunches of chalcopyrite ore found in the lowest workings. Recently some veinlets of cuprite have been found, but they are small and of rare occurrence. The ore is generally low grade, said to average throughout 2% copper. By sorting it is brought up to 4%, which is the average ore smelted. Development work consists of a series of large cuts extending from the top of ridge down to about 30 feet above the bottom of the gulch, a vertical distance of about 150 feet. A main tunnel driven at an elevation of 5180 feet has over 2000 feet of drifts and cross-cuts from it. Then there are three tunnels, one 45 feet above main tunnel, the others 70 and 120 feet below tunnel level. Most of the work is done above main tunnel and the ore body is stoped in places to the surface. Comparatively little work has been done on lower levels. The ore bodies are irregular; the richest bodies are usually found on the contact. Judging from the extent of the porphyritic intrusions, and the numerous croppings, undoubtedly large bodies of ore will be developed on the claims.

When property was under operation, the production from the mine was about 100 tons daily. The ore was hauled by tractor to the smelter at Valley Wells, five miles southwest of the mine. This plant is equipped with 100-ton capacity blast furnace for making matte. A 75-h.p. Diesel type Fairbanks-Morse engine supplies power pumps

as well as power for plant. Old slag dump containing 13,000 tons said to run 2 to 10% copper is also being treated. The smelter started operations in November, 1917. Charge is as follows: (1000 lbs. to charge) $\frac{1}{4}$ slag, $\frac{3}{4}$ ore, 13½% coke, 4% sulphur. Iron pyrite is obtained from Jerome, Arizona, and also from Francis copper mine, situated 4 miles southeast of Ames Station, on the Salt Lake Railroad. The average content of ore treated is 4% copper, 3 to 5 oz. silver and 0.04 to 0.10 oz. gold. Matte is hauled from smelter to Cima, a distance of 25 miles, and shipped to Salt Lake. Sixty men employed when operating. Idle. Owners, Ivanpah Copper Company; Dan Murphy, president; Godfrey Houlterhoff, secretary; Dr. C. D. Godshall, general manager.

Bibl.: Repts. XIII, p. 61, XV, p. 786. Bull. 50, pp. 326-328.

Columbia (Macedonia) Mine. Kelso mining district. It is 5 miles southeast of Ames, a station on the San Pedro and Salt Lake Railroad. On the southwest slope of Providence Mountains. Elevation 4600 feet. Holdings consist of 4 claims: Columbia, Columbia Extension, Columbia No. 2. Vein quartz 5 feet wide with diorite footwall and porphyry hanging wall, strikes N. 75° E., and dips 50 degrees SE. An incline shaft has been sunk on the vein to a depth of 350 feet, with drifts driven on the vein east and west on the following levels: 100′, 200′, and 300′. The quartz carries chalcopyrite, galena with gold and silver values. Gold values said to be from $4 to $8 per ton.

Equipment, 80-h.p. boiler, 25-h.p. steam hoist, Laidlaw-Dunn-Gordon compressor. Two 6″ Cameron pumps. Five-stamp mill. Idle. Adam Boech, 1736 Morgan Place, Los Angeles, owner.

Confidence Copper Mine. Kelso mining district. It is 4 miles southeast of Ames, a station of Salt Lake Railroad, on the southwest slope of Providence Range of mountains. Series of parallel true fissure veins cutting the granite. Strike east and west, with dips to south of 65 degrees. Veins have widths varying from 2 to 7 feet. On the Confidence vein an incline shaft has been sunk to a depth of 100 feet. Besides this shaft there are a number of shallow shafts and open cuts. The vein is highly mineralized with chalcopyrite, also contains hubnerite and wolframite, has an average width of 5 feet. The wolframite occurs in kidneys along the footwall of the vein. On the Confidence claim there are also a series of cross-veins which strike N. 30° E. and intersecting the main vein from the southwest. The ore mined is said to carry 4 to 6% copper, $8 in gold. Owners, Confidence Copper Mining Company; Edward Buett, president; Edward Bluett, Jr., secretary, Los Angeles, California.

Emperor Mine. Clark Mountain district, situated 25 miles north of Cima, on the west slope of Clark Mountain. Holdings consist of four claims. Elevation 5500 feet. The vein containing ores of copper and lead along contact of granitic-porphyry, intrusive in the limestone. General trend of ore body is little west of north, dip almost vertical. Ore consists of carbonates of lead and copper, carrying some silver. Width of ore body is from one foot to six feet. Development work consists of an open cut which was made along the outcrop for 50 feet. Fifty feet below is the upper tunnel. The tunnel was driven SE.

parallel to the vein for about 100 feet, then westward 20 feet cutting the vein. Then a drift was run NW. along the ore body 30 to 40 feet, and winze sunk 55 feet in it. The ore body was stoped out on both sides of winze throughout its depth. A lower tunnel was driven 125 feet vertically below upper tunnel, almost due south 187 feet, but did not reach the ore body. It is in hard gray limestone, and would probably have to be driven 50 feet further to cut contact. Ore shipped from these workings averaged about $40 per ton. Last car shipped ran: 5 to 6% copper, 11 to 12% lead, and 11 to 12 ozs. silver. Idle. Gus Hampstead of Nipton, California, owner.

Foster Copper Mines. Shadow Mountain district. These mines are situated 25 miles east of Silver Lake on the south slope of Shadow Mountain. A series of parallel veins carrying values in copper, gold and silver occur in porphyry and schist. The ore consists of chalcopyrite, axurite, malachite, and iron pyrites. Veins have a general north and south strike, and dip from 40 degrees west to vertical. Three shafts about 100 feet deep have been sunk on different veins, also number of short tunnels and prospect shafts. Main shaft has been sunk to a vertical depth of 125 feet. Equipment consists of 6-h.p. gasoline hoist, and 7″ x 6″ compressor. Twenty-two claims have been filed on by the company. Idle. Owner, Foster Mines Company; C. R. Foster, president and general manager, Cima, California.

Francis Copper Mine. Kelso district. It is 4 miles southeast of Ames, a station on the Salt Lake Railroad, on the southwest slope of Providence Mountains. Elevation 4350 feet. Vein occurs on porphyry-granite contact, which strikes N. 65° E., dip 80 degrees to NW. Ore occurs as chalcopyrite, galena with silver values. Stated to carry 3 to 4% copper, 6 to 12% lead, with 10 to 12 ozs. silver. Vein has an average width of 3 feet. A shaft has been sunk on the vein to a vertical depth of 100 feet, with drifts east and west on the vein at 25′, 45′ and 75′ levels. At elevation of shaft, a crosscut tunnel has been driven south 120 feet cutting a vein which strikes N. 40° E. Ore shoot developed on the 75-foot level is 125 feet long, 3 feet wide. Was shipping 30 tons per month of copper-lead-silver ore to the Ivanpah Copper Company's Smelter via Cima. Owner, Francis Copper Mining Company, Dr. L. D. Godshall, president; Godfrey Houlterhoff, secretary; Edward Bluett, superintendent; Los Angeles Trust and Savings Building, Los Angeles, California.

Hidden Treasure Copper Mine, Signal district, is 12 miles east of Goffs. Elevation 2450 feet. Ore occurs on contact of granite and schist. Strike N. 40° W. dip 45° SE. Width 2 to 4 feet. Porphyry dike on 6 eastern claims about 500 feet wide, with stringers of copper stained ore running throughout. Series of prospect holes and trenches have been made along this dike. Main shaft on vein 160 feet deep. Ore consists of oxides of copper, chalcopyrite, and iron pyrite. Idle. Owners, A. L. Morehead, and W. F. Chausse of Goffs.

Pacific Mines Corporation (Bagdad, Chase and **Roosevelt Mines).** Office, 120 Broadway, New York City; J. N. Beckley, president; J. H. Hobbs, secretary; Frank W. Royer, consulting engineer and manager. This company's property, consisting of 27 patented claims, is seven

miles due south of Ludlow. A railroad connects the mine with Ludlow. The ore is deposited in an igneous mineralized breccia, formed by a fault. This mineralized brecciated zone is highly siliceous. The brecciated zone strikes east and west, and dips 25 to 30 degrees north. Its average width is from 8 to 15 feet. It has been proven on the surface along its strike for 2000 feet. The footwall of this zone is monzonite, with rhyolite hanging wall. Ore body faulted by series of faults which strike north and south, and displace the ore from 100′ to 240′ in places. The ore is mainly chalcocite and pyrite, carrying 1% copper, 0.27 ozs. gold, and 5 ozs. silver, and is in a quartz-porphyry gangue. Developments consist of vertical shaft 400 feet deep, incline shaft 450 feet on 30 degree incline, also shafts of 200′, 140′ and 120′, respectively, all sunk on the ore body, with several thousand feet of levels, drifts and crosscuts. The shafts are all equipped with gasoline hoists. A 16″ x 14″ x 10″ Sullivan two-stage compressor supplies the necessary air for drills. It is reported that the developed ore reserves are 300,000 tons, having a value of $6 per ton. Before operations were suspended by the company a small flotation plant was installed, and the tests showed a recovery of 90% of gold, 40% of silver, and 95% of copper. When the property was under operation 100 tons per day were shipped to smelter at Clarkdale, Arizona. Idle.

Bibl.: Rept. XV, p. 790.

Stonewall Mine. Clark Mountain district. It is 12 miles northwest of Ivanpah, in Clark Mountains. Elevation 5000 feet. Holdings consist of 13 claims known as the Stonewall group. Ore bodies occur as irregular lenses in the limestone. Ore is lead-carbonate with bunches of galena. The mineralized zone strikes NW. and SE., with a dip of 45° to SW. Developments consist of tunnel 400 feet long, in which an ore shoot 90 feet in length and 3 feet wide developed. Ore reported to carry 4% copper, 35 to 40 ozs. silver. Owner, Benjamin Lawrence of Ivanpah.

DOLOMITE.

Joseph Scheerer of Victorville has a deposit of dolomite on his claims 5 miles east of Oro Grande. Report XV, pp. 878–879.

FELDSPAR.

Clement and Blackburn Feldspar Deposit. The deposit is situated 1½ miles south of Oro Grande. Seven claims have been filed on the deposit. Pegmatite dikes containing orthoclase feldspar occur in the granite. The dikes are said to be 3 to 10 feet wide, striking east and west, and of great continuity, running the full length of the claims. The feldspar is said to contain 11% K_2O. Idle. Owner, Mrs. Ada Clement of Pleasanton, California.

J. H. Sloan, Barstow, owns a deposit 3½ miles north of Hinkley Station on Santa Fe Railroad. Idle.

Bibl.: Report XV, pp. 862–863.

FLUORSPAR.

Massen Fluorspar Deposit. It is situated 3 miles southeast of Afton, a station on the Salt Lake Railroad, in Cave Cañon mining district. Elevation 2100 feet. Holdings consist of 18 claims.

Fluorspar occurs in stringers and veins in a feldsitic rock. The deposit consists of a series of parallel veins, which trend to the east and west, with varying dips. The veins are from a few inches to 6 feet in width, while in places there are numerous parallel veins and stringers in an area of 50 feet to 300 feet wide. Some of the veins can be traced on the surface for a distance 100 to 350 feet. The area containing the fluorspar is well defined, being two miles in length and about one mile in width. The color of the spar is green, white and purple. It is said that the grade mined in sample lots carried from 80% to 85% calcium fluorite with silica content of 4.27%.

The most extensive occurrence of fluorspar was noted on what is known as Fluorite Hill group of claims, where a number of open cuts and shallow shafts expose veins of spar, with widths of 2″ to 2 feet wide, the mineralized zone at this point being 600 feet in width and 1500 feet in length. The most extensive showing of fluorspar is, however, on the eastern end of the mineralized zone, showing outcrops from 3 to 5 feet in width. These veins strike NE. and SW. and dip 60 degrees to southeast. Spar could be hauled to Baxter, a station on the Salt Lake Railroad, a distance of six miles. Six men are employed on development. Owners, Massen and Seropian Metals and Minerals Company, J. M. Seropian, president; J. H. Massen, secretary; 26 Montgomery street, San Francisco, California.

Philadelphia Fluorspar Deposit. It is situated 25 miles south of Cima, a station on the Salt Lake Railroad, in the Providence Range of mountains. The fluorspar occurs in lenses of 10″ to 2 feet in width. Deposit is developed by short tunnel. Fluorspar reported to analyze 74% Ca Fe_2 and 3% S_1 O_2. Owner, C. Roberts and H. N. Benson of Los Angeles, California.

The occurrence of fluorspar is also reported south of Baxter Station, and James Garrity of Baxter, California, has taken up six claims on the deposit. The color of the spar is green, white and purple. It is reported that the fluorspar has a low silica and lime content.

FULLERS EARTH.

(See Bulletin 38, p. 275, Fifteenth Report, p. 863.)

GEMS.

Deposits of chalcedony, bloodstone, and jasper, opals, lazulite and turquois occur in several localities on the Mojave Desert in the northeastern part of the county. (See Bull. 37, pp. 76, 77, U. S. G. S. Min. Resources, 1911. Report XV, pp. 863 to 868.)

GOLD.

Gold was first discovered in San Bernardino Range of mountains in the placers of Holcomb and Bear Valley, in May, 1860. About the same time, gold was found in the placers of Lytle Creek.

In this county there are two chief groups of auriferous veins: Those of the San Bernardino Range, and those of the desert ranges.

The veins of San Bernardino Range occur mainly on and near the north slope of these mountains and close to the margin of the Mojave Desert. The chief districts are: Bear Valley, Black Hawk, Holcomb Valley and Morongo districts.

The chief districts of the desert veins are: Arrowhead, Dale, Goldstone, Gold Reef, Ivanpah, Ord, Oro Grande, Steadman, Twenty-nine Palms, and Vanderbilt. The only placer ground recently worked on the desert is that north of Barstow by the Cool-Gardie Mining Company.

The only new district that has been opened up since the Fifteenth Report of the State Mineralogist was issued is the Gold Reef district, situated 5 miles northwest of Danby, a station on the Santa Fe Railroad, on the southeast slope of Clipper Mountains. District was discovered in 1915. The veins in this district are well defined and are of the quartz-calcite type. They occur in tertiary volcanic rocks. The stronger veins strike northwest. Many dikes cut the formation, most of which strike northwest. These dikes are vertical components of lava sheets, which successively cover a large part of the district. The strongest veins cut the lava series, but some of the dikes are also fissured and carry vein matter. The rocks range in composition from dark basic to light acid phases. Rhyolite and basalt are the newest in the series, andesite and dacite representing the older members. Volcanic tuffs and breccia are dispersed through the general aggregate. Geologic observations would indicate that the veins were formed from 1500 to 2500 feet beneath the surface by hot solutions rising along deep fractures and depositing their minerals en route. Important quartz bodies were thus formed. The uppermost portion of these now shows as a chain of bold outcrops extending for several miles along the main line of fracture. The main quartz calcite vein reaches a width of fifty feet and stands in relief 100 feet above the surrounding country. It is continuous for a distance of 1500 feet. Along this main reef various large outcrops of quartz occur for a distance of 4 miles. The Tom Reed Gold Mines Company of Oatman, Arizona, and the Clipper Mountain Gold Mining Company of Los Angeles have sunk shafts on the main reef to depths of 500 feet to develop and explore the veins at this depth. In both these shafts a strong flow of water was encountered, causing the suspension of operations until pumps could be installed. The Gold Reef Consolidated Mines Company has recently been formed and active development campaign is planned by the company, who plan to use the Clipper Mountain shaft as the main working shaft.

At present writing there is practically no activity in gold mining throughout the county, for in general it costs more to produce an ounce of gold, under current conditions of labor and cost of materials, than the metal itself will bring in the open market. Therefore only those properties that have been operated since the Fifteenth Report of the State Mineralogist was issued will be discussed.

For information on the different gold mines throughout the county see Report XV, pp. 792 to 817.

Anaconda Mine. It is situated in the Twenty-nine Palms district, about 55 miles northeast of Banning. Elevation 2850 feet. Holdings consist of six claims. Vein occurs in the granite, strikes N. 40° W., dip

73 E°. Developments consist of two shafts 100 feet and 185 feet deep. The main working shaft is 185 feet deep, was sunk on a vein having a width of 8″ to 18″. Levels have been driven on the vein at 50′, 100′, 150′ and 185′. The mine is reported to have produced some rich ore above the 100′ level. It is reported that ore milled from these workings assayed $25 to $30 per ton; with a loss in the tailings of $8. Total production from the mine is reported to be $10,000. Idle. Owners, J. P. Rasmussen and Harry Thompson, of Los Angeles, California.

Clipper Mountain Mine. It is situated in the Gold Reef district, on the southeast slope of Clipper Mountain, about 5 miles northwest of Danby. Eight claims were taken up along the main reef. Ore occurs as quartz-calcite veins, having a rhyolite footwall and andesite hanging wall. Vein is from 10 to 80 feet wide, strikes NW. and SE., dip 60° SW. Shaft sunk to vertical depth of 300 feet. It was proposed to sink the shaft to a depth of 500 feet at which depth the footwall of the reef would be cut. At depth of 300 feet, a heavy flow of water was encountered, causing suspension of operations.

Equipment, 30-h.p. Fairbanks-Morse gasoline hoist, Gardner-Rix duplex 6″ x 8″ compressor. Owner, Clipper Mountain Gold Mniing Company, B. G. Doak, president; A. H. Hayes, secretary; P. B. Kepner, superintendent. Offices, 600 I. W. Hellman Building, Los Angeles, California.

Note—Property recently taken over by Gold Reef Consolidated Mining Company; S. S. Wold, president; E. S. Howard, secretary; 600 I. W. Hellman Building, Los Angeles, California, this company consolidating interests of the Gold Reef, Clipper Mountain, and Gold Reef, Tom Reed mines, and operating as one property.

Contact Mine. It is 55 miles northeast of Banning, in the Twenty-nine Palms district. Vein of quartz occurs in mica schist near granite contact. Vein strikes N. 40° E., dip 60° W. General trend of the schist is N. 10° E. Workings consist of 150 foot shaft, sunk on the vein, and an open cut along the outcrop for a distance of 50 feet north of shaft. On 50 foot level there is a drift 25 feet south on the vein. The vein averages about 2 feet in width. The vein quartz contains occasional bunches of galena, and a small percentage of iron pyrite. The ore milled from the property is reported to have yielded $70 per ton by amalgamation, and concentrates carried $260 per ton. Idle. Owner, P. T. Sullivan of Twenty-nine Palms, California.

Desert Gold Placer Mine. Ivanpah district. Desert Gold Dredging Company, H. P. Ewell, president, George W. Cram, secretary; offices, 415-416 Union Oil Building, Los Angeles; have located 115 placer claims on Desert Lake, 6 miles east of Ivanpah and 10 miles south of Roach, Nevada. Gold is stated to occur in unconsolidated sands and gravel of dry lake bed, known as Desert Lake. It has been reported that pay gravel has been proven to depth of 3 to 6 feet by test holes. Stated the gravel will average 20 cents per cu. yd. It was planned to install a dredge on the lake, but the European war interfered, and the plans of the company did not materialize.

Gold Reef Mine. Situated in Gold Reef district on the southeast slope of Clipper Mountain, 5 miles northwest of Danby. Elevation 2600 feet. Ore occurs in highly siliceous dike, striking northwest and southeast with dip of 60 degrees SW. Developments consist of vertical shaft 100 feet deep, also a number of shallow prospect shafts and open cuts on quartz-calcite veins along the outcrop of main reef. Property being operated by Gold Reef Consolidated Mines Company, offices 600 I. W. Hellman Building, Los Angeles. Owner, Gold Reef Mining Company; W. P. Reynolds, president; Frank Siever, secretary; P. B. Kepner, superintendent, 826 Washington Building, Los Angeles, California.

Gold Reef (Tom Reed Mines). The mine is in the Gold Reef district, 6 miles northwest of Danby. Elevation 2700 feet. The quartz calcite-vein on Gold Reef No. 6 claim reaches a width of fifty feet, and stands in relief 100 feet above the surrounding country. It is continuous for a distance of 1400 feet. On No. 6 claim a vertical shaft has been sunk to a depth of 500 feet in the hanging wall about 250 feet west of the vein. At the 500 foot level it is proposed to drive a crosscut to vein and drift along the vein and connect with workings of the Clipper Mountain Mine.

Recently large pumps were installed by the Gold Reef Consolidated Mines Company at the Clipper Mountain shaft, and pumping operations drained the water from the Tom Reed Company's shaft. The development work was started from this shaft, and the company hopes to develop a large tonnage of ore that will average around $6 per ton in gold.

Owner, Tom Reed Gold Mining Company, Oatman, Arizona. Operated by Gold Reef Consolidated Mines Company; offices, 600 I. W. Hellman Building, Los Angeles.

Gold Mountain Mine. This mine is situated in San Bernardino Range of mountains, north of Baldwin Lake in Bear Valley mining district. Elevation 7350 feet. Operated from 1860 to 1900 by Lucky Baldwin, and from 1900 to 1908 by Capt. J. R. DeLamar. Reopened in February, 1918, and operated until November 1, 1919, by James Hulmes of Berkeley, California. There are 16 claims along the lode. The vein system occurs as irregular bodies of massive quartz containing free gold, have been formed as a replacement of quartzite along its contact with schist. The quartzite is greatly shattered, and numerous seams cut the quartz. The values are mostly found near the cross fractures. The strike of the ore body is N. 60° W., dip 60 to 70 degrees south. The dip, however, flattens with depth. In the main adit tunnel, being only 30° south, the average width is 40 feet. Occasional masses of crushed quartzite are inclosed in the quartz. These have to be sorted out as the gold rarely occurs in the quartzite. Developments consist of a glory hole approximately 600 feet long by 40 feet wide by about 50 feet deep. An adit tunnel 700 feet long was driven N. 60° W., 85 feet vertically below outcrop. This is connected with bottom of glory hole by means of chutes. All ore is mined from this glory hole. Ore is said to average $4 per ton throughout, now working richer portions running from $6 to $10 per ton. Equipment, 9″ x 10″ Gardner compressor, and air drills. Mill, two No. 3 Gates gyratory

crushers; thirty-five 1000-lb. stamps; plant operated by 150-h.p. steam engine. Nine men employed. Owner, James Holmes, Pine Knot, Bear Valley, California.

Gold Park Consolidated Group of Mines. W. C. Winnie, president; J. E. Schweng, secretary; C. W. Roach, manager; offices, 1021 Black Building, Los Angeles, California. This company owns a group of 52 claims in the Twenty-nine Palms District, 64 miles northeast of Banning, and 4 miles south of Twenty-nine Palms. Some of the holdings are in San Bernardino County, while others are just south of the line in Riverside County. The following groups have been developed to some extent: Atlanta, Black Warrior, Boss, Caladonia, Gold Park No. 1, No. 2, and No. 27 and Oro Copio.

Gold Park Group No. 2.

Elevation 2300 feet. This group consists of ten claims. The ore occurs in lenses of quartz at intervals along fractures in a coarse grained granite. The general trend of these veins is N. 10° W. Near the surface the dip is steeply to the east, with depth changing slightly westward. The veins are usually narrow, about 8″ to 18″ of quartz, but occasionally widening to 6 feet. The gold is free milling and very finely disseminated. Seldom visible to the naked eye. Copper stains occasionally occur in the quartz, but these disappear usually below 20 foot depth. The workings on this group are mostly superficial, consisting of shallow shafts and trenches. The pay shoots are short, consisting of a maximum length of 60 feet. Said to average $8 to $10 per ton in gold. Developments consist of tunnel 100 feet long, and a number of shafts from 30 to 50 feet deep. Mill, 2 Nissen stamps and Bryan roller mill at Twenty-nine Palms. At mine there is one stamp test mill driven by 5-h.p. gas engine.

Boss Mine. A shaft has been sunk to a vertical depth of 122 feet on the vein, and a few feet north of intersection of the main vein striking due N. and S. and a branch striking about S. 10° W. These veins are in the granite. On the 65-foot level the vein was drifted on to the south connecting with a 100-foot shaft. The vein on this level shows a width of 1½ to 2 feet, and was stoped to the surface. At the bottom of shaft a drift was run due north 200 feet, but no pay shoot encountered. There are at least 1000 feet of crosscuts and drifts on this level. The vein formation is about 4′ wide, showing 8″ of quartz, the remainder consisting of shattered granite and stringers of quartz. Equipment, 7-h.p. gas engine hoist. Owner, Gold Park Consolidated Mines Company.

Atlanta Mine. On this claim a narrow vein of quartz occurs in the granite, striking N. 10° E. and dipping almost vertical. The workings consist of shaft and three tunnels of different elevations. The shaft is located near foot of hill and to the south of the tunnels, and was sunk to depth of 100 ft. on a narrow vein. About 100 ft. above the collar of this shaft is the lower tunnel. This was driven N. 10° E. for about 250 ft., about 150 feet from portal raise to upper tunnel and surface. Beyond this raise the tunnel is caved, so was not accessible. Practically no ore is exposed in lower tunnel. Fifty feet above tunnel is the Intermediate tunnel, driven on seam in granite, which opens

into a narrow lens of quartz. The shoots of ore developed in these workings were short, but reported to carry high values in gold. Owner, Gold Park Consolidated Mines Company.

Caladonia Mine. Workings on this claim consist of two shafts, sunk on vein to depth of 50 and 100 feet. Vein varies from 2½ to 4 feet. The ore extracted from these workings was treated in one stamp mill and reported to have yielded $12 per ton on the plates. The quartz lies between rhyolite and granite footwall. Owner, Gold Park Consolidated Mines Company.

Black Warrior Mine. This is the most southernly mine of the group, lying about 3½ miles south of camp. The mineralization occurs along a shear zone in altered granite. The hanging is a gneiss with a well defined talc wall. General trend of the ore body is N. 10° W. with a dip to the west. Workings consist of a 200-foot shaft sunk on the vein in the center of claim. The quartz in the vein matter is highly oxidized and contains considerable iron and lime. Its black appearance, due to iron and manganese stains, gives it its name. The vein is different from the others of the district, containing considerable pyrite and some arsenopyrite. The dump is said to contain 2200 tons of ore which will assay $14 per ton. The shaft is vertical to 70-foot level, from this point sunk on an incline of 65 degrees east. On 70-foot level a drift run 100 feet N. 45° W., exposing an ore body 60 feet in width. Mineralized zone made up of quartz and brecciated wall rock. On 150′ level a crosscut was run for 60 feet west, and is said to be entirely in ore. Equipment, 12-h.p. gas engine hoist; 8″ x 8″ compressor. Two men employed on development work. Owner, Gold Park Consolidated Mines Company.

Oro Copio Mine. On this claim the mineralization follows a shear zone, and the granite has been altered to a gneiss. A shaft sunk on vein to depth of 50 feet. Vein strikes N. 10° E. About 150 feet south of this shaft another shaft has been sunk on narrow quartz vein to depth of 100 feet. Vein 2 feet wide, stated average $8 per ton. Owner, Gold Park Consolidated Mines Company.

Hidden Hill Mine. Arrow district. It is situated 20 miles north of Fenner, a station on the Santa Fe Railway, on the eastern slope of the Providence Range of mountains. Claims: Hidden Hill, Bill McKinley, Golden Queen, Golden Queen Fraction. A series of parallel veins occur in a porphyritic granite, which is highly brecciated along these fractures. The veins are narrow, varying in width from 1″ to 12″. The quartz contains jasper with high gold values, and small amount of chalcopyrite. Veins strike N. 30° E. and dip 45 degrees west. The veins are displaced by a number of north and south faults.

Developments consist of incline shaft 240 feet deep. Crosscut tunnel 350 feet long. The shaft and main workings are located on the Golden Queen claim. Other claims have been developed by shafts from 50 to 100 feet deep. Mine was noted for high grade ore, only ore assaying around $50 was shipped. During 1913 one pocket encountered produced $13,000 from 300 lbs. of rock. Idle. Claypole and Company of Needles, California, owner.

Holcomb Valley. (Placer.) Lee Du Bois is testing the Holcomb Valley placer ground with a Keystone drill for the purpose of determining whether the gravels will pay to dredge. The gold placer ground of Holcomb Valley has been worked at intervals since 1860, but main difficulty of working the gravels is a heavy underground flow water encountered in shafts sunk, making it impossible to reach bedrock. It is feasible to work the placer ground by means of gold dredge, and if Mr. Du Bois' tests prove successful, it will mean a revival of mining activity in the district.

Bibl.: Rept. XV, pp. 798–799.

Mabel, Contention and Investment Group of Mines. This group of mines are in the Arrow mining district, 23 miles northwest of Fenner, at an elevation of 3750 feet, on the eastern slope of the Providence Range of mountains. There are 12 claims in the group.

The geology of the district. The formation is composed of principally granite, diorite, quartzite and porphyry. The lateral pressure that folded and faulted the country had no doubt much to do with the mineralization of this section, making many fissures which offered free passage to mineral solutions. At the time of this disturbance the country was intruded by the great porphyry dike, along which the mineral has been deposited in fissures and contact veins of various widths, strikes and dips. The intrusions have been very much altered. Some secondary movement has occurred along the contacts, which has altered the porphyry and granite walls, and caused the talc gouge now seen in the veins. The veins vary in thickness from few inches to 4 feet. The dikes of intrusive nature are over a hundrd feet in width and stand up prominently above the surrounding country; having been highly silicified, ore occurs on both walls of these dikes. The dikes have a general north and south trend and are faulted on a number of places on the property. Veins have a N. 20° E. strike, and dip 40° to 75° W. There are also a number which have an east and west strike and dip south, the most notable being the Contention and Big Ledge veins; the latter is 10 to 12 feet wide. The ores are siliceous in character, and contain values in gold, silver and copper, the principal value being gold.

Developments, Contention shaft 200 feet deep, with levels driven on the vein at 65′, 100′, 144′ and 200′. On 200′ level the vein has been drifted on 125 feet east and 115 feet west. Ore developed in this mine is reported to carry from $6 to $8 per ton in gold. Subway shaft is 50 feet deep, with a level driven 200′ north on vein. Mabel shaft 140 feet deep, with drifts on the vein. A large number of proposed shafts have been sunk on the different claims, all developing some ore.

Equipment consists of 3-stamp mill, one Standard concentrator and 10-h.p. gas engine. Property was under operation during the latter part of 1918 and the early part of 1919. Production is stated to have been about $100,000, all of which was shipped to the smelters. Only ore exceeding $50 per ton was shipped. Idle. Thomas A. Gannon, Fenner, California, owner.

North Star and Big Blue Mines. These properties are in the Big Bear Valley mining district, 45 miles east of Victorville. Vein 2 feet wide occurs on contact of limestone and mica schist. Strike east and west. Dip 45 degrees north. Mine adjoins the Rose mine. Developments consist of 300-foot tunnel driven on vein. Equipment consists of compressor, air drills and blacksmith shop. Property under option to Talmadge Bros. of Victorville. Owner, Al. Watts of Victorville, California.

Olympus Gold Mine. Situated on south slope of Paradise Range of mountains, at an elevation of 2300 feet, 22 miles north of Daggett. Holdings consist of 7 claims. Series of parallel veins occur in granite. Strike N. 30° W. Dip 33° NE. Varying width from 6 to 20 feet. The principal developments have been on the Klondike vein. Incline shaft has been sunk to a depth of 400 feet on the vein. At the elevation of the shaft, a tunnel has been driven north 400 feet on the vein. The vein in this tunnel has an average width of 6 feet of quartz, and in places lenses out to 20 feet. Fifty feet vertically above this tunnel there is a tunnel driven 300 feet on the vein, this upper tunnel being connected with lower tunnel by series of raises. At 365 feet from portal of lower tunnel the vein was cut off by a fault which strikes N. 45° E. It is reported that 50,000 tons of ore have been developed above the lower tunnel which will average $6 per ton in gold. Only small amount of drifting has been done on the vein from levels in the shaft, about 50 feet north and south on 135-foot level, 50 feet south on the 235-foot level. The mine is supplied with water from Paradise Springs, a distance of 2½ miles.

Equipment consists of 25-h.p. gasoline hoist, 9″ x 8″ Ingersoll-Rand compressor; 10-stamp mill driven by 40-h.p. gas engine and one Gibson mill. Three men employed in driving a lower tunnel to connect with incline shaft at a depth of 400 feet. Owner, Olympus Gold Mining Company; S. E. Bagley, president; M. W. H. Williams, secretary; H. Galerone, superintendent. Offices, 508 Alvarado street, Redlands, California.

Rex and Valencia Hill Group of Mines. Situated in Holcomb Valley district, 42 miles east of Victorville. Elevation 7500 feet. General formation is granite, through which intrude large deposits of quartzite, and irregular masses of quartz occur throughout the quartzite. On the Rex claim the quartzite is well defined, outcrops boldly for 1000 feet, having average width of 250 feet. This deposit can be traced through the adjoining claim to southeast. A shaft has been sunk near center of claim on an incline of 65 degrees to SW. to depth of 100 ft. The shaft was sunk in a cross-break in the main outcrop of quartzite, which break was filled with an intrusion of schist. A number of shallow shafts and open cuts have been made along outcrop on masses of quartz in the quartzite, from which values in gold assaying from $5 to $8 per ton have been obtained. The ore occurrence on these claims is very similar to the Gold Mountain mine, which is located east of these claims. I Ile. Owner, Rex Mining Company; R. H. Gilman, president; C. L. Metzger, secretary; 1682 W. Twentieth street, Los Angeles, California.

Total Wreck Mine. It is 3 miles northwest of Yermo, on the south slope of Gold Mountain, in Calico mining district. Elevation 2300 feet. The vein occurs as an iron-stained brecciated quartz along a fault fissure on contact of sandstone and tufacious breccia. Strike NW. and SE. Dip 70 degrees south. Width 8″ to 3 feet.

Developments consist of crosscut tunnel 500 feet long. In crosscut tunnel at 125 feet from portal cut what is termed the lead vein, and the vein is drifted on 60 feet to southeast. On SE. side of tunnel a winze was sunk to a vertical depth of 80 feet, cutting through the vein, which dips south. The crosscut tunnel continues in a northerly direction for about 270 feet, where cut the contact of the stratified sandstone and massive breccia, cutting a small vein of gold-bearing rock, which was drifted on 50 feet to the west. At 35 feet farther on cut a larger fissure, which was drifted on 600 feet to northwest. Reported ore in this drift will average about $8 per ton in gold. This contact vein is not parallel with the lead vein, but going easterly towards it, and the indications are that the two fissures will unite about 600 feet east of crosscut tunnel. The occurrence of the gold in the vein material is very fine. Owner, Mrs. Rosella Burcham, Randsburg, California.

GRAPHITE.

A deposit of graphite is said to occur near head of Santa Ana River in the San Bernardino Mountains, about 15 miles from East Highlands, a station on Santa Fe Railroad. It is undeveloped. Owner, W. E. Van Slyke, 716 Fifth street, San Bernardino.

Bibl.: Bull. 38, p. 280.

Eva Cañon Graphite Deposit. The deposits are in Eva Cañon, north of Ontario, about ½ to 1 mile from the mouth of the cañon, in an area of crystalline schists and associated with granite pegmatite. At the graphite prospect the schists are much decomposed, and in places there has been much slipping parallel to their foliation. The greatest width of highly graphitic material is about 5 feet. The graphite is crystalline but very fine grained, and so intimately mixed with silicates that it could probably not be separated from them economically in deposits so small.

(Notes taken U. S. G. S. Bull. Graphite by E. S. Bastin.)

GYPSUM.

San Bernardino County contains gypsum deposits in many places on the desert, the most notable and at present the only one being worked being that of the Consolidated Pacific Cement Plaster Company in the Amboy Sink. A similar deposit is said to exist at Danby Dry Lake, 32 miles southeast of Danby Station, on the Santa Fe Railway.

Gypsum occurs also in thin-bedded deposits associated with the beds of rock salt in the Avawatz Mountains, and to a lesser extent in the borax beds of the Calico district. A deposit was located some years ago near Camp Cady on the Salt Lake route.

Bibl.: Bull. 38, p. 287. U. S. G. S. Bull. 413, pp. 25-28.

Amboy Dry Lake Deposits. Consolidated Pacific Cement Plaster Company; office, 612 San Fernando Building, Los Angeles, California; J. D. Bowerstock, president; D. A. Mulvane, secretary. This company is operating on the west side of Amboy Dry Lake, and has a mill at Amboy.

Bibl.: XV Rept., pp. 868-870. U. S. G. S. Bull. 697, pp. 81-82.

Avawatz Mountains Deposits.[1] Not far from the northern boundary of San Bernardino County, on the northeast edge of the Avawatz Mountains, there are extensive deposits of rock gypsum. The locality is at the extreme south end of Death Valley, and about 10 miles west of the Tonopah and Tidewater Railroad. The Avawatz Salt and Gypsum Company of Los Angeles has gypsum claims in sections 15, 22, 23, 25, and 26, T. 18 N., R. 5 E., San Bernardino base and meridian.

The gypsum-bearing strata range from 150 to about 400 feet thick, the average thickness being about 250 feet. They outcrop over an area 9 miles long by 1 mile wide. These strata consist of greenish or reddish sands and clays, which carry large quantities of gypsum, and beds of rock gypsum 1 to 10 feet thick. The rock gypsum is massive, fine grained and varies in color from white through shades of green, pink and red to dull black. Analyses of a number of samples show from 74 to 97 pure gypsum.

M. Mulcahy et al., of Daggett, have two gypsum claims in Calico district, 2½ miles west of Yermo on Salt Lake Railroad. The gypsum occurs in beds varying from 2′ to 4′ in width, associated with the borax beds in the Tertiary sediments of the Calico range. Idle.

Bibl.: Rept. XV, p. 870.

IRON.

Large deposits of iron ore occur in the desert regions of San Bernardino County. It is estimated that there are 20,000,000 tons of available high-grade ore, and double that amount of probable ore in Riverside and San Bernardino counties. The principal deposits in San Bernardino County are: Cave Cañon Group, north of Baxter; Iron Age, 6 miles east of Dale; Iron Mountain Group, 10 miles west of Silver Lake; the Vulcan Group in Providence Range of mountains, 4 miles east of Kelso, and the Armstrong and Doran Group, 8 miles northwest of Cadiz. Less important deposits occur in the Keystone Mountains, north of Amboy, south of Blythe Junction, and in the Lava Beds district south of Daggett.

The iron ore deposits of San Bernardino County will eventually become of importance both on account of exhaustion of high-grade ores in the eastern section of the country and because of the necessity for supplying the growing demands of the Pacific Coast.

For detailed description of the different deposits see Bulletin No. 38, p. 299; U. S. G. S. Bulletin No. 285, p. 198; U. S. G. S. Bulletin No. 430, pp. 228-239; Bulletin of A. I. M. E., September, 1915, 1889; Report IX, p. 235; Report XV, pp. 817-821.

[1] Abstract from report made by H. R. Johnson for the Avawatz Salt and Gypsum Company.

LIME AND LIMESTONE.

Limestone deposits of great commercial value occur in several localities in San Bernardino County, the most important ones being those at Baxter, Colton and Oro Grande.

Bibl.: Bull. 38, pp. 61-64. Fifteenth Report, pp. 871-879.

LIMESTONE.

Swarthout Cañon Limestone Deposit. McFadden Corporation, 434 Marsh-Strong Building, Los Angeles, California; Ward McFadden, president; S. W. Crockett, superintendent, are opening up a large deposit of limestone in Swarthout Cañon, 10 miles northwest of Cajon, a station on the Santa Fe Railroad. The limestone is hard and coarsely crystalline and mostly white in color, said to be very pure. Company plans to ship a large tonnage to Los Angeles and other cities on the coast. Twelve men are employed.



Photo No. 42. Afton Magnesite Mine, Afton, San Bernardino County; Cliffside Magnesite Company, San Bernardino, California. Photo by Dr. Cook.

MAGNESITE.

Afton Magnesite Mine. Situated 1½ miles east of Afton Station, on the Salt Lake Route and less than 2000 feet south of the railroad. The deposit is located on steep hillside on the east side of Cave Cañon.

Three claims, Cliffside, Hill Top and Crown, have been located along the outcrop. The deposit of magnesite outcrops as a bold white ledge striking easterly over a precipitous ridge which rises abruptly out of the Mojave River Valley to an elevation of 500 feet above the floor of the valley. The magnesite ledge is exposed for about 400 feet from the base to the top of the croppings. It forms a striking landmark visible several miles west of the deposit. Near the top of the cropping a slide has denuded it for a width of a couple of hundred feet. It here appears to be about 10 to 20 feet thick, dipping 40 degrees northward. There are at least a thousand tons exposed in this place; undoubtedly a large tonnage can be developed.

The magnesite occurs occasionally as nodules. This condition is near the hanging wall. Nearer the footwall it is harder and stratified, varying from massive to thin, platy structure; occasional seams of silica occur interbedded in the magnesite. Its color varies from pinkish to dead white. The magnesite underlies a soft red colored decomposed conglomerate material. This in turn underlies a hard, fine-grained gray sandstone, whose trend is parallel to that of the magnesite. Underlying the magnesite are decomposed sandstone and dark, bluish, slaty shales.

Analysis of magnesite: (Smith, Emery and Company.)

SiO_2	10.10%	Ca O	3.10%
Al_2O_3	1.73%	Mg O	38.19%
Fe_2O_3	1.41%	CO_2	40.65%

An aerial tramway has been installed from mine to bins at siding on railroad. A calcining plant is being installed in San Bernardino. Six men are employed. Owner, Cliffside Magnesite Company, John M. Nordheim, president; W. J. Swan, secretary, San Bernardino, California.

MANGANESE.

Very few deposits of manganese of any commercial importance are known in San Bernardino County. However, some deposits of promise were developed during 1915 and 1916, the most important being the Owl Hole Manganese Mine, 36 miles west of Riggs Station, on the Tonopah and Tidewater Railroad.

Numerous low-grade deposits occur in the desert region, but in general the percentage of silica contained is too high to make them of commercial value.

Emma Group of Manganese Claims. The deposit is located 36 miles west of Riggs, a station on the Tonopah and Tidewater Railroad, about 1 mile north of the Owls Hole mine. At an elevation of 2800 feet, on ridge north of Owls Hole mine, a vein of manganese occurs on contact of granite and limestone. The outcrop can be traced along the contact for several hundred feet. Manganese occurs as pyrolusite, and shows a low silica content. Developments consist of series of short tunnels. Idle. Ruben Stinton of Silver Lake, California, owner.

Black Stone Manganese Deposit. It is 3 miles southeast of Afton, a station on the Salt Lake Railroad, on ridge east of the Mojave River. Elevation 2600 feet. A series of lenses of manganese occur on contact of granite and limestone, for distance of about 1000 feet. The strike of the contact is north and south, with a dip of 70 degrees to the east. The largest lens noted was about 50 feet in length and 8 to 10 feet wide. The fracture can be traced for a mile, and at intervals shows from 8 inches to 4 feet of ore. Manganese occurs in form of psilomelane, with small amount of pyrolusite. Idle. Owner, J. H. Massen of Yermo, California.

Lavic Mountain Deposits. These deposits are situated 5 miles northwest of Ludlow in the Lavic Mountains. Manganese oxides occur

along a series of parallel fractures in a rhyolite breccia. The outcrops can be traced for a distance of one mile. The veins strike N. 60° W. with dip of 60° southwest. The veins have widths 12 inches to 3 feet. Ore is psilomelane. Developments consist of series of open cuts on different veins. In 1917, 100 tons of ore were shipped from the property. Ore carries high silica content. Idle. Owners, Seymour Al. I. D. Garinger, and L. N. Root of Daggett, California.

McDowell Group of Manganese Claims. The claims are located on low-lying hills west of Colorado River, about 20 miles north of Parker, Arizona.

Manganese oxides occur in several places on the claims in small seams and in deposits formed by impregnation from fissures, but rarely do the deposits of manganese oxides attain a width of 3 inches and they persist for only a few feet. Small veins of psilomelane that strike east and west were noted in diorite and granite near the river. Psilomelane is the dominant oxide in these deposits, but some pyrolusite was also observed. Calcite occurs in the seams with the manganese oxides. Only a prospect; seas of ore are too small to be mined. Idle. H. W. McDowell, Arizona.[1]

Owls Hole Manganese Mine. It is situated 36 miles west of Riggs, a station on Tonopah and Tidewater Railroad, northwest of Owl Hole Spring, Owl Mountains and southwest of Death Valley narrows. Elevation 2400 feet. The manganese oxides occur along a series of fault fractures which strike NW. and SE. in granite, and also on contact between the granite and limestone, the latter at one time covering the whole area of the granite, but has since been mostly eroded. At different points the granite is overlain by granitic conglomerate. Two shafts have been sunk to depth of 60 feet along these fractures, which are more or less parallel. The ore developed in these workings shows a width of 4 to 6 feet. There is also an open cut 150 feet in length on a parallel vein about 50 feet west of north shaft, showing 3 feet of ore in south face of cut. North of shaft in gulch there is an open cut where the manganese oxides occur on contact of limestone and a granitic conglomerate. The croppings at this point are 50 feet wide, and the ore is intermixed with the granitic conglomerate. At the edge of this cut a shaft is sunk 50 feet in ore. About 1½ miles north of these workings there is a large body of manganiferous iron croppings 200 to 300 feet long and about 50 to 75 feet wide. Developed by series of open cuts. Manganese oxides are psilomelane, pyrolusite, and manganite. Calcite occurs in the fractures with the manganese oxides. Ore shipped from the property is stated to have carried 45% to 70% MnO_2. Ore was hauled by tractor and trucks to Riggs Station. Idle. Owner, Alex Yoeman of Silver Lake, California.

Red Cross and Hidden Treasure Groups of Manganese Claims.[2] These claims are located 11 miles north of Drennan, a station on Parker Branch of Santa Fe Railroad, in the Whipple Mountains. Elevation 2300 feet.

Manganese ore occurs as lenticular and irregular masses in the sandstone, limestone and volcanic breccia. Some of the ore bodies are

[1] Extracts taken from U. S. G. S. Bull. 710-E.
[2] Notes from U. S. G. S. Bull. 710-E.

connected with northwesterly fissures along bedding planes. There are many outcrops of ore on the claims, but only a few have been exploited. One deposit enclosed in volcanic breccia is 25 feet long and 4 feet wide. At two other places ore occurs in fissures in the limestone. Bodies being 8 feet wide and 25 feet long. Manganese ore consists of massive psilomelane with a small amount of pyrolusite present. The ore is high grade, shipments of ore stated to have yielded 45% manganese, 4% silica, 2% iron, and 0.04% of phosphorus. Idle. Owners, Fred W. Hall and Mrs. Maude Washbesh of Parker, Arizona.

MARBLE.

Nearly all the limestone found in San Bernardino County may be classified as marble, but none is being quarried for building or monumental purposes. For detailed description on these deposits see our Bulletin No. 38, pp. 102-148, Report XV, pp. 879-883.

MINERAL WATER.

For detailed description of Mineral Springs of San Bernardino County, see U. S. G. S. Water Supply Paper 338, by Gerald Waring; also Report XV, pp. 883-891.

MOLYBDENUM.

Small kidney like deposits of molybdenite occur in a granitic gneiss, on ridge west of the south fork of Lytle Creek, 2 miles west of Glen Ranch and about 3 miles west of Keenbrook Station on Santa Fe Railroad.

The occurrence of molybdenum is also reported near Bonita Falls on south fork of Lytle Creek.

NITER.

(See Bulletin 24, pp. 174-178, Report XV, pp. 890-891.)

QUICKSILVER.

The occurrence of quicksilver is reported 9 miles northeast of Danby Station on Santa Fe Railroad. Fourteen claims have been taken up on the deposit by F. T. Madden and associates.

It is stated veins of quartz from 4 to 6 feet wide occur in serpentine which is impregnated with cinnabar.

SALINES.

Salts.

There are inexhaustible deposits of salt widely distributed over the desert portion of San Bernardino County, many of which have not been developed. Several companies are now producing limited amounts and there is an excellent outlook for increased production in the near future.

Avawatz Salt and Gypsum Company, Kerckhoff Building, Los Angeles, California; H. H. Kerckhoff, president; Thos. L. Henderson, secretary. The company owns 52 claims, containing about 5200 acres, along the northeast margin of the Avawatz Mountains, 10 miles west

of Tonopah and Tidewater Railway. Extensive beds of rock salt occur on the company's holdings, said to be 95% pure, sodium chloride. Idle.

Bibl.: Bull. 24, pp. 126-128. U. S. G. S. Bull. 540, pp. 526-530.

Consumers Salt Company, 304 Grant Building, Los Angeles; L. E. Stump, president; J. G. Hunter, secretary. This company is working a deposit of rock salt in old lake bed 4 miles south of Saltus, a siding on Santa Fe Railroad. The beds of rock salt are 8 feet thick with an overburden of sand and gravel 4 feet thick. In working the overburden is first removed by scrapers, and the salt blasted out with dynamite. A narrow gauge railroad connects the mine with the mill, located at Saltus, 3 miles east of Amboy. The salt treated in mill is first crushed, washed in saturated brine and then dried in a rotary calciner. Mill operated by a 25-h.p. gas engine. Production, when operating, 300 tons per month.

Danby Dry Lake Salt Deposit. A bedded deposit of rock salt stated to be 15 feet thick occurs in Danby Dry Lake, near Ward, a station on Atchison, Topeka and Santa Fe Railroad, on Parker cutoff. Estimated tonnage said to be 25,000,000 tons. Analysis 98% pure sodium-chloride. Holdings consist of 660 acres of patented land. Small production being made from the property. Owners, R. B. Evans of Pasadena, and Judge Russ Avery of Los Angeles, California.

Pacific Rock Salt Company, 600 Central Building, Los Angeles, California, owns a deposit of rock salt in the Amboy sink, a few miles southeast of Amboy. The beds of rock salt are said to be 8 feet thick, overlain by an overburden of sand and gravel about 4 feet thick. A large tonnage has been proven by drilling on the company's holdings. The company has a small mill east of Amboy. For description of other undeveloped salt deposits of San Bernardino County see our Bulletin No. 24, "The Saline Deposits of California," pp. 126–133.

SODA AND POTASH.

Searles Lake, for many years an important source of borax, is now the principal source of potash and soda in California. Three plants are extracting potash from the brines of Searles Lake, namely, American Trona Corporation, Solvay Process Company, and West End Company.

The saline deposits of Searles Lake are fully described by Hoyt S. Gale in U. S. G. S. Mineral Resources, 1912, Part I, p. 886. See also Bull. 540, p. 405, and Prof. Pap. 98-A.

American Trona Corporation, Pantages Building, Los Angeles, California; Alfred von der Ropp, president; J. H. Brown, secretary. The plant is situated at Trona, on Searles Lake, 30 miles from Searles, a station on the Nevada and California Railroad.

The crystal lake area consists of 13 square miles, one-third of which is concentrated brine. The average depth of the potassium chloride bearing ground is about 80 feet. The average potash content of this crystal body is roughly 4% K Cl. Charles G. Lee reported that the crystal body contains 110,000 million gallons, or 594,000,000 tons of

brine. This does not include any incoming waters from either underground or surface sources. The potash contained in the brine is estimated to amount to 23,760,000 tons of potassium chloride. Ten wells have been sunk in center of crystal lake area, and the brine is pumped from these wells by two centrifugal pumps, through an insulated 10″ pipe line to two large storage tanks 500,000 gallons capacity each. From storage tanks the brine goes to pre-heaters, then pumped to evaporating pans, consisting of two triple-effect 22-foot diameter Monster vacuum pans, and two double effect 16-foot diameter pans of same design. On top of each pan is a motor which drives an agitator, as it is necessary to keep solution under agitation. The liquor in pans is boiled down to the point where the potassium chloride begins to salt out, and is then sent to the crystallizing house in this condition at temperature of 90 to 95° C. The triple effect pans are operated with constant flow, the liquor entering the pan next to the vacuum pump (where the vacuum is highest and the boiling point the lowest) and passing in constant flow from this pan through the intermediate pan to the final high temperature low-vacuum pan, and from this pan to the crystallizing house. The pans stand 86 feet high and are 22 feet in diameter. The pans handle from 200,000 to 250,000 gals. of raw brine, and about 100,000 gallons of mother liquor per 24 hrs. This total of 300,000 to 350,000 gals. of liquor is concentrated to about 100,000 gals. of "concentrate liquor" before being sent to the crystallizing house to cool. During the boiling, sodium chloride, sodium sulphate and sodium carbonate are salted out. These tailings salts drop to bottom of vacuum pans, and are removed by salt elevators, which handle approximately 350 tons of waste salts per 24 hours. The elevators discharge their salts into waste salt cones from which they are washed back to the lake with brackish water. The concentrated liquor goes to a rapid cooling system where the temperature as low as 10° C. is used, and by which means the two crops of salts are obtained. One crop contains 75 to 80% K. Cl. These salts then pass through filters and centrifugals for drying, and are shipped east to the fertilizer market. The second crop contains 50 to 60% borax and 20% K. Cl. This material goes through a subsequent treatment separating the borax from K. Cl, and furnishes refined borax 99½% purity and high grade K. Cl, running 95%, which goes to chemical trade. The capacity of the plant is about 20,000 tons per year, or approximately 100 tons per day of crude potash. At present the plant is producing 1800 tons of crude potash salts per month, using only one of the two units. The product analyzes from 75 to 80% K. Cl, and contains less than 3½% borax.

Dr. H. W. Morse is technical manager of the corporation.

Power plant contains twelve 500-h.p. Babcock-Wilcox boilers, which supplies steam for evaporation and power for plant.[1]

Solvay Process Company. This company has leased the Pacific Coast Borax Company's ground on Searles Lake, consisting of 1000 acres. The company has erected a plant and refinery at Boro-Solvay. The plant is located 2 miles from the plant of the American Trona Corporation, producing about 200 tons per month of high grade salts.

[1] In above description, free use is made of Mr. Alfred De Ropp, Jr.'s article published in Mining and Oil Bulletin of July, 1919, "Potash of Searles Lake."

West End Company, of Reno, Nevada. Constructing a plant for the extraction of potash from the brines of Searles Lake.

SILVER.

In the year 1881, important discoveries of silver ore were made in the desert regions of San Bernardino County. The most important silver districts were at Calico, Ivanpah, Trojan, and Silver Reef districts. In 1919, due to the discovery of high grade silver in the Rand mining district, near Atolia, on the San Bernardino and Kern County line, a new silver district has been added to the above named. Mining in these districts was active during the eighties and early nineties, and at present writing with high market value of silver there has been increased activity in mining in some of these old districts. By far the largest production of silver in the county was derived from the Calico district.[1]

Alta Mine. It is situated 1¼ miles east of Riggs, a station on the Tonopah and Nevada Railroad, at an elevation of 1800 feet, on the northwest slope of the Shadow Range of mountains. Holdings consist of 11 claims. The ore occurs in irregular lenses along a series of parallel fault fissures which strike north and south, and also at intersections of east and west fissures with the main north and south fractures in the limestone. Ore occurs as native silver, galena and chlorobromides of silver. The main fissures are filled with a porphyritic material which is heavily stained with iron and manganese, and the high grade ore as a rule occurs with barite. Width of veins varies from 12″ to 4 feet. The north fissures dip 65 to 70 degrees west. Developments consist of crosscut tunnel 300 feet in length, driven at an elevation of 1800 feet, on the steep side of mountain above the camp. Most of the ore was taken out above this tunnel, through an intermediate tunnel 50 feet vertically above lower tunnel and driven 100 feet on the main fissure. About 50 feet above intermediate tunnel is an upper tunnel 75 feet in length on the vein, which has been stoped to the top of the mountain. It is reported that the production from the workings amounted to about $200,000 in silver. Four men are employed by Christopher Baker of Silver Lake, who has a lease on the mine. Owner, Mrs. Frank Riggs of 1801 Oxley street, South Pasadena, California.

Avawatz Crown Mine. Silver Lake district. Situated 8 miles east of Riggs, a station on Tonopah and Tidewater Railroad. The main ledge is a highly brecciated quartzite, having a total width of 210 feet, and exposed for a distance of several thousand feet. Shaft was sunk 325 feet deep and a crosscut driven from the 300 foot level, which cut the brecciated zone for a distance of 210 feet, and the entire zone was found to be mineralized with silver bearing galena. The richest portion of the ledge is next to the hanging wall, sample of which gave an assay result of 150 ozs. silver and 20% lead, with 5½% copper and 6% zinc. This entire width of breccia shows an average of 4 ozs. silver and 8½% lead. There is a wagon road from mine to railroad, a distance of 11

[1] In description of mines of Calico district have made free use of the report of Waldemar Lindgren's report on "The Silver Mines of Calico," Trans. Am. Inst, Min. Engrs., Vol. XV, p. 718.

miles. Owner, Avawatz Consolidated Mines Company; Alvin B. Carpenter, president; M. L. Neely, secretary; offices, Citizens National Bank Building, Los Angeles, California.

Bell Gilroy Mine. Trojan district. It is situated 22 miles northwest of Fenner, a station on the Santa Fe Railroad, on the eastern slope of the Providence Range of mountains. Elevation 4350 feet. Holdings consist of three claims. The country rock is carboniferous limestone, the ore deposit being argentiferous galena in a silicified limestone breccia near a contact with intrusive monzonite. The breccia occupies a shear zone 400′ to 600′ wide, the strike of this being north and south and a dip of 30 to 40 degrees towards the east, but the dip of the seams of ore varies greatly. The main ore bodies occur on intersection of north and south fissures with east and west fissures. The main fissures are 8 feet wide, and the ore is stated to have carried 20 ozs. silver, and 6 to 12% lead. A number of tunnels have been driven on the various fissures at different elevations, none of which is over 150 feet in length. Approximately there are about 500 tons of ore on the dumps which is reported to assay 10 ozs. silver and 6% lead. With systematic development the property could be made a producer. Idle. Owner, A. A. Irish, 514 Grosse Building, Los Angeles, California.

Bismark Mine. Calico district. It is situated 5 miles northwest of Yermo, on San Pedro and Salt Lake Railroad, on the divide between Bismark Cañon and a branch of Wall Street Cañon. Chlorides and chloro-bromides of silver occur in irregular fractures in mineralized zone along a fault fissure. This fault fissure can be traced one mile to south of workings. This fault, the course of which is N. 17° W., dip 30° W., separates a heavy mass of brown tufa on the west from a light, well stratified tufaceous sandstone. The ores of the Bismark are cerargyrite, and a little chrysocolla, occurring in a gangue of barites. There are no well defined walls, but only one striated dividing plane, along which the ore bodies lie. The later are found on both sides of the plane, although most frequently on the east in the sandstone, and are usually irregular with a width not exceeding 8 inches. Developments consist of shaft 100 feet deep, and series of open cuts and tunnels. Owner, J. R. Lane of Calico, California.

Bonanza King Mine. Trojan district. It is situated 25 miles east of Fenner, a station on the Santa Fe Railroad, on the eastern slope of the Providence Range of mountains. Elevation 4200 feet. Holdings consist of 12 claims. Irregular lenticular ore bodies in carboniferous limestone occurring along a series of parallel north and south fissures, these fractures or fissures are near the contact of limestone and monzonite, and run parallel to the contact. The ore occurs as lead carbonate, chloride of silver, and chloro-bromide of silver with small percentage of galena. There are three well defined fissures known as Ray, Hogan and Peat, along which most of the ore has been found. Ore bodies along these fissures have a width of 4 to 20 feet, with length of shoots from 50 to 200 feet. Ray and Hogan fissures are about 100 feet apart, while Hogan and Peat fissures are only 50 feet apart. All drifting has been to the south of the shaft, and the ore shoots have a general trend to the south. The fissures dip from 50 to 70 degrees to the west. Developments

consist of a vertical shaft 540 feet deep, with levels at 100′, 200′, 300′, 400′ and 500′; from the 500′ level a winze has been sunk on an incline to 800′ level.

All ore has been stoped out above the 200′ level to the surface. On the 600′ level a drift has been driven east 150 feet to contact of lime and monzonite. The proven ore zone on the property is 1000 feet in length by 400 feet wide.

It is stated that early day shipments averaged about 100 ozs. in silver. The property was purchased by present owners in 1914 and operated until June, 1920, when operations were suspended. On the property there is about 8000 tons of dump ore stated to carry 10 ozs. silver with 1% lead, and 5000 tons of tailings assaying 10 ozs. silver.

Mine equipment consists of 25-h.p. gas engine hoist, 14″ x 12″ Ingersoll-Rand compressor driven by 60-h.p. Fairbanks-Morse engine, 2-stage triplex pump driven by 15-h.p. motor. Mill 10″ x 20′ Blake crusher, 5′ x 4″ Allis-Chalmers ball mill, Dorr classifier, two 12′ K. and K. flotation machines, one 8′ K. and K. flotation machine, one Overstrom concentrator, 60-h.p. motor drives Ball mill, and Dorr classifier; 40-h.p. Western gas engine drives generator, rock breaker, flotation machines and concentrators. During 1919 a test run was made with mill on ore from mine and dumps; heads averaged 8 to 10 ozs. silver, making a saving of 75%, producing a concentrate assaying 35 ozs., treating 40 tons daily. Some rich shipping ore was produced from the property during this later operation said to have carried 100 to 500 ozs. silver. Owners, Hall, Rawitser and Company, Acton, Massachusetts; home office care William Rawitser, 10 High street, Boston, Massachusetts.

California Rand Silver Mine. Rand mining district. The mine is 1½ miles southeast of Randsburg, ½ mile from Osdick Siding, on the Kraemer-Johannesburg branch of the Santa Fe Railroad, in section 6, T. 30 S., R. 41 E. There are 12 claims in the group. Elevation 3600 feet. The ore occurs in an irregular fault fracture in a quartzite dike which has a general course of N. 45° E. The strike of the ore body being N. 20° E. with a dip of 75 degrees east. An incline shaft has been sunk on this fracture to a depth of 300 feet. At a depth of 90 feet passed through the oxide zone, and encountered primary sulphide ores, in the form of argentite, pyrargyrite, and stephanite, associated with stibnite.

The silver sulphides have evidently replaced the antimony sulphide (stibnite) as where there is a large proportion of stibnite in the rock, the ore is low grade. Width of ore body was from 12 to 16 feet, and shows a length of 100 feet, on 90 foot level. On 50 foot level drift north 50 feet and drift south 50 feet in ore. On this level at a point 10 feet north of shaft, crosscuts driven 60 feet into footwall schist, and 50 feet east into hanging wall schist. Levels have been driven on 50′, 90′, 150′, 200′ and 250′. First carload of ore was shipped from the property June 15, 1919, to Selby smelter, returns on which gave 0.24 ozs. gold, and 50 ozs. silver per ton. On November 14, 1919, $250,000 worth of ore had been shipped to smelter from a depth of 90 feet. The mine to date has produced about one million.

Equipment, 25-h.p. gasoline hoist, Ingersoll-Rand compressor. From 30 to 50 men are employed. Owner, California Rand Silver Mining

Company, John W. Kelly president; Edith F. Coons, secretary; Morris B. Parker, consulting engineer.

Carbonate Hill Group of Mines. Holcomb Valley district. These mines are situated 43 miles east of Victorville, in the San Bernardino Range of mountains. Elevation 7500 feet. Eight claims are located on what is known as Carbonate Hill, which lies east of Van Dusen Canyon. The formation of Carbonate Hill is limestone, with numerous intrusions of porphyritic rocks. Both the limestone and intrusions have an easterly and westerly strike, and a northerly dip, varying from 30 to 45 degrees. Most of the porphyry dikes on the hill seem to have been intrusions along the bedding planes of the limestone. The limestone has been thoroughly metamorphosed into marble. The porphyritic dikes are numerous, nowhere obtaining a very great width, along the contacts the limestone and these porphyry dikes are found lenses of lead carbonate ore with occasional bunches of galena. A number of shafts, none over 50′ deep, and short tunnels have been run on these contacts and some small lenses of ore developed. A crosscut tunnel 460 feet long was run from Van Dusen Cañon to intersect these ore shoots, but after striking one of the porphyry intrusions work was suspended before reaching the ore zone. Some of the veins on the surface showed a width of 3 feet. Samples taken from these outcrops reported to assay 20 ozs. silver with 12 to 20% lead. Idle. Owners, C. L. Metzger and R. H. Gilman, 1682 West Twentieth street, Los Angeles, California.

Garfield and Thunderer Mines. Calico district. They are situated 5 miles northwest of Yermo, a station on the Salt Lake Route, on ridge west of Odessa Cañon. The divide between Bismark and Odessa Cañons is mainly built up of massive violet brown liparite. In this liparite occurs a series of ore deposits, somewhat different from the Odessa and Silver King ore zones. The ore occurs in fractures and crushed zones of rock, usually cementing the fragments. These zones are connected with a distinct fault plane. The Garfield Mine is entirely in liparite connected with a fault plane running NW. and SE. Some ore was found along main fault, but the largest bodies lie on the south side of it. The whole forms a zone of numberless irregular fissures in the liparite. Silver ores occur mainly on these cracks, and the whole often appears as a breccia of liparite, cemented by the gangue and argentiferous minerals. The ore bodies are extremely irregular from mere seams to a width of 40 feet. The argentiferous minerals are as usual cerargyrite and imbolite. Besides these chrysocolla and barite always occur. The ore bodies are formed on both sides of fault plane.

Developments: At an elevation of 2800 feet, is lower Garfield tunnel 4000 feet long. At a higher elevation (approximately 100 feet vertically) is an upper tunnel 2500 feet in length. In lower Garfield large chambers are found on both sides of main fault, 200 feet long by 40 feet wide. In upper tunnel there is a chamber 300 feet long by 40 feet wide. Idle. J. R. Lane of Calico, California, owner.

Imperial Lode Mine. It is in Lava Beds district, 9 miles southwest of Lavic, a station on Santa Fe Railroad. The lode is exposed for a distance of 8000 feet, cropping boldly above the surface for entire distance. It strikes NE. and SW., and dips NE. The claims are the Desert Queen, Mammoth Chief, Meteor, Morning Star and Sampson.

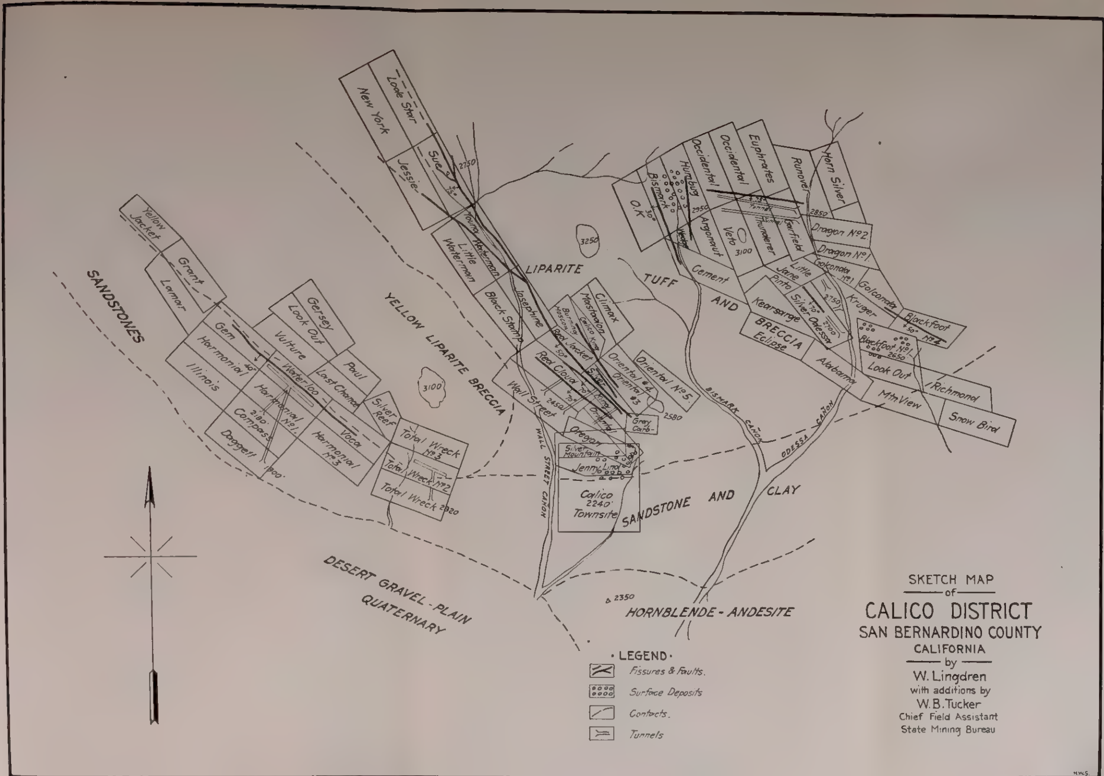


Plate VI. Sketch Map Calico District, San Bernardino County.

The Mammoth Chief, Meteor and Morning Star claims are extensively developed by tunnels, shafts, and open cuts. The ores occur as chloride, argentite accompanying pyrite, chalcopyrite and iron oxides. The silver sometimes occurs with copper glance in small bunches in solid masses of lead carbonate. Twelve men employed on development work. William Dickeman of Ludlow, California, manager.

Bibl.: Rept. XI, pp. 349-354.

Mohawk Mine. Ivanpah district. It is situated on west slope of Mohawk Hill, 24 miles north of Cima. Holdings consist of 8 claims. Elevation 4500 feet. Several veins of lead carbonate ore occur in limestone. The veins appear to be parallel to the bedding along contact of a gray lime and an older bluish limestone. Underlying the limestone is granite, forming the core of the mountain. Strike of main vein is S. 15° E., dip 30° westward. The ore is a sandy carbonate, often running up to 30% lead. No ore is shipped that runs under 16%. A tunnel is driven on this vein 100 feet. The ore body is stoped to surface. A winze was sunk 80 feet on the ore body, and at a depth of 40 feet connected to surface by drift. In the bottom of winze ore body exposed for widths of 7 feet. Value of ore shipped from these workings in 1917 was $70,000; croppings can be traced on the surface for 1500 feet. Company plans to drive a tunnel on vein from west end at a point about 200 feet below apex. This should open a large ore body. About 1500 feet west of these workings is a shaft 140 feet deep, and an adit connects with bottom of shaft. Tunnel driven N. 20° E. in an ore body of zinc carbonate (20% Zn) opened for 40 feet, showing a width of 20 feet. The zinc ore occurs on the footwall of the lead vein. Large amount of low grade ore is exposed on the dumps and in the old workings, as only the richer portions were shipped. Ore is hauled to Cima. Owner, Ivanpah Copper Company; Dan Murphy, president; G. Holteroff, secretary; offices, Los Angeles Trust and Savings Bank Building, Los Angeles, California.

Odessa Mine. Calico district. It is situated 3½ miles northwest of Yermo on Salt Lake Route, on slope of ridge west of Odessa Cañon. Elevation 2700 feet. Ore bodies are found in bunches, or pockets, varying from small deposits of nominal value to large ore chambers. Ore bodies occur on intersection of fissures running in all directions through the rock mass, the fissures intersect main fault fracture, and another system runs parallel to main fault plane. The main fault fracture strikes N. 40° W. and dips 50° SW. Chlorides and chlorobromides of silver with traces of copper in form of malachite and crysocolla are found along the seams and fractures in the rock mass. Main Odessa tunnel is 600 feet in length, driven on main fault fissure. Ore stoped out from tunnel level to surface. A number of winzes have been sunk from tunnel level to depths of 100 feet on vein. Two other tunnels have been driven at lower elevations, 150 to 200 feet in length. Owner, J. R. Lane of Calico, California.

Oriental Group of Mines. Calico district. It is situated at Calico, 3½ miles northwest of Yermo, station on Salt Lake Railroad, on southwest slope of King Mountain. Elevation 2500 feet. There are 12 claims in this group. The Oriental vein lies in the King fault system

and intersects the Silver King vein near the southeast corner of the Silver King claim. Ore occurs along a complex system of filled fault fracture, consisting of a series of irregular fissures and fractures running in all directions, and the crushed mass is mineralized with silver chloride with a barite gangue. These ore deposits have been developed by nine tunnels, all of which are crosscut tunnels to vein system with drifts north and south along fault fissure. The vein system strikes N. 40° W., and dips 70° south. Ore shoots are irregular, widths varying from 8 inches to 50 feet. The greatest vertical depth below outcrop is about 700 feet. The most recent developments have been on No. 9, or Wall Street tunnel, level. On this level crosscut driven 360 feet to vein, with drift 360 feet NW. and 720 feet SE. A winze



Photo No. 43. View of Oriental and Silver King Mines, Calico District, Calico, San Bernardino County, California.

has been sunk from the level 200 feet on an incline of 70 degrees, at 100 feet below the collar of winze a drift has been run NW. 300 feet, and SE. 350 feet on a narrow barite vein. At bottom of winze a drift was run NW. 50 feet and SE. 50 feet. During early part of 1919 seven cars of ore were shipped from these workings, which averaged 30 oz. silver per ton. Property is under lease to D. B. Gemmel, 1002 Hibernia Building, Los Angeles, California, who has installed a cyanide plant for treatment of mine fills. The ore is being drawn from stopes on No. 6 level, which are reported to run from 6 to 8 ozs. in silver. Ten men are employed. Owner, J. R. Lane of Calico, California.

Perseverence Mine. Trojan district. It is 22 miles northwest of Fenner, a station on the Santa Fe Railroad, in the Providence Range of mountains. Lies northeast of the Bonanza King mine. Holdings consist of 12 claims. The ore bodies occur as irregular lenses of chlorides and bromides of silver and argentiferous galena on contact of limestone and granite. These deposits vary in width from 2 to 10 feet. General strike of the ore zone is N. 45° E., and fissures dip 75° E. to vertical. Developments consist of shaft 162 feet deep with levels at 40′, 72′ and 160′, with 1350 feet of cross-cuts and drifts.

Equipment, 8-h.p. gasoline engine, 9″ x 8″ compressor driven by a 25-h.p. gas engine. Idle. Owner, Orange Mining and Milling Company, M. L. Eltistie, president; Gay Richards, secretary, Orange, California.

Silver King Mine. Calico district. It is situated at Calico, on the southwest slope of King Mountain, 3½ miles northwest of Yermo, a station on Salt Lake Railroad. Elevation 2600 feet. Claims: Silver King, Red Jacket, Josephine, Calico King, and Burning Moscow. Ore deposits occur on the King system of fault fractures. Complex fracture can be traced NW. and SE. through these claims. They are a divergent form of fractures. Towards the southern end of the system considerable faulting has followed the fracturing; and it is noted that King Hill with its bold, rocky face and step faults indicates a throw of 500 feet. Ores found along these fissures are all similar in character. A gangue of barite and jaspery silica encloses more or less regularly chlorides and chloro-bromides. Manganese minerals are common. The cerargyrite and embolite mostly occur as thin coatings in joints and cracks, but often embedded in the barite. At the northern end of the system the deposits occur as typical fissure veins with well-developed walls. The fissures occur in brownish liparite. Going southeast from the north end mines along the fissure, evidence of increased faulting and extensive crushing of the rock is encountered. The crushing evidently reached its maximum about the Red Cloud and Red Jacket mines. Here the liparite is in places completely disintegrated and brecciated; on innumerable cracks and fissures running in all directions barite and jasper are deposited; and although the main deposits are connected with the main fault planes, there are numerous smaller veins and pockets in the neighborhood. On the Silver King the dislocation has been large, resulting in step faults with successively smaller throw. The hanging wall of first fault is a liparite brecciated tufa. The other fissures are all in a fractured and brecciated liparite. The fissures crop boldly on King Hill, striking 35° to 65° W. of N., dip 70° S. The ore bodies follow the fissures, but there is no true fissure vein. The gangue of the ore is impregnated in crushed rock, mostly in hanging wall of the well-developed fault plane, and form irregular ore bodies 20 to 50 feet wide, again contracting to a narrow seam along footwall. On the sixth level the most southernly fault branches; the main fault runs through Red Jacket, while another continues through the Burning Moscow in northerly direction. Developments consist of shaft 500 feet deep on 70° incline, the mine is also opened by series of cross-cut tunnels from Oriental Mine, which intersect the King vein on the 4th, 6th, 7th, 8th and 9th levels. There has been about 6000 feet of drifts and cross-cuts on the vein system. Owner, Waterloo Mining Company, care Upham, Black, Russell and Richardson, Mills Building, Milwaukee, Wisconsin.

Silver Rule Mine. Resting Springs district. The mine is situated at an elevation of 4800 feet, on the southwest slope of Kingston Range of mountains, 17 miles east of Morrison's Siding on the Tonopah and Tidewater Railroad. Holdings consist of 5 claims. Carbonates of lead and zinc occur along a fissure in dolomitic limestone, which strikes

NW. and SE., dip 75° north. Width of ore being from 3 to 15 feet. The lead ore carries silver values. The lead and zinc ore bodies are distinct, being separated by a gouge. Ore is reported to carry 10 ozs. silver, 20 to 40% lead, and 7% zinc.

Developments consist of two tunnels, upper tunnel 220 feet in length, and at 75 feet vertically below is a lower tunnel 400 feet in length. The ore shoot developed on the upper tunnel was 25 feet in length and 6 feet wide, ore averaged 40% lead, 10 to 15 ozs. silver, with small amount of gold. Idle. John Chambers, Tecopa, California, owner.

Silver Lode and Black Water Mines. Resting Springs district. These mines are situated on the northeastern slope of Kingston Range of mountains, 17 miles west of Ripley, Nevada. Elevation 4600 feet. There are 4 claims in the Black Water group and 6 claims in the Silver Lode. Lead carbonate ore occurs as irregular lenses along contact of granite and limestone. Strike NW. and SE., dip 60° NE. Developments consist of a cross-cut tunnel 350 feet in length driven to cut the contact on the Silver Lode claim. About 2000 feet east of this tunnel, a shaft has been sunk on the Black Water claim to depth of 100 feet on a fracture in the limestone. The ore is a lead carbonate with occasional bunches of galena, stated to assay 12 ozs. silver and 20% lead. Six men employed. John Chambers of Tecopa, California, owner.

War Eagle Mine is 9 miles north of Bagdad, a station on the Santa Fe Railroad. Elevation of 1800 feet. Ore occurs along a fault fissure in porphyry, strikes east and west. Width of ore deposits from a mere seam to 30 feet. Ore occurs as chloride and sulphide of silver with galena.

Developments consist of shaft 700 feet deep, with over 7000 feet of drifts and crosscuts. Equipment consists of 35-h.p. gas engine hoist; twenty-five-ton concentration mill. Ten men are employed. Shipping concentrates. Owner, Southwestern Lead Company, I. W. Hellman Building, Los Angeles, California; D. L. Williams, general manager.

STONE INDUSTRY.

Granite occurs over considerable areas in San Bernardino, but is quarried only at Deeliz, Oro Grande and Victorville. For detailed description of deposits the reader is referred to the following publications: Bulletin No. 38, pp. 48 to 51; Report XV, pp. 896–898.

Russell-Greene-Foel Company, Pacific Electric Building, Los Angeles, California, are operating the Deelex quarry, 9 miles west of Colton. The stone is quarried for use as ballast, rubble and riprap.

STRONTIUM.

Beds of celestite (strontium sulphate) are stated to occur associated with colemanite layers at the borax mines of the Pacific Coast Borax Company at Calico. Large deposits of celestite occur in the lake beds containing salt and gypsum in the Avawatz Mountains, on the holdings of the Avawatz Salt & Gypsum Co., of Los Angeles, California. A

large deposit of celestite occurs 2 miles north of Argos Station, on the Santa Fe Railroad, and about 6 miles from Ludlow. Strontianite occurs in clay beds 10 miles north of Barstow.

Avawatz Mountains Celestite Deposits. Situated in Avawatz Mountains, 10 miles northwest of Silver Lake. The principal outcrops of celestite are near and west of what is known as the Jumbo salt outcrop. The celestite is exposed in the form of resistant "hog backs" in some places flanking the ridges, and in other places cutting through and continuing across the valleys between them. Thickness of the celestite zone is from 75 to 80 feet. The exposed reefs of celestite are dark brown in color, compact and crystalline. General strike of the beds follows the north edge of the Avawatz Mountains. (Quoted from W. C. Phalen's Report, U. S. G. S. Bull. 540, pp. 526-531.)

The deposits are of great extent, and a large tonnage can be developed. Owner, Avawatz Salt and Gypsum Company, Kerckhoff Building, Los Angeles, California.

Ludlow Celestite Deposits. It is situated 4 miles north of Argos Siding, on the Santa Fe Railroad. The beds of celestite are said to be 12 to 20 feet thick, and of great extent. Some ore was shipped from these deposits during 1918 by Ellis Mallery, H. W. Hellman Building, Los Angeles. Ownership in dispute; probably on railroad land.

TALC.

Amargosa Group of Talc Mines. These deposits are located 1¼ miles south of Acme, a station on the Tonopah and Tidewater Railroad, on a ridge west of Amargosa River, in Painted Cañon. Two claims have been located under the names of White Cap and Snow Drift. A vein of high grade talc 2 to 12 feet in width occurs on contact of limestone conglomerate and diorite. Strikes N. and S., dip 45° E. Talc is high grade, and white in color with low lime content. Developed by two tunnels; on lower tunnel vein drifted on 200 feet, in upper tunnel 150 feet. Fifty-five cars were shipped to Los Angeles in 1918. Idle. Owner, W. W. Hite, and Thomas Coghland of Tecopa, California.

Acme Talc Mine. It is situated 7 miles east of Acme Siding, on Tonopah and Tidewater Railroad, and 8 miles southwest of Tecopa, in low Desert Range of hills, east of Amargosa River. Deposits of pure white talc of good quality occur along contact of limestone and diorite. The outcrop can be traced for a length of six claims. The general strike of the ore deposits is N. 30° W., dip 45° E. The outcrop shows a width of 20 to 50 feet. On the south end of property, a tunnel has been driven northwest 400 feet in talc, about 200 feet vertically below outcrop on hill. Vein in these workings shows a width of 20 feet, and has been stoped to the surface. To the northwest of these workings about ¼ of a mile, a number of tunnels and open cuts have been made on the same vein, all of which produced a large amount of ore. A new deposit is being developed about one mile west, on a parallel vein. At this point an open cut has been made along the outcrop, a distance of 200 feet, which shows a width of 15 feet of talc. Talc hauled

to Acme station by 5-ton trucks, from which point it is shipped to the company's grinding plant at West Glendale. Here it is pulverized, producing three grades, and shipped to consumers in the east. The deposit is being worked under contract by George Morton. Shipping 40 tons per day from deposit. Owner, Pacific Minerals and Chemical Company; L. Lindsey, president; Hugh McPhee, secretary, West Glendale, California.

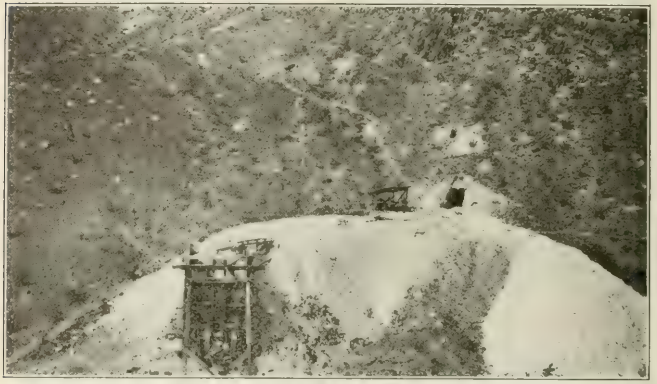


Photo No. 44. Acme Talc Mine. View of adit and outcrop of talc vein. Seven miles east of Acme, Inyo County. Pacific Minerals and Chemical Company, owner.

Gould Talc Deposit. It is situated in township 17 N., R. 10 E., 10 miles northeast of Silver Lake on the west slope of Shadow Mountains. Holdings consist of two claims. The deposit lies on and near the contact of limestone and diorite and can be traced for the full length of the claims. Fibrous and nonfibrous material, talc and tremolite strikes NW. and SE.; 5 to 8 feet in thickness, very white. These shafts have been sunk along the outcrop to depths of 30 to 40 feet. The deposit lies west of the Pacific Coast Talc Company's holdings. Owner, C. O. Gould, 615 East Main street, Stockton, California.

Sheep Creek Deposits. These deposits are situated 12 miles west of Riggs, a station on the Tonopah and Tidewater Railroad, and 20 miles northwest of Silver Lake, in the Avawatz Range of mountains. The talc deposits in this region occur on contact or very close to a dark basic igneous rock, probably a diorite and a belt of impure limestone. The talc is pure white to light gray in color, and varies in hardness from solid outcrops, which are moderately hard, and to very soft crumbly masses. The talc near the intrusive rock is usually the purest. Four deposits occur in this region, the three largest being on Sheep Creek, and the fourth is northeast of Jumbo salt deposit. The deposit at the mouth of Sheep Creek is in impure limestone zone about 125 feet in thickness. Most of the talc is found in the fifty feet next to the igneous intrusion, the best being at the contact. Of this 50 feet about

25 feet is talc of the soft and hard varieties. A cut near the top of cliff has penetrated the talc for 15 to 20 feet. About ⅔ of talc is soft white talc, the other ⅓ being hard gray talc. Outcrop can be traced for 1500 feet. Fibrous and nonfibrous material, talc and tremolite. Very white in color, and pure, strike is NW. and SE. A large tonnage can be developed on the different deposits.

It is estimated that approximately 400,000 tons can be mined from these deposits. Analysis, U. S. G. S.:

SiO_2 = 60.20%
MgO = 27.98%
CaO = 2.60%
Al_2O_3 = 1.25%
Fe_2O_3 = 2.50%
H_2O = 5.70%

Owner, Avawatz Salt and Gypsum Company, Kerckhoff Building, Los Angeles, California.

Talc Product Company Deposit. The deposit is situated 2¼ miles east of Love Siding, on the Tonopah and Tidewater Railroad, in Shadow Range of mountains. Talc deposit can be traced NW. and SE. It occurs on contact of limestone and diorite. The body has a thickness of 5 to 8 feet. It is a slippery foliated talc. Its derivation from tremolite schist suggests that the talc deposit will persist in depth.

Analysis, U. S. G. S.:

SiO_2 = 63.36%
MgO = 27.60%
CaO = 3.49%
Al_2O_3 = .46%
Fe_2O_3 = .09%
FeO = .30%
H_2O = 3.92%

The company has a grinding plant at 2480 Hunter street, Los Angeles, California. Owner, Talc Products Company; Harry M. Thompson, president; Everill C. More, secretary; W. H. Moody, manager, 752 Washington Building, Los Angeles, California.

Tremolite Mine (Pacific Coast Talc Company Deposit). It is situated 10 miles northeast of Silver Lake, and 7 miles southeast of Riggs Station, on the Tonopah and Tidewater Railroad, on the northwest slope of Shadow Mountains. Elevation 2300 feet. Five claims have been located, known as Tremolite No. 1 to No. 5. The talc is remarkable for its whiteness, mode of occurrence and origin. The deposit can be traced NW. and SE. for nearly a mile. It lies between limestone and diorite, although there is much granitic and aplitic intrusions, as well as mica schist and other metamorphic rock nearby. The body has a thickness of 5 to 10 feet, and is well banded, as it is stratified parallel to overlying limestone. Vein dips 55 degrees south. Shaft No. 1 has been sunk on an incline of 58 degrees to a depth of 120 feet on the vein, and drifts driven on the vein on two levels. About 2000 feet east of No. 1 shaft, No. 2 shaft has been sunk to depth of 40 feet, developing 5 feet pure white talc. There are two parallel veins, known as footwall and hanging wall veins, which are about 25 feet apart with a belt of hard tremolite between.

Analysis, U. S. G. S.:

SiO_2	=	60.88%
MgO	=	28.85%
CaO	=	4.28%
Al_2O_3	=	.36%
Fe_2O_3	=	.10%
FeO	=	.33%
H_2O	=	4.50%

Company has a grinding plant at 2149 Bay street, Los Angeles, California. Thirty-two tons are shipped daily from the property to Los Angeles. Ten men employed. John J. Rogers, superintendent. Owner, Pacific Coast Talc Company, George T. Walker, president; A. M. Algeo, secretary; R. W. Glending, vice president and general manager, 2149 Bay street, Los Angeles, California.

TUNGSTEN.

San Bernardino County was the largest producer of tungsten in the state, from 1906 until the early part of 1919, when the market price fell to $7 to $10 per unit, thus causing all the producing mines to suspend operations, and there is no mining activity at present writing in the tungsten bearing areas of the county.

The deposits at Atolia are the largest scheelite deposits known, while the Clark Mountain and New York Mountain districts in eastern San Bernardino wolframite and hubnerite are the principal ores with some scheelite. For detailed descriptions of these districts and the different mines see Report XV, pp. 830–849. Only those properties will be discussed that later developments of importance have occurred, and properties not reported on in previous reports.

Atolia Tungsten Mine. This has been the most productive mine in the county, and the company owns 97 claims in the Atolia district. The scheelite occurs in a series of parallel more or less overlapping veins in a zone of granite 2 miles long and about 2000 feet wide, striking about 10° south of west, dipping from 13° to 80° north. The individual veins are not continuous throughout the zone, but occur as shoots up to 1000 feet in length. The veins vary from mere seams up to 6 feet in width. Occasionally they open into larger bodies. The vein materials associated with the scheelite are quartz and calcite. The deepest working is No. 1 shaft. This is a two compartment shaft sunk to a depth of 1000 feet on the vein (incline on 69° to 450 feet, then flattens to 39 degrees to the 1000 foot level). At 950 feet the shaft goes into the footwall, and a short crosscut to cut the vein. Mine practically stoped out above the 800′ level. Between 900′ and 1000′ levels two large blocks of ore have been developed, one east of shaft 200 feet long and 4 feet wide, other west of shaft 200 feet in length and 5 feet in width. East of shaft the vein is intersected by a series of north and south cross veins on breaks; at a number of places the vein has been faulted. On the 900′ level the vein is drifted on about 1000 feet. Ore treated in 100-ton concentration mill, said to have averaged 6 to 7% WO_3. Concentrates average 60% WO_3. Phosphorus content averages .12% and must be reduced to .04%. Sulphur content must not be over 1%. To reduce the phosphorus content, portion of concentrates are treated in vat with

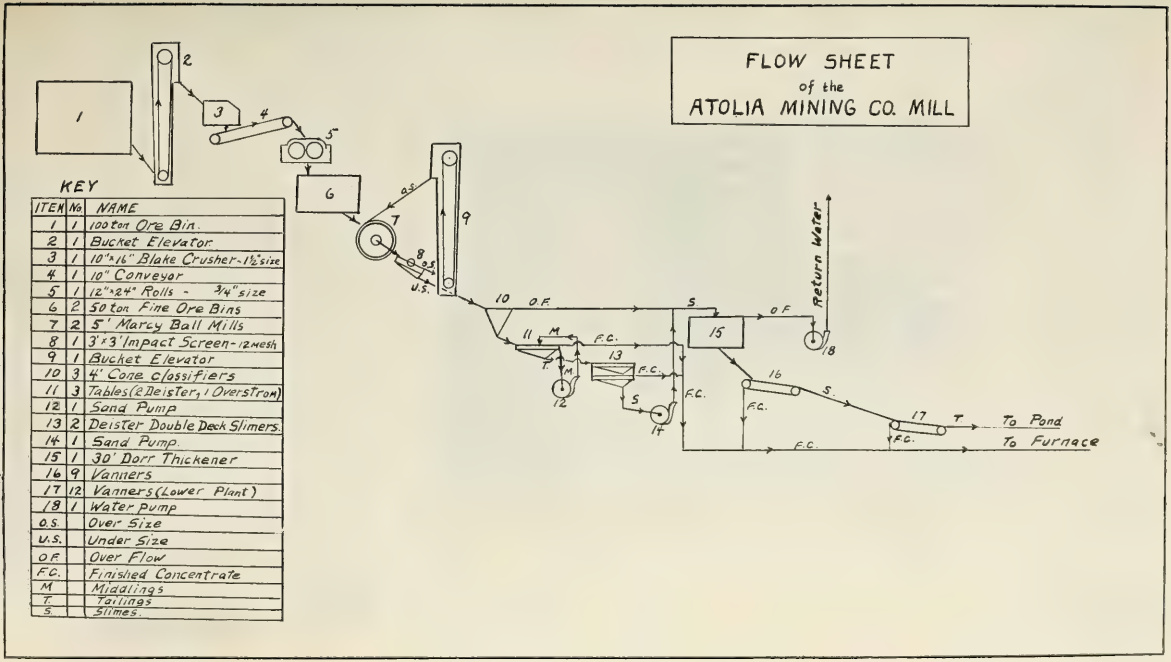


Plate VII. Flow Sheet, Atolia Mining Company's Mill.

solution of H_2SO_4 and H. Cl. Steam heated to 97° C. Liquid decanted and four washings of water applied. Then the concentrates are dried and introduced to reverberatory furnace to get rid of sulphur content. This being reduced to 0.16% S. Capacity of furnace 10 to 12 tons per 24 hrs. Owner, Atolia Mining Company; E. C. Voorheis, president; E. A. Stint, secretary, Humboldt Bank Building, San Francisco.



Photo No. 45. No. 1 Shaft, Atolia Mining Company, Atolia, San Bernardino County.

Black Hawk Tungsten Mine. This mine is situated in the Atolia district, 1 mile east of town of Atolia. The holdings consist of 5 claims, known as the Halloran and Leonard group, one of which, a patented claim, is the only break in the continuity of the main group of the Atolia Mining Company's claim. The scheelite veins on these claims are parallel and overlap each other, and are not continuous for any considerable distance. The veins vary from mere seams up to 3 feet in width. The scheelite is associated with quartz and calcite. Veins strike 10 degrees south of west and the dip varies from 20 degrees to 80 degrees north. Veins occur in the granite. Developments consist of three shafts. Main working shaft was sunk to a vertical depth of 500 feet, with idea of cutting the different parallel veins that were productive both east and west on the Atolia Mining Company's claim.

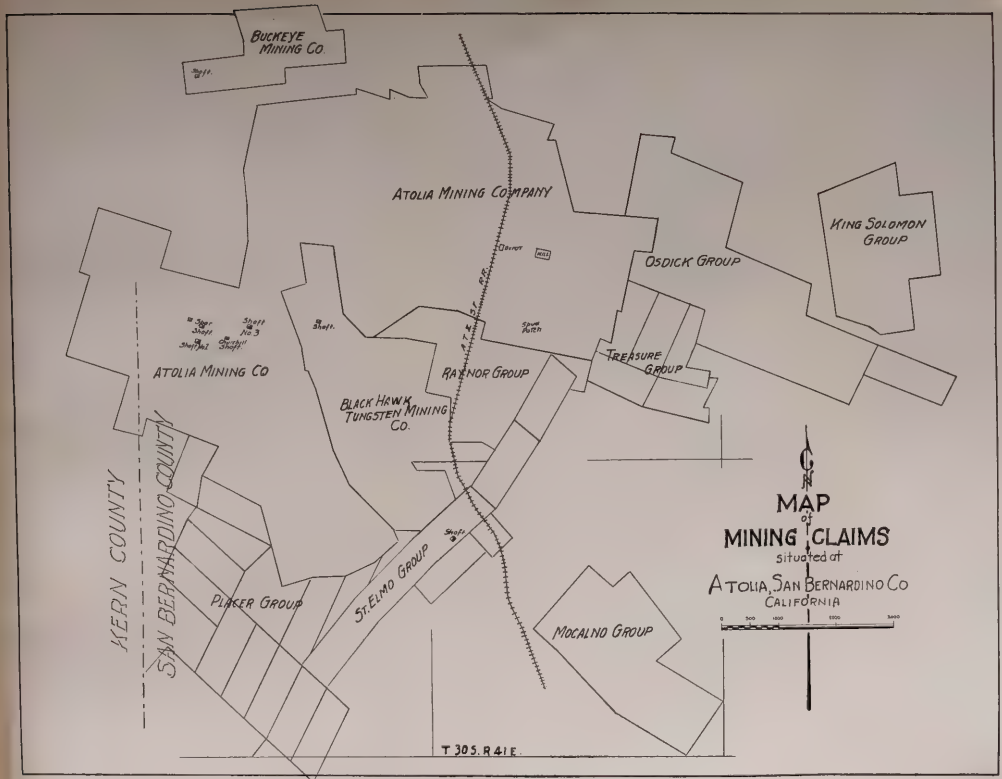


Plate IX. Map of Mining Claims, Atolia, San Bernardino County.

Drifts were run on the 100′, 200′, 300′, 400′ and 500′ levels east and west on the different veins and seams, but no large shoots of ore were developed. A large amount of crosscutting was also done to the south without developing any ore. On the 500′ level a crosscut was run 500 feet south, which developed a small shoot of ore near the face. To



Photo No. 46. Eighty-Ton Mill, Atolia Mining Company, Atolia, San Bernardino County.

the south of this shaft two inclines were sunk to depth of 100′ and 160′. Some ore was shipped from these workings. Owner, Black Hawk Tungsten Mines Corporation, M. L. Conroy, president, 527 Front street, San Pedro, California.

Buckeye Tungsten Mine. It is situated 1½ miles southeast of Atolia, and to the north of the Black Hawk mine. Elevation 3400 feet. Three claims. Three parallel veins cut the granite, striking 10 degrees north of west, and dip northward. The three veins are about 50 feet apart, and vary in width from 2″ to 2 feet. The gangue is quartz and calcite. The vein matter carries scheelite, which appears to be disseminated throughout the quartz. The largest vein, the middle one, has been opened by trenches and cuts at intervals of 3000 feet along its strike. The deepest workings on it are two 50-foot shafts. Owner, Buckeye Tungsten Company, C. C. Ray, president, W. M. Keeling, secretary, Atolia, California.

Mojave Annex Tungsten Mines. It is situated on the north slope of the New York Mountains, 2 miles southeast of Brant, a station on the Salt Lake Railroad. Holdings consist of two claims in Cliff Cañon and a group of seven claims in the Clark Mountains. All work, however, has been confined to the Cliff Cañon claims. Wolframite is deposited in quartz stringers, varying from 1″ to 12″ in a pegmatite dike. The dike is 40 to 50 feet wide, dips almost vertically. The quartz stringers lie parallel to the dike. Between the wolframite bearing stringers shoots of quartz containing galena, ruby silver and some copper are encountered. Development work consists of a tunnel driven 100 feet along dike. The wolframite occurs in small crystals, and occasional irregular bunches. A 20-ton mill was built to concentrate the wolframite. Consists of Force feed jaw crusher, which reduces the ore to ½″ size,

then from bins ore goes to Davis rolls, and reduced to 10 mesh size. Then to Stebbins dry concentrator. Idle. Owner, Mojave Annex Tungsten Company, Joseph B. Evans, president; H. G. Parsons, secretary, 752 South Main street, Los Angeles, California.

United Tungsten Copper Mines. These mines are situated in the Morongo district on the eastern flank of the San Bernardino Range of mountains, 50 miles southeast of Victorville. Elevation 6800 feet. Thirty unpatented claims are held by the company. Minute crystals of scheelite occur in contact metamorphic veins between granite and limestone, often replacing the lime. The ore bodies are very irregular both in character and content, varying from well defined veins of a few feet in width to pockets of irregular and uncertain size. Scheelite is deposited in minute crystals in a soft epidote gangue. In the gangue are also calcite quartz and garnets. In this gangue is also found the carbonate of bismuth, bismutosphaerite. Developments consist of one main working tunnel 200 feet long, and several shorter ones, also two shafts on the vein of depths of 50 and 80 feet. Owing to the irregular character of the deposits, it does not appear that any amount of ore will be developed on the property. Idle. Owner, United Tungsten Copper Mines Corporation, 30 Broad street, New York City.

VANADIUM.

Vanadium ores are found in the Signal district, 8 miles north of Goffs at the properties of Lombard and Main, and at the Louisiana California Mine. The ore occurs here in gold quartz veins, and has been identified by Shaller as cuprodescloizite. The associated lead minerals are cerussite, and vanadinite. The occurrence is also noted 4 miles northeast of Klienfelter, a station on the Santa Fe Railroad on the Vanadium King Claims, owned by A. L. Moorhead, and W. F. Chausse of Goffs. It is reported the ore will assay 3% K_2O_5. The ore is a vanadinite and pyromorphite. The occurrence is also reported in the Twenty-nine Palms district, in the gold bearing quartz vein of Gold Park Consolidated Mines Company.

Bibl.: XV Report, pp. 849-852.

SAN DIEGO COUNTY.

There has been very little mining activity in San Diego County since Report XV of the State Mineralogist was issued.

The principal mineral production of the county has been entirely confined to commercial minerals. The mineral output for the year 1919 being valued at only $343,230.

San Diego County contains valuable deposits of clay, copper, feldspar, gems, gold, lithia, marble, nickel and silica.

CLAY.

In the bluffs of Rose Cañon, about 10 miles north of San Diego, are extensive exposures of Eocene Tertiary clay or shale, which is suitable for the manufacture of common brick and tile.

The two brick plants operating in Rose Cañon being, Sunnyside Brick Company, W. A. Russ, owner; Thirtieth and Grape streets, San Diego, California.

Bibl.: Rept. No. 7, "Clay Industry of California."

Union Brick and Tile Company, J. W. Rice, secretary, 2166 Park avenue, San Diego, California.

Bibl.: Rept. No. 7, "Clay Industry of California."

Only a small amount of high grade clay is being produced at present in San Diego County, although there are a number of deposits of plastic and refactory clays in the neighborhood of Encinitas and Cardiff that are worthy of investigation.

On the **Kiellar Ranch** east of Cardiff, a station on the Santa Fe Railroad, a deposit of red mottled clay is being developed by the St. Luis Fire Brick Company, and shipments are being made from the deposit to the company's plant in Los Angeles, California.

Southern California Clay Products Company of Los Angeles are shipping clay from their deposit, 7 miles east of Encinitas.

Bibl.: Cal. State Min. Bur. Rept. No. 7, p. 93, "Clay Industry of California."

American Encaustic Tile Company of Los Angeles are working a deposit of feldspathic rock on McGinnes Mountain near Dehesa, and making occasional shipments to the company's plant in Los Angeles, California.

Bibl.: Cal. State Min. Bur. Rept. No. 7, p. 93, "Clay Industry of California."

Dinero Ranch Clay Deposit. It is situated 3 miles southeast of Otay, and 5 miles east of Nestor, a station on San Diego and Arizona Railroad, in sections 26, 29, T. 18 S., R. 1 and 2 W.

The deposit occurs as a massive clay-like variety of kaolin, containing a great amount of combined water. It is locally called otaylite, and it is probably halloysite, hydrous silicate of alumina. The material is

quite soft, is white, gray and red, and has a soapy feel. It appears to form a nearly horizontal bed, varying from 1 foot to 6 feet in thickness, a few feet below the surface of Otay Mesa, and underlying several hundred acres, outcrops of the material are noted at several points in the bluffs of the Otay River Valley. The material when exposed to the air disintegrates. One half a mile up the cañon from John Mosto's ranch, a large open cut 50 feet high by 200 feet long shows 6 feet of halloysite with 8 to 12 feet of soil overburden. The deposit is being worked under lease by the General Petroleum Company, and a large tonnage shipped to the company's refinery for use as a purifier of oils.

Owner, John Mosto, of Otay.

Otaylite Products Company, of 2026 Barranca street, Los Angeles, D. A. Hamburger, president, F. H. McCullough, secretary, were working a deposit of the same material to the south on the Jamul ranch. The beds are from 1 to 6 feet thick. Some of the material was shipped to the company's grinding plant in Los Angeles. The ground material is used for a cleaning compound, also softening of water, and as paint-filler.

COPPER.

Copper deposits are found at several points within the county, but to date no large deposits of commercial value have been developed.

The principal districts where copper ores occur are in the hills between Escondido and Encinitas.

For detailed description of deposits see Bulletin No. 50, pp. 344 to 345; Rept. XIV, pp. 665-669.

FELDSPAR AND SILICA.

There are a large number of deposits of feldspar associated with silica in the granite area of San Diego, most of which are some distance from railway transportation.

Owing to the increased demand for feldspar by the manufacturers of enamel wares and pottery, there should be an increased production of this material from the county.

William Stell of El Cajon owns a large deposit of feldspar and silica, on ridge south of Cottonwood Creek, near Marina Dam, about 5 miles north of Campo, a station on the San Diego Railroad. Here a bold outcrop of silica and feldspar, 100 feet wide, can be traced for over 1600 feet. Said to be over 100,000 tons of feldspar and silica that can be easily mined. Both feldspar and silica are of good quality and free from impurities.

M. A. Turner, of 928 Eighth street, San Diego, owns a deposit 5 miles west of Alpine, which is said to outcrop at a number of points within a distance of one mile along its general strike. In places it is about 25 feet wide. The principal outcrops are in section 35, T. 15 S., R. 1 E., S. B. B. and M. Quality of spar reported of high-grade material, with high potash content.

GEMS.

The gem industry of this county has at times attained considerable prominence, but production has been small for several years past, due to lack of demand. **Pala Chief Mining Company,** operating Pala Chief mine, being the only producer, and this being worked only at intervals, for the local market requirements. The Pala Chief mine is noted for the gem stone kunzite found in the pegmatite dikes on the property, also produces tourmalline and quartz crystals. Owner, Frank L. Salmons of San Diego, California.

For complete description of the gem minerals of San Diego County, see Report XIV, pp. 691-708; also California State Mining Bureau Bulletin No. 37.

GOLD.

The principal gold belt of the county lies in ranges 2, 3, 4 and 5 east, extends southward through a distance of 45 miles from the Rice or Montezuma district, east of Warner's, to the Mexican boundary. The principal mineralized area is near Julian and Banner. In the Cuyamaca Grant are several prospects, and the Stonewall mine, which has been a productive mine in the past. At Deer Park, Pine Valley and Descanso are a number of gold mining claims, as well as west of the Cuyamaca Grant on Boulder Creek. There is very little activity in gold mining in the county, but some prospecting development is going on in the Banner and Julian districts.

For detailed descriptions of mines and districts see Report XIV, pp. 646-665.

Apex Mine, near Julian, being developed by Schindler and N. B. Roff of Julian. Under lease from R. M. Melrose, of Julian, California. Development consists of cross-cut tunnel 300 feet to vein, with drift on vein for 50 feet. This mine was formerly known as the Empire, including the following claims: Homestake, and North Star.

Bibl.: Repts. XII, p. 243; XIII, pp. 342-345.

Golden Chariot Mine. Being reopened by R. D. McCulloch of Julian, California. Five-stamp mill on property.

Bibl.: Repts. VI, p. 86; IX, p. 147; XIII, p. 337.

North Hubbard Mine. It is $\frac{1}{4}$ mile southwest of Banner. Veins strike NW. and SE., cutting mica schist, width 12″ to $1\frac{1}{2}$ feet. Tunnel 500 feet in length and about 500 feet of drifts. Equipment, mill, 6″ x 10″ Dodge crusher, 5 stamps, one Standard concentrator. Six men employed. Owners, Frank Talbot, and Mark Brokenshine of San Diego, California; T. Lyon, superintendent.

Bibl.: Repts. VI, Pt. I, p. 87; XI, p. 380; XII, p. 241; XIII, p. 341.

Owens Mine. Situated in the Julian district, in section 31, T. 12 S., R. 4 E., S. B. B. and M. Three veins in mica schist from 3 to 6 feet wide. Strike N. 70° W., dip NE. Shaft 350 feet deep. Ten-stamp

mill. Three men employed. Property being reopened by H. A. Williams of Julian, owner.

Bibl.: Repts. VI, pp. 85-87; VIII, p. 519; IX, p. 144; X, p. 541; XII, p. 242; XIII, p. 343.

GRAPHITE.

Liebuck Graphite Mine. It is situated in Mason Valley, 3 miles east of Oriflamme Creek, about 2 miles east of Mason. Elevation 2600 feet. The deposit is a band of graphitic schist with a maximum width of 80 feet, which is traceable for about 400 feet. At the south end of its exposure the schist strikes about N. 85° W. Farther northwest the strike shifts to N. 60° W. Average dip is 65 degrees NE. Graphite flakes are less than 0.2 millimeter, stated to carry 11.9% graphite. Owners, Frank Stevens of Julian, T. L. Works of San Diego.

Seyer Graphite Mine. It is 4 miles east of Mason, in section 34, T. 13 S., R. 5 E. Deposit occurs as two graphite bands of schist 4 to 12 feet wide. Most of the graphite forms minute flakes, a small fraction of a millimeter across a fine-grained schist, but scattered through the schist are rounded nodules of graphite as large as a pea. The graphite schist, according to reports, showed 16.2% graphite. Owner, W. B. Seyer of Julian, California.

LIMESTONE AND MARBLE.

In San Diego County crystalline limestone occurs at many points, in areas of metamorphic rocks, but owing to lack of transportation in the regions where it occurs, there has been very little development work done on these deposits.

Bibl.: Rept. XIV, pp. 673-674.

LITHIA MINERALS.

American Lithia and Chemical Company, 206 Broadway, New York City; Wm. N. Crane, president; Theo Ludlum, secretary. This company owns a large deposit of lepidolite near Pala, estimated tonnage being from 500,000 to 1,000,000 tons. Has been shipping ten cars per month of lepidolite to Wheeling, West Virginia, for use in the manufacture of glass. The ore is hauled from Pala to Oceanside, a station on the Santa Fe Railroad, a distance of 25 miles. Ten men are employed.

For description of the lepidolite deposits of San Diego County see Report XIV, pp. 706-708.

MINERAL PAINT.

See Report XV, pp. 689-690.

MINERAL SPRINGS.

There are a large number of mineral springs in the county, some of them having a high reputation as curative agents.

For a description of the principal springs, see Report XIV, pp. 717-722.

MOLYBDENUM.

Molybdenite has been found at several points in San Diego County. It occurs disseminated in flakes and small masses in a micaless granite or aplite, which appears to be dikes in the surrounding biotite granite. The principal deposits are situated 7 miles northwest of Ramona, also the occurrence is noted at several points between Campo and Julian. During 1916-1917 there was much activity shown in development of these deposits on account of the increased market value of the metal caused by the European war.

At present writing none of the deposits are being worked.

Aiken Molybdenum Deposit. The deposit is on ridge west of Campo, in section 9, T. 18 S., R. 5 E. Elevation 2650 feet. Molybdenite occurs disseminated in flakes and small masses in aplite dike, which strikes N. 30° W. This dike in the biotite granite is about 25 to 50 feet wide, and can be traced for a distance of ½ mile. The occurrence of molybdenite is small and very sparsely scattered through the aplite dike. The ore was first discovered in the railroad cut west of Campo. Owner, Edward T. Aiken of Campo, California.

Bour Molybdenum Deposit. This is the most important deposit in the county, and upon which the most development work has been done. The deposit is 6 miles west of Ramona, in section 3, T. 13 S., R. 1 W., on the south edge of San Pasqual Valley.

Molybdenite occurs in flakes and small masses in a micaless granite or aplite, which appears to be a dike in the surrounding biotite granite. The prospect work has been confined to the surface along the dike, and at several different points with open cuts. The molybdenum minerals occur in a zone 30 feet in width. Two well-defined shoots of ore have been developed by open cuts about 100 feet in length and 15 feet deep on the crest of the hill. At an elevation of 1350 feet, a crosscut tunnel is being driven SW. 240 feet to cut the dike at a depth of 200 feet below outcrop. The ore milled from the large open cut on top of hill gave an average of ½ to 1% molybdenum sulphide. The dike trends northwest, and has been traced 1500 feet southward from the brink of the gorge of the Santa Maria Creek, on whose south wall it is exposed. Its width varies from 30 to about 200 feet. The molybdenite is very unevenly distributed through the rock. The greater part of the dike is barren or nearly so, but the mineral is conspicuous in the open cuts lying between the road and the top of the hill to the south. The molybdenite is clearly an original constituent of the aplite to which it is confined. Its occurrence in the coarser parts of the rocks indicates that the coarse crystallization were both due to local concentration in the magma of the more mobile constituents. The dike as so far proven is for the most part barren, and its tenor as a whole cannot exceed a small fraction of 1%. A 25-ton mill was installed on the property, and one ton of concentrates were produced in 1917, which carried 60% MoS_3. Milling operations were unsuccessful, and work was suspended the latter part of 1917. Owner, Mrs. E. M. Bour, 118 Harrison avenue, San Diego, California.

Harvey Ranch Deposit. It is situated in section 19, T. 15 S., R. 2 E., 11 miles east of Lakeside. Small specks of molybdenite occur in an aplite dike through a zone of 130 feet in width. Dike strikes N. 20° W. The greater part of the dike is barren, or nearly so, and the molybdenite was very much scattered through the dike in small flakes. T. J. Harvey of Lakeside, California, owner.

Judson Ranch Deposit. It is situated 5 miles west of Ramona, in sections 1 and 12, T. 13 S., R. 1 W., and is one mile northwest of the Bour mine. The deposit occurs in an aplite dike in the surrounding biotite granite, striking east and west, with a dip south. The dike has a width of 50 to 100 feet. At an elevation of 1900 feet an open cut has been made on the footwall side of the dike. The open cut is 100 feet long by 15 feet wide, with a depth of 10 feet, showing molybdenite sparsely disseminated through the dike in small masses or flakes. At certain points in the dike the molybdenite occurs associated with iron pyrites. Besides this open cut, the prospect work has exposed the rock at several points and the molybdenite occurs in a zone 20 feet or more in width. As at the Bour mine, the molybdenum is very unevenly distributed, the greater part of the rock being barren. The aplite dike can be traced from the gorge at the edge of San Pasqual Valley for a distance of one mile on the property. Owner, Andrew B. Judson of San Pasqual Valley.

Mayer's Ranch Deposit. A deposit of molybdenite occurs on the north side of Cottonwood Creek, 4 miles southeast of Dulzura. Undeveloped.

Sutherland Ranch Molybdenite Deposit. The deposit is about 7 miles from Ramona on the Julian Road. Molybdenite occurs in quartz veins from 1″ to 5″ wide. Owner, R. L. Case, Escondido, California.

Woolsey Molybdenite Deposit. It is 8 miles southwest of Ramona and ½ mile southeast of Sandy Dell Ranch, on highway to San Diego. Deposit consists of 40 acres of molybdenum-bearing ground. Northeast of the road where the highway cuts across the property, there is a showing of molybdenite in biotite granite. A series of open cuts have been made at different points north of the road, in the biotite granite, all of which show molybdenite in flakes and masses distributed through the granite. There is no well-defined aplite dike on the property, but in places the biotite granite is altered to aplite. Owner, Miss Ida Woolsey, San Diego, California.

NICKEL.

Friday Mine. It is situated 4 miles south of Julian, in SW. ¼ of SW. ¼ of section 15, T. 13 S., R. 4 E.

On the surface the outcrop of the vein is an iron gossan consisting chiefly of limonite striking east and west, with a width of 25 to 50 feet, which iron cropping can be traced ½ mile west to Gibson property on section 16. In the upper workings of the Friday mine copper sulphide and carbonates with small amounts of nickel were exposed. The ore body has been developed by a vertical shaft which is in the gossan for 60 feet. The shaft is vertical for a depth of 130 feet. From this depth

the shaft has been sunk on an incline of 70 degrees for a distance of 45 feet. At 130 feet from collar, a drift has been driven east 108 feet. At a point 40 feet east of shaft the drift encountered the ore body, from which point the drift is in ore for a distance of 60 feet to where the ore body is cut off by a slip.

The ore body does not appear to be sharply defined, except where there is an indication that it is faulted. It lies near the contact of gabbro and schist, and in places is enclosed in gabbro. The ore body developed is 60 feet long and 20 feet wide. On the 175-foot level drift has been driven east in the schist 108 feet, at which point a crosscut was driven north, cutting a small lens of ore. The 175-foot level follows a zone of fissuring in the schist, and has failed to develop the ore body encountered on the 130-foot level. Ore consists mainly of pyrrhotite, but contains pyrite, and an iron nickel sulphide, and is accompanied by small quantities of amphibole and calcite.

Analysis of ore made by Dearborn Chemical Company, Chicago, Illinois:

Silica Si O_2	4.80%
Iron Fe	38.65%
Nickel-Ni	4.34%
Cobalt Co	2.37%
Arsenic As	5.95%
Sulphur S.	35.49%
Copper Cu	Trace

Assays of picked ore have carried as high as 22% nickle. Property idle. Owner, Friday Copper Mining Company, Frank Brown, president; Becker Stern, secretary; American National Bank Building, San Diego, California.

Bibl: Report XIV, pp. 666-667. U. S. G. S. Bull. 640 D.

PETROLEUM.

Petroleum of commercial interest has not yet been discovered in this county, although a number of wells have been drilled, and are being drilled, and the operators of these seem quite hopeful of success. In several wells small amounts of gas have been encountered and occasional layers of sandy material with small indications of oil, but nowhere has oil been encountered in measurable quantity. It is of interest to note that the middle miocene beds which are the chief reservoirs of oil in San Joaquin Valley and in Orange County, have not been identified in the county, and the deepest wells in the latter have passed through all the Tertiary beds and the cretaceous strata, and have penetrated a black shale, sometimes calcareous, which is probably of the Jurassic age. It is evident, therefore, that if oil be found, it must occur in beds of different geologic horizon from those constituting the commercial oil reservoirs to the northward.[1] The chief encouragement to drill for oil in western San Diego County is stated to be the frequent occurrence on the beaches of masses of asphaltic residue or brea.

During the year 1920 there has been a renewal of interest of the development of oil in San Diego County, and large number of com-

[1] Ralph Arnold. Bulletin Am. Inst. Min. Eng., March, 1914, pp. 406-11.

panies have been organized to drill for oil. Oil development at present writing consists of 5 wells being drilled by various companies, and as yet no oil indications have been encountered.

The following information relative to the different wells drilled is taken from the reports of the Department of Petroleum and Gas of the California State Mining Bureau:

Well No. "Balboa" 1. Balboa Oil Company, situated in lot 1105, T. 16 S., R. 3 W. Depth of well 5625 feet. Results being no oil or gas encountered. Well abandoned.

Community Oil Well No. 1. Community Oil Company, 377 Spreckels Building, San Diego, California. This well was known as Scott well and was abandoned 4 years ago, the present company taking over the well with the idea of drilling to a greater depth. Well located in section 9, T. 19 S., R. 2 W. Depth 1860 feet. Reported that oil sands were encountered. Well abandoned by company, and casing found in bad shape.

Community Oil Well No. 2. Community Oil Company, 377 Spreckels Building, San Diego, California. Well situated in section 4, T. 19 S., R. 2 W. A test hole was put down by the company to depth of 119 feet with Shattuck rig. Then the well was mudded up and abandoned.

Community Well No. 4. Community Oil Company, 377 Spreckels Building, San Diego, California. Well situated at Moreno, T. 16 S., R. 3 W. This well was drilled to a depth of 2112 feet, and struck substantial flow of water, and was considered by the company as a water well and abandoned.

La Costa Well, formerly known as Clark well, at La Costa Station, in section 26, T. 12 S., R. 4 W. Well being deepened by the La Costa Oil Company. Office 336 E street, San Diego, Cal. Original depth of well was 2330 feet, present depth 2190 feet. Reported a small showing of oil and gas. It is proposed to drill well to depth of 3000 feet.

Linda Vista Well, Linda Vista Oil Company, San Diego, California. Well situated in section 22, T. 15 S., R. 3 W. Depth 1095 feet. No oil or gas encountered. Propose to drill to depth of 3000 feet.

Ocean Side Oil and Gas Company is drilling a well in section 24, T. 11 S., R. 5 W. near Oceanside. Depth of well is 1450 feet. No oil or gas showing at present depth.

Otay Oil Company well is located T. 18 S., R. 1 W., near Otay. Depth of well reported to be 3500 feet deep. No oil or gas was encountered.

Tecolate Dome Oil Company, 331 Spreckels Building, San Diego. Are drilling well No. 1 in lot 1272, T. 16 S., R. 3 W. Depth of well 1050 feet. No indications of gas or oil reported at this depth.

Bibl.: Report XIV, pp. 708-710.

STONE INDUSTRY.

Granite occurs in this county in great variety and abundance, and is of fine quality for building and monumental material.

Simpson-Pirnie Granite Company, San Diego, are operating their quarry near Santee Station on the San Diego and Arizona Railroad.

The Simpson-Pirnie Granite Company's Quarry 1½ miles west of Foster, has been recently taken over by the Raymond Granite Company, who propose to operate the quarry on a large scale.

For complete detailed description on granite deposits see Report XIV, pages 671-676.

CRUSHED STONE AND SAND.

Independent Stone Company, 713 American National Bank Building, G. L. Parker, president; L. J. Rice, secretary, operating stone quarry at Spring Valley.

San Diego Stone Company, 643 Spreckels Building, E. A. Hornbeck, president; C. Kalbough, secretary, operating quarry at Sweetwater Dam.

Fenton-Sumption and Barnes Company, 168 Tenth street. Company produces gravel and sand from Otay Valley and Tia Juana Valley.

GRINDING MILL PEBBLES.

At several points along the ocean shore from Encinitas south to near San Diego, there are beaches of washed pebbles varying from 1 inch to six inches in diameter, which came from conglomerate beds made up of well rounded water-worn pebbles of various granitic and porphyritic rocks with some felsite and flint. The wave action has broken down portions of the cliffs for considerable distances and formed beaches of pebbles which are well washed and cleaned of softer materials. The rock sorted out for shipment are mainly basalt and diabase with an occasional felsite and flint pebble. J. T. Momand of Carlsbad is at present writing the only shipper of pebbles, which are collected on the beaches and hauled to Carlsbad, a station on the Santa Fe, where loaded in gondola cars for shipment.

SALT.

There is no source of salt in San Diego County, except the water of the Pacific Ocean, from which it has been extracted at various points on the coast by solar evaporation. At the present time there are but two plants in operation in the county, both of them near San Diego. They are operated by the Western Salt Company, and J. P. Duncan's Sons.

The **Western Salt Company's plant** is situated in the south end of San Diego Bay, near Fairchild on the San Diego and Arizona Railroad. Present production 12,000 tons year. For full description see Report XIV, pages 713-716.

The **Chollas Valley Salt Company,** controlled by J. P. Duncan, 1420 National avenue, San Diego, has a small plant. Its production amounts to 600 tons yearly.

Bibl.: Rept. XIV, p. 716.

SAN LUIS OBISPO COUNTY.

Since the Fifteenth Report of the State Mineralogist was published the only activity in mining has been in the production of the following minerals: Chromite, manganese, petroleum, quicksilver and sodium sulphate.

In the years 1917 and 1918, there was a great activity in the development and mining of chromite, manganese and quicksilver ores throughout the county, and the mineral wealth of the county was considerably increased during these years, but with the decline in metal prices following the signing of the armistice between the Allied Powers and Germany, practically all the mines were forced to suspend operations. A small amount of chromite and manganese is being mined in the neighborhood of San Luis Obispo to supply the local demand on the Pacific Coast.

When mining of chromite was active a number of concentration plants were installed on the different properties to treat the low grade ores; these plants are now idle. For detailed description of the different chromite and manganese mines see State Mining Bureau Bulletin No. 76, "Manganese and Chromium."

MINERAL RESOURCES.

Among San Luis Obispo County's mineral resources both developed and undeveloped are: Asphalt, bituminous rock, brick, chromite, coal, copper, gypsum, infusorial earth, iron, limestone, marble, mineral water, onyx, petroleum, quicksilver and miscellaneous stone.

Bibl.: Rept. XV, pp. 674-726.

BITUMINOUS SANDSTONE.

Sands of the Pismo and Santa Margarita formations which have been saturated with and cemented together by natural asphalt are of widespread occurrence in San Luis Obispo County. The deposits have been most extensively developed near Edna, a station on the Southern Pacific Railroad about 6 miles south of San Luis Obispo.

Bibl.: Rept. XV, pp 677-679.

The **Consolidated Bituminous Rock Company,** Nevada Bank Building, San Francisco, operated their quarry, one mile southwest of Edna, at irregular intervals during the year. Three to five men are employed.

PETROLEUM.

The only productive oil field in San Luis Obispo County is what is known as the Arroyo Grande field. This field, which includes Arroyo Grande, Edna, and Huasna districts is located south and southeast of San Luis Obispo. They include the area south of San Luis Valley drained by the San Luis Obispo and Pismo Creeks together with the drainage basins of the Arroyo Grande Creek and Huasna River. San Luis Obispo County produced in 1919 a total of 31,656 bbls., valued at $32,922.

The geology of the various oil districts and the present oil development throughout the county are described in detail in "Summary of Operations California Oil Fields of the Sixth Annual Report of the State Oil and Gas Supervisor, issued by California State Mining Bureau." Also in Bulletin 69, "The Petroleum Industry of California," so that no further description will be given here.

Bibl.: Bulletins 11, 19, 32, 63, 69; Annual Reports of State Oil and Gas Supervisor I, II, III, IV, V, VI.

QUICKSILVER.

The only activity in mining of quicksilver ores is at the following properties:

Klau Mine, 16 miles west of Paso Robles, California. The mine was reopened in the early part of 1920 by Carson Quicksilver Mining Company, G. B. Street, president; C. Underwood, secretary; offices.

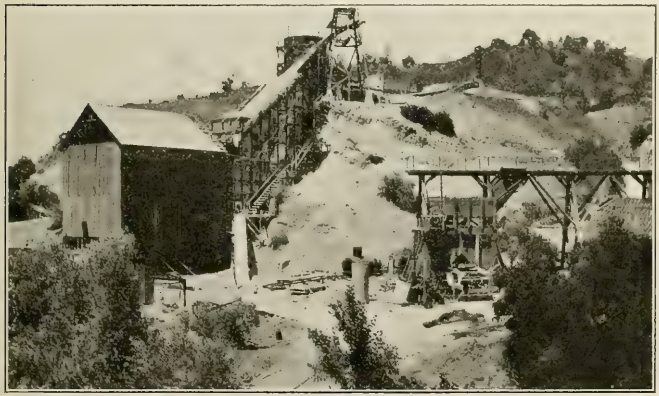


Photo No. 47. View of Fifty-Ton Scott Furnace, Klau Mine. Carson Quicksilver Mining Company, Klau, San Luis Obispo County.

Wilmington, Delaware; Ellard Carson, general manager. A new 50-ton Scott furnace has been installed, and was placed in operation on September 1. Thirty-five men are employed.

Bibl: State Mining Bureau Bulletin No. 78, pages 135-138, "Quicksilver Resources of California."

Oceanic Mine, 5 miles east of Cambria, Murray Innes, owner, 217 Kohl Building, San Francisco; Ellard W. Carson, manager, Cambria. Operating one 50-ton Scott furnace, producing 100 flasks of quicksilver per month. Fifty men employed. For detailed description see State Mining Bureau Bulletin No. 78, pages 140-141, "Quicksilver Resources of California."

Rinconada Quicksilver Mine, situated 11 miles east of Santa Margarita, operated by Rinconada Mercury Corporation, George Hathaway, president, Chas. R. Hamilton, secretary; A. H. Simpson, superintendent; offices at Margarita, California. The company is installing a 75-ton rotary furnace on the property. Twenty men employed. For detailed description of mine, see Bulletin No. 78, pages 147-148, "Quicksilver Resources of California."

SODIUM SULPHATE.

Soda Lake lies in Carrizo Plain, T. 31 S., R. 20 and 21 E. It contains 3000 acres, practically all of which have been located by the Consolidated Chemical Company, which has 23 claims. The lake receives the drainage of the Carrizo Plain. The salts leached out by the rain water have formed a layer, usually very thin, but in places filling deeper channels. Under this crust is a mud layer containing considerable of the salines in solution. The deposit is principally sodium sulphate, but crystals of blödite, the hydrous sulphate of magnesium and sodium, are associated with it.

Due to the increased demand at present for natural sodium sulphate, the deposit is being extensively developed by the Consolidated Chemical Company of Lompoc, California. The company has a plant at Soda Lake for evaporating the saline water and recovering the solid salt. Capacity, 600 tons per month. The deposit can be easily mined, although the long haul of 28 miles to McKittrick, the nearest shipping point, makes the marketing of the product by the company a difficult problem. The amount of salines available have been estimated at over one million tons.

Bibl: Rept. VIII, p. 532; X, p. 563; XV, p. 127. Bull. 24, p. 136. U. S. G. S. Bull. 280, p. 369; Bull. 540, p. 428.

SANTA BARBARA COUNTY.

Santa Barbara County owes its principal mineral output to the presence of productive oil fields within its boundaries. Outside of oil development there has been very little activity in mining and development of other minerals contained in the county during the past year.

Therefore only brief mention will be made of the properties that were producers since the Fifteenth Report of the State Mineralogist was issued. The reader is referred to this report for detailed description of the different mineral deposits.

MINERAL RESOURCES.

Santa Barbara contains asphalt, chromite, diatomaceous earth, gilsonite, gypsum, limestone, magnesite, mineral water, natural gas, petroleum, potash, quicksilver and miscellaneous stone.

Bibl: Rept. XV, pp. 727-750.

ASPHALT AND BITUMINOUS ROCK.

There are many deposits of asphalt and bituminous rock in the county, only one of which is worked. The **Higgins Mine**, owned by Higgins Estate, is one mile southeast of Carpinteria Station, between the railroad and the sea. Beds of bituminous sandstone occur on the property, widths varying from 12′ to 20′ underlying the shales that trend towards the sea. A small production was made from the mine during the past year, for use on the roads in the county. Property is worked under lease.

Bibl: Rept. XV, pp. 730-734.

BRICK.

The **Coleman Brick and Lime Company,** Santa Barbara, W. T. Coleman, owner, operated their brick kilns during the past year. capacity of kilns being 40,000 bricks daily. Sixteen men are employed

Bibl: Bull. 38, p. 257, Rept. XV, p. 735.

CHROMITE.

Since the Fifteenth Report was issued a number of deposits of chromite were developed, one of which shipped some ore in the latter part of 1918.

La Laguna Ranch Chrome Deposit. It is situated 12 miles northeast of Los Olivos in the San Rafael Mountains, on ridge between Figueroa and Coralles creeks. Lenses of chromite occur in a belt of serpentine on the southeast slope of the ridge. Chromite occurs in massive boulders, and a large amount of float is scattered along the ridge and in the different gulches. Burns and O'Donnell of San Francisco opened up and developed these deposits under lease, and also discovered some deposits of greater extent on adjoining government land in township 8 N., R. 30 W. Owner, La Laguna Ranch Company,

W. H. Bradley, secretary, 320 Chamber of Commerce Building, Pasadena, California.

Los Olivos Chromite Deposit. A deposit of chromite occurs 16 miles east of Los Olivos, in the San Rafael Mountain Range, ¼ mile north of Happy Cañon and Acachuma wagon road. The chromite occurs in small lenses in a wide belt of serpentine which strikes northwest and southeast. Owner, P. B. Montanaro of Los Olivos, California.

DIATOMACEOUS EARTH.

Celite Products Company, formerly the **Keiselguhr Company of America,** home office 11 Broadway, New York City; local office 1135 Van Nuys Building, Los Angeles, California; A. H. Krieger, general manager. The company owns valuable and extensive deposits of infusorial earth, 2 miles southeast of Lompoc. The company has been a larger shipper of this material during the past two years. The capacity of the plant has been increased, and a kiln installed for the manufacture of celite brick. The deposit occurs in extensive beds of soft, white earth in a very pure state, varying from thinly bedded to massive, forming a capping over the hills, overlying brown siliceous shales, conformable with them, striking east and west, and dipping 30 degrees south. The material is quarried in open cuts. It is taken up in large blocks, air dried at the quarry. It is then hauled by trucks to the plant at Lompoc, where it is ground to powder and transferred to different warehouses by a pneumatic system. When blocks of the material are required, the material is transported in its natural state direct from the quarry, sawed into required sizes and dried before shipment. The waste material too fine to be dried is utilized in making brick, tile and other refractory materials. One hundred men are employed.

Bibl.: Bull. 38, pp. 293-296. Rept. XV, pp. 737-738.

Salispuedes Ranch Deposit, owned by the Hollister Estate, Santa Barbara. The deposit is over 100 feet thick and very extensive, capping low hills south of the Santa Ynez River, and 3 miles southeast of Lompoc. Property under lease and bond to the Diatomite Products Company, A. E. Cohen, president, who propose to develop and operate the property on a large scale.

Bibl.: Bull. 38, p. 296, Rept. XV, p. 738.

LIMESTONE.

Union Sugar Company, Betteravia, operates a limestone quarry, 6 miles southwest of Lompoc, on the north side of San Miguelito Cañon. The limestone occurs in a massive ledge varying in width from 15′ to 35′. Operated continuously. Product shipped to the company's sugar plant at Betteravia. Twelve men are employed.

Bibl.: Rept. XV, pp. 739–741.

PETROLEUM.

The production of petroleum for Santa Barbara County for the year 1919 was 6,089,082 bbls., valued at $6,850,217, while the production of natural gas amounted to 4,084,709 M. cu. ft., valued at $336,092. The

producing oil districts of the county are: Santa Maria, Lompoc, and Summerland fields. A detailed description of these fields is contained in Bulletin 69, "The Petroleum Industry of California," also recent information on oil field development in the county is contained in the Annual Reports I, II, III, IV, V, VI of the State Oil and Gas Supervisor, issued by the State Mining Bureau. Therefore no further description will be entered into here.

Bibl.: Repts. VII, p. 89; XII, p. 537; XIII, p. 582 Bulls. 11, 19, 32, 63, 69.

QUICKSILVER.

Acachuma Mine. It is situated in section 2, T. 7 N., R. 29 W., 12 miles east of Los Olivos at the head of the Acachuma Creek. Developments consist of several tunnels totaling 2000 feet. Has been worked during the past year by C. Wood of Los Olivos, owner.

Bibl.: Bull. 27, p. 196. Rept. XV, p. 746.

Los Prietos Mines are 8 miles in an air line directly north of Santa Barbara, in that portion of the Santa Ynez Mountains north of the river. This group of mines, known as the Snow and McAvoy-Millburn mines, was purchased in 1918 by F. M. Townsend and associates of 912 Higgins Building, Los Angeles. A large amount of development has been done on the two properties since Report XV was issued, and some experimental work done on the ores extracted with the idea of installing a rotary furnace at the Snow mine. There is a 12-pipe retort on the property. C. L. Millburn of Los Angeles, superintendent.

VENTURA COUNTY.

Ventura County was the tenth county in the state in respect to the value of its mineral production for 1919, the exact figure being $3,017,074, practically all of which was due to the output of petroleum and natural gas, the remainder being made up of clay, clay products and miscellaneous stone.

Among its other mineral resources are: Asphalt, borax, gypsum, mineral water, phosphates, sandstone and miscellaneous stone.

Since Report XV was issued there has been practically no developments of other mineral resources of the county.

For detailed descriptions of the mineral deposits of the county, see Report XV, pp. 751-769.

Brief mention will be here made in regard to petroleum:

Ventura County increased its production of oil, for the year 1919, to 1,685,073 bbls., valued at $2,755,094, the output of natural gas being 1,038,574 M. cu. ft., valued at $252,240. The highest gravity of petroleum produced in the state is found in the county.

The producing oil fields of Ventura County are confined to the Santa Clara Valley and the hills north of the Simi Valley. The principal oil fields are Newhall, Ventura-Ojai and Santa Paula-Sespe.

As the petroleum industry in this county is described in detail in Bulletin No. 69: "The Petroleum Industry of California" and also in the Annual Reports of the State Oil and Gas Supervisor, issued by the California State Mining Bureau, no detailed description will be entered into here.

Bibl.: Repts. VII, p. 101; VIII, p. 684; XII, p. 357; XIII, p. 585. Bulls. 11, 19, 32, 63 and 69. Annual Reports of State Oil and Gas Supervisor, 1, 2, 3, 4, 5 and 6.

AUBURN FIELD DIVISION.

Part I.

By C. A. Logan.

INTRODUCTORY.

The counties of Plumas, Sierra, Nevada, Butte, Yuba, Placer, El Dorado, Amador, Alpine, Calaveras and Tuolumne are included in the Auburn or Central California Field Division.

The district (with the exception of Alpine County) slopes westward from the summits of the Sierra Nevada to the valley floor, which has an elevation of 30 feet above sea level at Sacramento. Going eastward from Sacramento on the overland route of the Southern Pacific Railroad, the upward grade is encountered first at Rocklin, and continues steadily till the summit is crossed at an elevation of 7018 feet, and 104 miles east of Sacramento. The pass through which the Western Pacific Railway enters the state is much lower, following as it does the course of Feather River, but a profile elsewhere across the district from west to east shows the same upward grade, culminating in passes from 6300 to 9600 feet in elevation, through which scenic highways lead into Nevada. Eight such main automobile roads cross the mountains and these are all heavily travelled in summer. The westward slope is traversed by numerous rivers which drain into the main trunk streams, the Sacramento and San Joaquin rivers. The tributaries have carved deep cañons, in many places 3000 feet below the old peneplain surface, and have had the effect of cutting the country into roughly defined blocks or "divides". The roughest and steepest grades occur where the roads cross from one divide to another. As the rivers approach the valley floor they break from their cañons, and, at the height of the rainy season, have in past years often caused floods in the valley farming districts, a condition partially remedied by flood control measures.

Fruit and grain raising are principal industries of the valley and adjacent foothills and deciduous fruit especially reaches its highest development in the decomposed granodiorite soil of the Placer County foothills wherever water for irrigation is available. The fruit belt ends at about 2500 feet elevation.

Besides being the principal gold placer and gold quartz mining district of the state, production of the following minerals and metals has been made on a commercial scale: Asbestos (chrysotile and amphibole), barite, brick-clay, building stones, coal (lignite), chromite, copper, fire-clay, glass sand, granite, iridium, iron, limestone, manganese, marble, mineral pigments, mineral water, osmiridium, platinum, pyrite, quartz, quartz crystals, silver, slate, soapstone, and tungsten. Most of these are now being produced and deposits of the others will no doubt ultimately be utilized again. There are also undeveloped prospects of lead, magnesite and molybdenum.

The dredgers, now the chief producers of placer gold here, are located on the lower courses of nearly all the rivers from the places where they leave their rocky cañons downstream as far as working is profitable. Hydraulic and drift mines formerly highly productive, contribute comparatively little now to production. Quartz mines, found in every county, may be grouped into several rather well defined belts of which the Mother Lode, East Belt, and Grass Valley and Nevada City districts are best known.

ROADS AND TRANSPORTATION FACILITIES.

Transportation is generally adequate and comparatively cheap, due to paved highways, good dirt roads and branch line railroads. The mines of Tuolumne County have railroad connection over the Sierra Railway of California, which meets the Southern Pacific at Oakdale and extends to Jamestown, Angels Camp, Sonora and Tuolumne. A good highway extends from Stockton to Sonora and good roads branching from it and radiating from Sonora, reach the Mother Lode mines and the districts around Soulsbyville, Confidence, Tuolumne, Columbia and others.

From Sonora a road goes past Tuttletown, Melones and Angels Camp. The latter district has a branch railroad and also an outlet by graded highway through San Andreas to a branch of the Southern Pacific at Valley Spring; the highway continues to Lodi, connecting with the state highway to Stockton and Sacramento. A good road runs from San Andreas to the adjoining county seat of Jackson, most important of the Mother Lode towns. Jackson has railroad and wagon road connection with Ione, where the Amador Central Railroad meets the Southern Pacific Company's branch from Galt. A good macadamized road extends north from Jackson along the Mother Lode through Sutter Creek, Amador City, Drytown and Plymouth. From Plymouth one may drive north along the Lode to Nashville, Placerville (on a Southern Pacific branch line) and may drive the entire length of Eldorado County, meeting a main line railroad at Auburn, or he may drive west to Sacramento. As the climate is mild at these low altitudes, most of these roads are traveled the year round.

Roads from Auburn and Colfax extend to all the mines of the Forest Hill and Iowa Hill divides and to the higher mountain country beyond Westville. Above 3000 feet elevation the roads are not as a rule passable for automobiles between the middle of November and the middle of April.

The state highway from Sacramento, paved as far as Auburn, is partly graded from Auburn to Grass Valley and is paved from Grass Valley to Nevada City. This road is used by automobiles the year round. From Nevada City to Washington there is a dirt road 18 miles long, open for automobiles from May to November. Similar dirt roads run from Nevada City to North Bloomfield, 15 miles, and Graniteville, 31 miles; to North Columbia, 15 miles; Alleghany, 32 miles, and Forest City, 36 miles. Branch roads and trails from these places reach the mines.

There are two routes from Nevada City to Downieville—one via Alleghany, the other and better via North San Juan and Camptonville, 46 miles. Part of the latter passing Indian Valley is graded highway. From Downieville the road follows Yuba River to Sierra City, then turns north to climb the mountains, passing the summit at Gold Lake and reaching the Western Pacific Railway at Blairsden. The trip up the Yuba Cañon and over the summit is equaled by few in scenic beauty.

Quincy and the Plumas County mines may be reached during the dry season by automobile from Marysville via La Porte, a distance of about 100 miles, or 65 miles drive from Oroville. The first road gives access to the famous old drift and hydraulic mines at La Porte, Port Wine,

Table Rock, Scales, Gibsonville, and Little Grass Valley, all in easy driving distance of La Porte. The second passes through Bucks Ranch, from which place the mines on and adjacent to the Middle Fork of Feather River may be reached. The copper mines near Indian Valley may be reached by machine from Quincy, or from any of the towns in Indian Valley. This district has also the Indian Valley Railroad, which connects with the Western Pacific Railway at Paxton and runs to Engels.

The hydraulic and drift mines of Butte County, most of which are idle, and the Oroville and adjacent dredging fields, now nearly worked out, are reached from Chico and Oroville. Likewise, roads to the mining districts of Yuba County radiate from Marysville.

Alpine County, consisting entirely of an elevated mountain region, is reached from the west via Auburn and Truckee or via Placerville to Meyers Station near Lake Tahoe, thence over the summit and down the West Carson Cañon; or through Jackson and Kirkwoods; or through Angels Camp, Calaveras Big Trees, and Hermit Valley (8900 feet elevation at summit), thence down the East Carson River to Markleeville. This county has a very small permanent population.

POWER AND WATER SUPPLY.

The mines and dredgers of the district are operated by hydro-electric power, except in the case of small isolated properties and prospects, which use steam or water. The Great Western Power Company utilizes the water of the Feather River watershed, and the Pacific Gas and Electric Company that of rivers to the south, including the Yuba, Bear and American. Lake Almanor and Lake Spaulding are immense storage reservoirs, which regulate the flow to the power houses during the summer. The streams of the district still possess enormous undeveloped power possibilities and new developments are constantly going on. This latent and inexhaustible resource is one of the state's chief assets. Electricity should eventually displace at a lower price all other forms of power, light and heat in central California.

The water supply in the region fluctuates seriously because of the division of the year into wet and dry seasons. The need of water for irrigation has outstripped the development of storage facilities, so that in dry seasons following winters of light snowfall in the higher mountains, a shortage of water for irrigation, placer mining, and electric power generation arises. Disputes follow both as to priority of right to the running water, and the right to the use of the electric power generated from it. The miner feels, and justly so, that his business is as important and essential to public welfare as any, and rightly resents an "apportionment" of power which permits nonessential uses of electricity in cities, while stamp mills, hoisting works and dredgers are permitted to work only part time. The mining industry suffers in this particular as in others, because of a lack of voting strength and solidarity. Local conditions and lack of capital to build ditches and reservoirs result in a short productive season for many of the hydraulic and drift mines. In the higher mountains many mines can wash gravel only during the spring thaw.

CLIMATE.

The climate below an elevation of 3000 feet is ideal for mining. Snow seldom occurs, and does not lie long on the ground, below the 2500-ft. contour. The mines of the Mother Lode, the dredging fields, the foothill copper belt (except Plumas County) and many others are in a belt where spring begins in February. The temperature in summer goes rarely to 110 degrees Fahrenheit in the lower foothills in the middle of the day, but the almost total absence of moisture in the air makes this temperature safe and prostrations from heat are practically unknown. The winter temperature in this foothill region seldom goes below 25 degrees and practically never below 14 degrees, which low point may be reached once in the winter.

The mountains from 4000 feet elevation upward may be snow-covered from about November 15 to April 15. From May to November the climate in the mountains is ideal, with days of unbroken sunshine and dry air, and cool nights. The western slope of the mountains has the same long dry season as the valley, but on the east or Nevada side of the summit there are occasional summer thunderstorms.

LABOR.

In the placer mines native American labor is used, but in the large quartz mines there is a great variety of races, and some of these have taken hold so firmly as to give certain camps a well-marked individuality, where the few American miners, if any are hardy enough to remain, seem almost foreigners. During the good times when mining on the Mother Lode was active, it was no uncommon thing to find underground crews of 200 to 250 men in which only 5 or 6 were American-born. With the decadence of mining in recent years, the population of the mountain districts is falling off rapidly.

OUTFITTING AND SUPPLY POINTS.

Each county seat is usually a district center and supply point. This is the natural outgrowth of early conditions. In every case the county seat was in the beginning one of the first and most important of the mining camps. All miners' trails led that way, and when trails became roads the county seat was found to be the center of the system. There is usually the place to gather preliminary information, and there one must go to search records.

Besides well stocked general merchandise and hardware stores found in all the county seats, many of the mining towns have foundries. At Grass Valley the Taylor Foundry and Engineering Company makes general mining machinery; at Nevada City the Miners Foundry; at Angels Camp (Altaville) the Angels Iron Works; at Sutter Creek, the Knight Company. All have been established for years, and many of the largest stamp mill installations and hoists in California have been made by them. At Marysville, the Yuba Construction Company makes all kinds of gold dredging machinery, and also tractors, and their products go to all parts of the world.

Part II.

Auburn District: By Counties.

ALPINE COUNTY.

The mineral industry of this county has been quiet for a good many years. The county at an early date was a notable producer of gold, silver and copper, mining having begun in the early sixties. This county lies entirely along the summits and east slope of the Sierra Nevada Mountains and the easiest way to reach the district is through Reno, thence over the Virginia and Truckee Railroad to Minden, and from there by auto stage to Markleeville. Four good dirt roads make the automobile trip in summer from the California side a pleasant and interesting one. (See under roads and transportation facilities.)

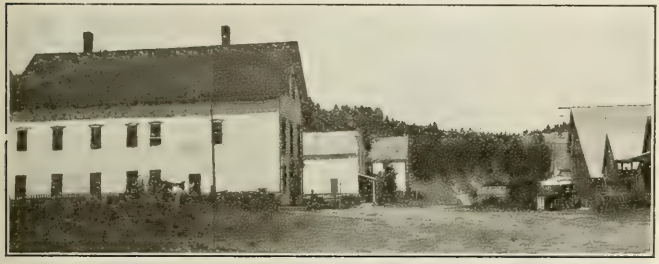


Photo No. 48. View of Markleeville, county seat of Alpine County. Photo by C. A. Logan.

Markleeville, the county seat, is practically the only town in the county and has a permanent population of probably about 150. It lies at an elevation of 5500 feet, in a district possessing great natural attractions for campers, and having mineral resources that have been only partially prospected and developed.

The known mines are all situated above 6000 feet. The region is isolated, and because of the character of the ores is not calculated to attract the average prospector. Geologically, the country differs entirely from the western slope of the mountains.

The following mining districts have received some notice in past publications: Monitor, Mogul, Silver Mountain, Silver King, Blue Lakes-Hope Valley joint district. Very little has been done in any of these districts except the first two, in the last thirty years. There is at present some prospecting during the summer in the Monitor, Mogul and Hope Valley districts on the old mines, and newer finds have been made near the state line below Woodfords and in the Wolf Creek district. The writer visited the county in August, 1920, and gathered information on the properties mentioned below, which are the only ones showing any recent activity.

The geology of the Mogul and Monitor districts is described by Eakle[1], who emphasizes the immense scale on which the volcanic rocks

[1] A. S. Eakle, Ph.D., Mines and Mineral Resources of Alpine County, California. State Mining Bureau, 1916.

of the region have been mineralized. The andesites have been altered and silicified by ascending hot solutions carrying the minerals forming the ores. The resulting mineral deposits are zones of rich, narrow stringers and impregnations of immense bodies of lower grade without definite walls.

Silver ore was first found at Silver Mountain in 1861 and ore was discovered at the Morning Star mine in 1863. Work began on the Advance mine at Monitor in 1863, and at the Tarsus, later called the Colorado No. 2, probably the same year. According to Peter Curtz, the first reduction plant in the county was a 10-stamp mill built in 1863 at Markleeville by Paul Pioda for custom work. This mill crushed about 1000 tons of ore from the I. X. L. mine in the Silver Mountain district



Photo No. 49. Monitor, Alpine County. All that is left of a camp that had over 2000 inhabitants in the '60's and '70's. Photo by C. A. Logan.

in 1864, and Mr. Curtz, who worked in the mill, states that this ore assayed $250 a ton of which about $125 a ton, or 50%, was recovered. The charge for milling was $30 a ton. Gold ores were also worked in this mill from the Boulder Hill and Washington mines.

The difficulty of treating the ores successfully has been a great setback to the mines in the county. Such was the history of Silver Mountain, the Exchequer and I. X. L., Globe, Advance and for a time the Colorado No. 2. Transportation to the railroad in the old days was also slow and very expensive.

There is ample water available in the forks of Carson River and in their perennial tributaries for generating electric power. The absence of good timber in the region near the river is striking. It was stated in 1868 that 5,000,000 feet of saw logs and 6000 cords of wood were being floated down the Carson River each year for the use of the Comstock mines in Nevada.

GOLD AND SILVER.

Advance Group adjoins the Colorado No. 2 and is below it on the slope of Colorado Hill near the old town of Monitor, which has disappeared except for two old hotel buildings. This group, consisting of seven locations, comprises the unpatented claims formerly held by the Hercules Consolidated Mining and Milling Company, which still retains the Colorado No. 2 and other patented ground.

The Advance (now **North Advance**) is opened by a tunnel driven north into Colorado Hill from near the level of Monitor Creek. At the face, the tunnel is 700 feet below the outcrop. At a distance of 660 feet from the portal the tunnel is forked, the right branch entering the patented ground of the Colorado No. 2, where it connects by winze with the upper workings of that property. The west branch continues N. 15° W.; 100 feet to the Du Boise stope, which is in the Advance ground. About 1912, Du Boise had a lease and option on the Hercules Consolidated holdings which then included the Advance and Colorado No. 2. During his one year's tenure, he opened the Du Boise stope and is said locally to have taken out several thousand dollars of ore, shipping the high grade and running the Colorado mill 3 or 4 months on low grade ore. This ore occurred in a bunch which opened out suddenly from a narrow stringer lead, which is associated with pink and black manganese minerals. Two of the owners were putting up a raise on a stringer of ore just off the Du Boise stope when visited. The ore stringers of complex sulphides run from $\frac{1}{4}''$ to $1''$ wide, at times mixed with the manganese minerals and at times in the soft clayey seam filling of the altered rock. This stringer had been followed up 40 feet in the hope it might open into a chamber of ore. A small shipment made this summer is reported by the owners to have yielded 100 oz. silver and $20 gold a ton.

On this level there are probably 2500 feet of drifts and crosscuts, most of them in low grade ore, and there are several old stopes above the level. At the portal of the tunnel there is a caved shaft said to be 300 feet deep. This shaft was put down in the sixties or seventies and is supposed to have been in good ore which was too base to yield to methods of treatment used then. It has never been cleaned out since the mine was closed about 1880. There is no machinery or equipment on the property. Owners, A. M. Dahl, J. H. Pearson, and A. L. Stewart of Markleeville and G. P. Merrill of Woodfords, Alpine County.

Alpine Mine is now a part of the Curtz Consolidated. This property was worked to a depth of 200 feet, and is said to have produced $378,000 from two ore shoots, which were rich in free gold.

Colorado No. 2 is owned by Hercules Consolidated Mining and Milling Company, Reno, Nevada. No recent work has been done on the Colorado No. 2, the last ore milled having come from the adjoining Advance. Recent exploration has been through the Advance tunnel, which is about 100 feet vertically below the lower tunnel of the Colorado No. 2; the Advance Tunnel is no longer owned by this company, and the upper tunnels formerly used are said to be inaccessible. The Colorado mill is on these claims. It contains 20 stamps, 8 Frue

vanners, 1 Pindar, and 1 old Wilfley concentrator, an old double compressor, a steam plant and four large old style electric motors. The mine plant included electric locomotives, electric hoist, and a great deal of valuable equipment, which is ruined by exposure or has been carried off. There is also a power site on the East Carson River.

This mine was the principal silver producer of the county. It was worked from 1864 to 1876, and the concentrates were shipped out, as they could not be treated successfully at the mine. Was closed in 1876 and reopened by Peter Curtz in 1879. Curtz operated the property about one year, and the record of his operations are the only definite data at hand now about the property. He used the chlorination process at the property with good results, recovering in bullion from 91% to 95% of the assay value of the concentrates.

Concentrates treated during the summer of 1879 ranged in value from $420 to $900 a ton, averaging $584, of which from 38% to 43% was in gold and the balance silver. As the concentrate rose in value, the percentage of gold increased. The ore averaged about $12 a ton. The mill at that time contained 10 light stamps and 4 Frue vanners, but 5 stamps more were added during the season. Curtz states his mining and milling cost totaled $1.50 a ton.

The mill equipment was being removed from the property late in 1920.

Wolf Creek Group. This is a group of claims located in part in May, 1920, near the mouth of Wolf Creek, a tributary entering the East Fork of Carson River at a point about 4 miles from the old camp of Silver Creek. The district is reached by trail from the highway near Silver Creek. High grade gold ore was reported to have been found in float quartz here during the past summer, and the owners, Ed Dickson, J. P. Woodbury, R. T. Dickson, Geo. Smith, and E. T. Drake, were sinking prospect shafts. Elevation 6000 to 7000 ft. Located approximately in sections 20, 21, 22, T. 9 N., R. 21 E.

Woods Lake Mine. Work was done years ago on this property, which is reached by about a mile and a half of trail from the Amador road near Woods, and is in section 27, T. 10 N., R. 18 E., near the summit of the Sierras. Ore that carried 20% galena and was worth $80 a ton in gold, silver and lead, is said to have been mined from a winze near the mouth of one of the tunnels years ago, and packed out; but there is no definite record of this. The country rock is granite and mica schist. There are 8 claims in all. The vein was developed by two tunnels, one of them 100 ft. long.

W. G. Hoffman bonded the property in the summer of 1920 under an agreement to do $2500 work, and was prospecting it in August. R. S. Wray, B. Phillips, A. Lowe, Aug. F. Stiegeler (a jeweler of San Francisco), and W. G. Hoffman are the locators.

COPPER.

Alpine Fairview Group. Tri-State Mining and Development Company, Reno, Nevada. Eight claims in section 1, T. 11 N., R. 19 E. Superintendent, P. A. Sample, Gardnerville, Nevada. Claims are 7 miles from Woodfords, near Bazeman's Ranch, ¾ mile from the state line, and the same distance from the Woodfords-Gardnerville road, at an elevation of about 6500 feet. Eight years ago a 40-ft. tunnel was

driven and abandoned. Lately a shipment of a few tons of copper oxide ore from near the surface was made, and assays are said to have been very encouraging.

Curtz Consolidated Group. Curtz Consolidated Mining Company, Bank of Italy Building, Oakland, Peter Curtz, manager. There are 22 mining claims, a dam site and power plant on East Fork of Carson River. The mining ground includes the Alpine group covering 4500 feet on the Alpine outcrop, Georgia group of 5 claims, and the Morning Star group, covering 9000 feet on the outcrop of same name, all in section 29, T. 10 N., R. 21 E., in the Mogul district, and is reached by 8 miles of road from Markleeville. Eakle[1] has described the geology of the district, and the history of the property. No work except assess-

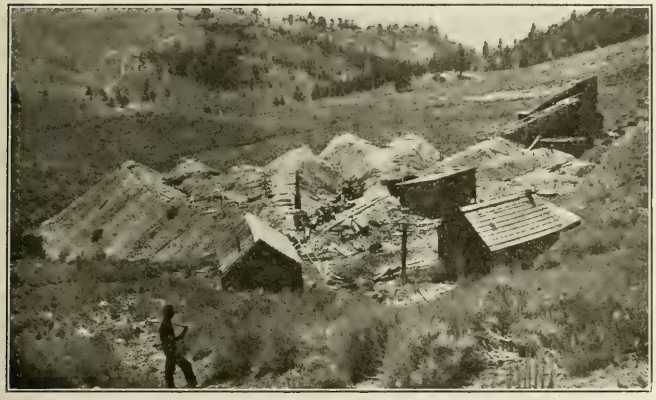


Photo No. 50. New mill and dumps at Curtz Consolidated property, Mogul District, Alpine County. Photo by C. A. Logan.

ment has been done since his report. The Morning Star mine is credited with a production of $600,000. The enargite ore shipped to Swansea during 2 or 3 seasons is said to have carried $400 a ton in copper, gold, and silver. About $100,000 of the production was from cement copper and amalgamation at the mine about 1882 when Louis Chalmers operated the property. There has been little, if any, production since then, as all the work in recent years has been aimed at developing the mine at greater depth than the old workings. The new tunnel driven by Curtz in 1914 was intended to strike the Morning Star ledge 800 feet in, but the dip of the ledge in its downward extension had probably changed to vertical, and it was not found. At a distance of 1000 ft. the tunnel encountered what Curtz called the West Ledge, which he says is 30 ft. wide with bunches and streaks of milling ore. He followed this ledge 100 ft. by a drift, and 600 ft. by a parallel drift and crosscuts. Sixty feet east of the West Ledge he crosscut the Silver Ledge, 10 ft. wide,

[1] A. S. Eakle, Ph.D., Mines and Mineral Resources of Alpine County, California. State Mining Bureau, 1916.

which he says averaged $12 a ton. This same ledge is reported to have been cut on the 190 level 300 ft. distant on the strike from the above mentioned crosscut. The ore in this body is thought to be amenable to concentration on the ground, judging by tests made by Curtz. He believes this ore body should be the first objective of any new work, as it can be quickly and easily reached. He reports some concentrates from it assayed $40 gold and $94.37 silver per ton.

The ores of this group of mines are numerous and complex, comprising enargite (arsenical copper ore) complex silver sulphides, auriferous pyrite, and small amounts of galena and zinc blende. There is considerable pyrite on the old Morning Star dump which carries gold and shows the intimately mixed enargite. The more interesting and important workings of the mine are not accessible. Work was resumed on this property late in 1920.

Globe Mine. It is in Monitor district in the south ½ of section 31, T. 10 N., R. 21 E., 7 miles from Markleeville, most of the way by good road. This property was worked in the 60's and 70's by Colonel Winchester, a devout spiritualist. A crosscut adit was driven about 1000 ft. to the ledge and 200 to 300 feet of drifting was done. The mine produced some chalcocite ore carrying gold and silver, which was hauled by teams to Sacramento at a cost of $40 a ton for shipment to the coast. Attempts to treat the ore at the mine were unsuccessful.

After lying idle practically since those days, the mine was taken hold of in 1918 by J. O. W. Applegren, who has done some new crosscutting and drifting, and was reported to have a good prospect, but he was absent and the mine was idle in August, 1920. Resumption of work was planned.

LEAD.

Black Jack Lead Prospect. One unpatented claim lying about a mile and a half by trail from Loope, approximately in section 28, T. 11 N., R. 21 E. Lumps of high grade galena have been found in a clay seam and in masses on the surface, but no vein had been uncovered up to last August. A few shallow prospect holes, 50-ft. tunnel and 20-ft. crosscut had been driven up to that time.

MINERAL SPRINGS.

Grover's Hot Springs. This property is 4.2 miles by road from Markleeville. Two groups of hot springs issue from a terrace on the edge of a meadow 200 to 300 yards south of Markleeville Creek. The springs deposit a good deal of calcite, and the terrace has probably been built up in this way. The combined flow from the dozen springs is probably 12 miner's inches, and the temperature of the water ranges from 128° to 146° F., being in one case too hot to drink. Water from one group is collected in a small bathing pool. Local people and campers resort to the place a good deal in summer, and the water has a local reputation for benefiting colds, rheumatism, etc.

In October, 1920, a movement was on foot in Markleeville to obtain the springs and surrounding land, and make the place a free camp site and park for tourists. It is admirably fitted for such use, as the

location is one of great natural beauty. Following is an analysis of the water by Laird J. Stabeler:

Grains per U. S. gallon.

Na_2Cl	19.91	$CaCO_3$	6.38
Na_2SO_4	12.02	$MgCO_3$	1.16
Na_2CO_3	34.10	Fe,Al	0.32
Organic matter	Trace	Silica	0.82

There are other mineral springs in the county which are so remote that they are seldom visited.

AMADOR COUNTY.

Amador County, known principally for its deep gold quartz mines, also has valuable gold placers, lignite beds, pottery and fire clay and silica sand deposits and less important resources of chromite, copper, limestone, marble and sandstone.

The Mother Lode Belt extends through the county in a northwesterly and northerly direction and the principal towns of Jackson, Sutter Creek, Amador City, Drytown and Plymouth are on it. For many years alternating with Nevada County as the state's chief gold producer, Amador may drop back to third place in 1920.

The year 1920 has been a disastrous period for the county's quartz mines. Early in the year it was believed that the underground fire in

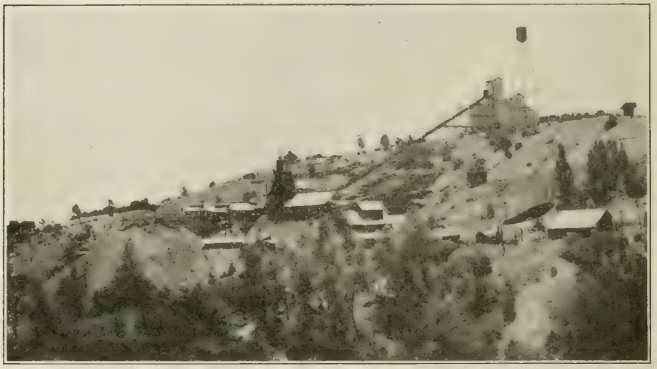


Photo No. 51. Argonaut Mine, near Jackson. Photo by C. A. Logan.

the Argonaut and Kennedy mines was under control, and milling was resumed at the Argonaut. Early in March, 1920, however, fire was found in the 3300 level of the Kennedy, apparently having eaten its way through caved ground in old workings which were thought to be securely closed, as all communicating drifts had been bulkheaded off. Doors of four-inch planks were at once put in on every level of the Kennedy to keep floating timbers out of the shaft. Filling with water through the Kennedy shaft began March 17 and stopped April 11. In June, water was standing at the 2700 level in the Kennedy shaft.

The Argonaut Company began unwatering in early summer. It was found that the task was too big for the one plant, and early in the fall an agreement was made whereby the Kennedy Company also began unwatering and good progress is being made (November, 1920). With no untoward accidents, it is hoped that both mines will be unwatered in the first quarter of 1921. There is room for fear, however, that conditions about the 3700 level in the Argonaut will be such as to seriously retard work below there, so no forecast can be made.

The Argonaut Company should be extremely anxious to resume mining and milling, as they were in richer ore when milling stopped early in March, than had been found in many years. With the good grade of ore continuing and allowing for a normal average mill capacity of 70,000 tons a year, this property should produce about $1,000,000 annually.

Costs at the Argonaut during 1918, which are the last obtainable for a full year on account of interruption to operations during 1919, are shown below. Incidentally it may be said that tonnage milled in 1918 was the largest ever crushed.

COSTS AT ARGONAUT MINE, 1918.

By courtesy of N. S. Kelsey.

Stoping	$3.316	
Development	0.823	
Hoisting	0.877	
Surface	0.448	
Total mining cost		$5.464
Bullion	$0.424	
Concentrate	0.301	
Slimes	0.166	
Total milling cost		$0.891
General office expense at mine		0.624
Total working cost		$6.979
Construction		0.404
Grand total cost per ton		$7.383

The above figures are for 73,890 tons milled, or an average of 6157 tons a month. In February, 1920, 7613 tons were milled but in spite of the increased tonnage, total working cost increased:

COSTS AT ARGONAUT MINE, FEBRUARY, 1920.

By courtesy of N. S. Kelsey.

Stoping	$2.885	
Development	1.294	
Hoisting	0.860	
Surface	0.385	
Total mining cost		$5.424
Bullion	0.532	
Concentrate	0.354	
Slimes	0.243	
Total milling cost		$1.129
General office expense at mine		0.592
Total working cost		$7.145
Construction		0.18
Grand total cost for 7613 tons		$7.325

Total labor cost per ton was $3.487.
Total cost of supplies per ton, $1.937.
Timber cost per ton mined, $0.60.
Labor of timbering per ton mined, $0.65.

Costs after reopening are expected to be increased 25¢ to 30¢ a ton above the February, 1920, figures.

The Argonaut shaft has reached an inclined depth of 4800 feet (vertical depth 4050 feet). They have the footwall vein only of the Mother Lode, with a hard schist footwall carrying a heavy gouge and a very heavy hanging wall of Mariposa slate. The ground has to be timbered heavily and stopes are kept filled within one floor of the back. The ore-shoot has a maximum length of 500 feet, and an average thickness of 14 feet. Levels are opened every 150 feet and raises put up 90 to 110 feet apart for stoping. The 4500 level and above are about worked out, and mining will be resumed on the 4650 and 4800 ft. levels.

The mill is equipped with 60 stamps of an average weight of 1000 lbs. each, dropping 96 times a minute.

Milling stopped at the **Kennedy Mine** on March 10, 1920. Whether or not regular operations will be resumed when the property is unwatered has not been stated, but the labor situation, cost of operation and grade of ore, considered together, do not encourage resumption of work.

The Kennedy workings have reached a vertical depth of 4050 feet. At the time of closing, work was going forward on the 3450, 3600, 3750, 3900 and 4050 levels with little ore left above them. With a heavy gouge on the footwall and a badly swelling slate hanging wall, it is necessary to use heavy square setting all through the mine. All stopes are filled with waste obtained by raising in the hanging wall or drifting.

This property has a mill of one hundred 1250-pound stamps with 42 Frue vanners. The mill is operated by electricity. Under normal full time operation on present grade of ore, it is capable of a production of $800,000 to $900,000 a year. The slimes plant has been torn down.

The company has a steam plant capable of generating 1800 h.p., but normal requirement is 1200 h.p., largely used for operating the 800-h.p. hoist which has a maximum speed of 2200 feet a minute. They burn crude oil and have their own oil pipe line to the mine from Martell, and ample oil tank capacity for storage at the mine.

Bunker Hill Mine. Milling at the Bunker Hill Mine ceased in February, 1920, because of high cost of operation brought about by abnormal industrial conditions. Since May, 1917, the mill had been operated at one-half capacity or less, in the vain hope that "normal" conditions would ensue. This property had been operated at a profit steadily for 11 years and had paid 123 dividends totalling $1,000,000 up to September, 1916, when dividends were suspended. Underground work is still going on. The shaft was sunk to 2800 feet and a winze has been sunk 640 feet below the 2800 level. The hanging wall vein is being explored on the 3200 and 3400 ft. levels. No work is being done above the 2800 ft. level except running the pumps, which are located on the 800, 2100 and 2400 ft. levels.

This company in August, 1914, reported a total operating cost of $3.34 a ton. The present cost, judged by result of their last operations and cost at similar properties nearby, would be very close to $7 a ton. To November 1, 1920, the crosscuts on the lower levels had not developed ore that could be profitably treated at such cost. Thirty men were employed; the full crew is 120.

The mill contains 40 stamps, 24 Frue vanners, 5 Deister Overstrom concentrators and a 5 ft. x 6 ft. Hendy ball mill. Mill practice consisted of stamping and amalgamation, followed by concentration on the Deister tables, after which the sands were ground in the Hendy mill and the entire pulp was concentrated on the Frue vanners. Mill capacity is 200 tons a day. Cost of treatment was reported to be 25½¢ a ton in 1914 and over twice as much in 1920. Electric power is used throughout.

The **Central Eureka Mine** at Sutter Creek is producing steadily. After being operated at a loss for many years, during which 48 assessments were levied and only low grade ore was found, the courage and



Photo No. 52. View of Mother Lode District in Amador County, showing (1) in right foreground, Bunker Hill Mill; (2) in center, the Treasure Mine; and (3) in left background, the headframe of the Fremont Mine.

perseverance of the stockholders of the Central Eureka were rewarded by the finding of very good ore in considerable quantity on the lower levels. The workings have now (November, 1920) reached a depth of 3900 ft. During the past year and a half the ore has been coming from the stopes of the 3500, 3600, and 3700 ft. levels, with a little from the 3350-ft. level.

Geological conditions have proved puzzling in the Central Eureka, and recent success has been due in large measure to the active exploratory work directed by Superintendent Howe. Exploration of the east and west country, which was recommended by C. E. Julihn in 1917 after the retiring directors had concluded the mine was exhausted, was first put in effect that year. An east crosscut was driven a distance of 774 feet on the 700-ft. level and on the 1800-ft. level, a west footwall crosscut was driven 717 feet without results. A hanging wall crosscut south of the shaft on the 2540 level found some ore, but for two years more the average grade of ore milled was too low to pay expenses. Good ore was finally struck on the 3500 level and stoped up to the 3425 level; a winze was sunk from the floor of the north 3500-ft. drift a depth of 105 ft. and a level driven at a depth of 85 ft. For 50 feet north of winze and 80 feet south of it, this level was in $20 ore or better. This shoot was 1 to 2 feet wide on the 3425 level; 7 feet wide on the 3500 level and 14 feet wide on the winze level,

but widened to 21 feet and improved in grade north of the winze. Other possible oreshoots were indicated but not explored on both footwall and hanging wall. During 1919 there was heavy expense on account of repairing pumps, shaft, drifts and crosscuts in the South Eureka which had to be used in keeping water out of the Central Eureka.

During the year ending April 22, 1920, a total of 34,705 tons of ore were milled from the 3500, 3600, and 3700 levels principally. This ore had an average assay value of $13.15 a ton and an extraction of $12.40 a ton or 94.31% was made. About one-quarter of the ore came from the so-called south shoot on the 3500 level, but this shoot is



Photo No. 53. Central Eureka Mine, Sutter Creek.

spotted, and apparently faulted between the 3500 and 3700 levels. The 3700 north stope on the north shoot averaged over $20 a ton. Of the total recovery, 85% was bullion.

Late work indicates that the vein in the lower levels enters the greenstone. The winze has been sunk to 3700, and the shaft to 3900 ft. Drifts have been run 70 feet north and 77 feet south in fine grade ore on the 3900 level and a stope begun. Both walls are being aggressively prospected. The 3600 level has been driven a total length of 415 feet south of the winze in search of the south ore shoot.

Milling has been interrupted during the summer by power restrictions. This property's mill contains thirty 1280-lb. stamps, dropping 96 times a minute and crushing through 24 mesh screen. Concentrates are saved on 16 Frue vanners. The mill capacity is about 3500 tons a month. Electric power is used except for the hoist, which is steam operated, using oil fuel. The Central Eureka and South Eureka are connected on the 1600 and 2540 levels. Water from the lower part of the Central Eureka is pumped to the 2540 level and piped to the South Eureka pump station, which is maintained and operated by the Central Eureka Company. Heavy timbering is required consisting of 14″ x 14″ square sets on the north end and stulls and posts on the south end.

The **Fremont Mine**, lying just north of the Treasure on the Mother Lode, is being unwatered after lying idle about two years. This property before closing, produced 200 tons a day of average Mother Lode ore carrying about $5 a ton. The reduction equipment comprises 40 stamps of 1000-lb each and 16 Frue vanners.

The **Keystone Mine** at Amador City was closed late in 1919 and the reason given at that time was the lack of room for storing tailing. The mine has been idle since. It is one of the properties that could be worked at a profit under pre-war conditions.

Old Eureka Mine is still being prospected. The bottom of the old workings was at 1965 feet. The present company has sunk the shaft to 3500 feet and has driven levels at 1700, 2125, 2950 and 3500 feet. Total drifts up to July 1, 1920 were 1720 ft. on 1700 level; 1345 feet on 2125 level and 1685 feet on 2950 level. Crosscuts totalling about 1500 feet had been driven into the foot and hanging walls. According to reliable report, no ore that would pay to mill under present conditions has been encountered, although low grade rock has been found.

The **Plymouth Consolidated Mine** at Plymouth has reached a depth of 3050 feet and good ore has been found on that level. Shaft sinking has been going on here the past summer and work has been done on the 2750, 2900 and 3050 levels. In the late summer milling was curtailed but has been resumed at the rate of about 300 tons a day. William J. Loring, in a recent article* states that the main vein was poor or unpayable from the 2450 level to the 3050 level, where the vein north of the shaft is said to be up to 12 feet in width and assays $20 a ton or more. Loring states the shaft is to be sunk another 600 feet during 1921.

The mill of the company was an innovation in Mother Lode practice when it was put in operation. It is described in this Bureau's last report on the Mines and Mineral Resources of Amador County.

The **Treasure Mine**, adjoining the Bunker Hill on the north, has reached a depth of 2470 feet, of which the last 870 feet is a winze. The following levels were being worked at time of last visit: 1800, 2000, 2160, 2320, 2470. The 1600-ft. level of the Treasure connects with the 1500 level of the Bunker Hill.

The ore being milled at the Treasure contains more sulphides than average Mother Lode ore. The treatment given differs entirely from that at any other mine on the Lode. It is to be regretted that the secretary of the company failed to reply to a request for a flow sheet of the mill. However, the writer visited the mill late in June, 1920, and the following notes include his observations as well as information furnished by the company.

Ore from skip dumps over 1-inch grizzley. Oversize to gyratory crusher, product to a trommel 10 ft. long, $1\frac{1}{2}$″ screen, minus $\frac{7}{16}$″ to fine ore bin, over $\frac{7}{16}$″, less than $1\frac{1}{2}$″ to coarse ore bin. Oversize from trommel to 7″ x 10″ Dodge crusher, and coarse ore bin. Belt conveyors feed coarse ore to a large Hardinge mill, and fine to smaller Hardinge mill. The large mill grinds to $\frac{1}{4}$″; pulp goes to a Bunker Hill revolv-

*Reopening of the Plymouth Mine and the Results, W. J. Loring, Mining and Scientific Press, Nov. 27, 1920.

ing screen (slots equal to 16-mesh) where it is thinned. Fine through screen goes to shaker plates and coarse on screen is sent to a small Hardinge mill, thence fines to shaker plates and stationary plates, and coarse by sand pump to launder and mixing with part of pulp from large mill goes to Bunker Hill screen. Coarse on screen to second small Hardinge mill; fines through screen to shaker plates. Fine product from last mill to plates; coarse returned to other small Hardinge mill. Small mills grind one-half to 100-mesh and all finer than 20-mesh.

Pulp off plates pumped upstairs to classifiers. Coarse (underflow) to 2 Wilfley tables; Wilfley tailing reground; fines (overflow) to cone classifiers, which discharge their underflow to 2 Overstrom concentrators and the overflow to 8 Frue vanners. The mill has recently been operating 16 hours a day and handling 90 tons, although rated at

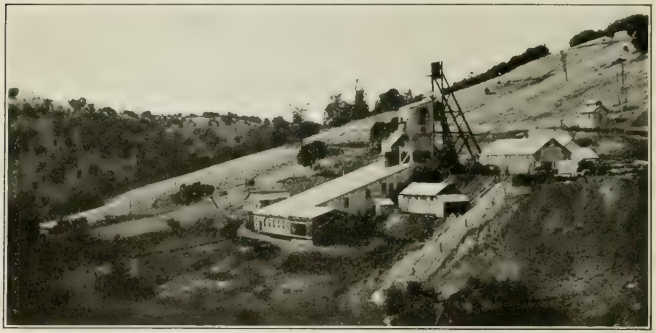


Photo No. 54. Treasure Mine and Mill, between Drytown and Amador City. Fremont headframe in background.

150 tons daily on the 24-hour basis. Electric power is used. The large Hardinge mill has its own 35-h.p. motor, and the main drive for other machines is from a 75-h.p. 440-volt 93-ampere General Electric motor. When the large mill is stopped for repairs the smaller ones may be run on ore from the fine ore bin.

PLACER MINING.

Little placer mining is going on in this county. The Wicker hydraulic property near Lancha Plana does some piping each year. There are a few small drift mines near Oleta, Pine Grove and Volcano which give work to the owners and a few men. Hydraulic mining on a large scale has been promised at Volcano, where options have been taken on a number of small properties and work on ditches and a debris dam has been going on. This property is now called the Elephant Mine.

CLAY.

Clay properties in this county have been listed in this Bureau's recently published Preliminary Report No. 7, entitled "The Clay Industry of California," which may be obtained free from the main

and branch offices of the Bureau. The undeveloped clay resources of the Ione-Carbondale district (which is the center of the industry in this county) are immense, and have been only partially prospected. Besides the properties now being operated there are unexploited deposits on the 33,000 acres of the McKissick Cattle Company. Many of the active properties are also capable of being operated on a much larger scale, should demand arise.

The washing and tabling process used by the Philadelphia Quartz Company gives a clay which carries only a trace of iron oxide, sufficient to give a light buff product on burning. There appears to be room for further experiments on the clays here, for the purpose of obtaining a white burning product. Local men have also advocated the construction of a pottery in the district, to utilize the raw product where it is mined. With freight rates increasing, this project appears to have possibilities worth looking into.

COAL.

There has been practically no lignite mined in the county during the year. The following properties have produced in the past:

Buena Vista Coal Mine. Address J. J. Fitzsimmons, R. F. D. Ione, California. Mine is at Buena Vista, 6 miles by road south of Ione. There are three beds of brown lignite located at depths of 60, 98, and 70 feet, the principal bed being 11 feet thick. This bed has been developed by 2 vertical shafts 70 feet deep and by several hundred feet of drifts. It was last worked in 1913, and some of the coal was sold to local buyers, who did their own hauling. There is said to be no water at the level of the coal, but in sinking the last shaft a water-bearing sand was cut at a depth of 20 feet, and this necessitated pumping about 2500 gallons of water a day. Coal said to have cost 75 cents a ton at collar in 1913, and haul to the railroad at Ione would cost about $2 a ton. There is a good galvanized iron building at the mine and a hoist and small bunkers and head frame that might be used, but the old steam boiler appears to be in poor shape. Fitzsimmons claims an area of 40 acres is underlain by coal.

Harvey Mine. Address Fred Harvey, Galt, California. Mine is one mile north of Carbondale, the nearest railroad point to which a spur track could be run with practically no grading. The coal has been partially developed by a vertical 2-compartment shaft 88 feet deep and drifts driven north and south in the nearly horizontal coal bed which is said to have a maximum thickness of 20 feet. Drifts totaled 1000 feet. There is also an air shaft at the north end of workings. There is a large building in good repair, housing a 60-h.p. steam boiler and a 25-h.p. donkey hoist. The shaft is well timbered as far as seen and nearly full of water. There is a 40-ft. head frame and bins. The mine has been idle for several years.

Mine No. 4. Address lessee, Pioneer Wood and Coal Company, Sacramento, California. Bunkers at Lignite spur, one mile east of Carbondale; shaft is ¼ mile north of railroad and connected by tram. Formerly property of Ione Coal and Iron Company. A bed of brown lignite, 7 feet thick, and lying nearly flat, has been opened by a vertical

shaft 85 feet deep and several thousand feet of drifts on the bed, leaving pillars. Mining is by hand labor. The lignite is hoisted in cars on a cage. Screenings from the mine are used for fuel to generate steam for operating the mine hoist and hauling the empty cars back from the bunkers. The mine was last operated in January, 1920. The production capacity then was 500 tons a month and there was said to be two years reserve of lignite left in the bed. The number and extent of undeveloped beds of lignite under this region is no doubt considerable, as it has been found as far south as Lancha Plana.

BUTTE COUNTY.

In recent years, this county's gold production has been almost entirely from the dredgers on Feather River and its tributaries, in the Oroville district. Dredging operations there were summarized by the writer in our Bulletin No. 85, "Platinum and Allied Metals in California," published in 1919. As indicated in that report, the end of gold dredging on new ground in this county, will occur with the exhaustion of the holdings of the American Gold Dredging Company, located seven miles below Oroville. There are only two companies now operating dredgers in the county; the above named company has one boat with 6 cu. ft. buckets, and Natomas Company of California has a dredger with 15 cu. ft. buckets and one with 7½ cu. ft. buckets, but the latter boat has finished its ground and the larger one has for several years been working most of the time in old ground, formerly dredged by smaller boats. These left some pay on the bottom where the ground was deep, and in odd spots which were slighted in the effort to make a record for big yardage.

None of the hydraulic mines in the county have been active the past year, and only perfunctory work has been done on the quartz mines. Even the drift mines, which were for years the backbone of the mining industry here, have been either idle or worked on the most limited scale, due to the very short supply of water and the adverse conditions facing all mining enterprises.

Besides gold, this county in its mountainous portions contains many deposits of the industrial minerals, which lie for the most part unprospected because of their distance from railroads. Among these may be noted asbestos, barite, chromite, lignite, limestone, manganese, mineral water, mineral paint, soapstone and miscellaneous stone. Platinum in small quantity is produced by the gold dredgers and an occasional diamond is found in the placer mines.

Brief mention is made below of a number of placer mines which have shown some recent activity, but have not been mentioned in the Bureau's later reports. Other drift mines and quartz mines are noted in the Bureau's last report on the "Mines and Mineral Resources of Butte County."

PLACER MINES.

Alder Creek Mine. J. H. Rempel, Stirling City, owner. The property is in sections 5 and 8, T. 25 N., R. 4 E., 15 miles by road from Stirling City, and contains 60 acres, patented. The elevation is 5325 feet.

The deposit consists of cemented bench gravel 8 to 20 feet deep, on granite bedrock. It is situated near the head of Alder Creek, and is dependent on snow water for washing. Rempel has been working the property alone since 1897.

Beauty Placer Mine. S. H. Vandergrift, Stirling City, owner. The property consists of 160 acres along Alder Creek in section 6, T. 25 N., R. 4 E., 17 miles by road from Stirling City and at an elevation of 5200 feet.

The gravel is said to average 6 feet deep and 50 feet wide, and the pay is mostly on the bedrock. Vandergrift sluices the ravine every year with water from melting snow.

Blue Hog Mine. Feather River Land and Mining Company, owner; Paragalia Mining Company, lessee with option to purchase; Henry S. Porter, president, Long Beach; E. F. Woodworth, manager, Chico. The property contains 580 acres, patented, situated about 5 miles from Magalia and an equal distance from Paradise.

This old mine has been worked at intervals for nearly 40 years. It covers about three-fourths of a mile of a lava capped channel containing loose gravel on slate bed rock. The pay gravel is 2 to 5 feet deep and 70 to 100 feet wide. There is a main tunnel which was reported to be 1700 feet long early in 1920 and a drain tunnel 900 feet long; the former has been advanced during the last year. Over 1000 feet of main tunnel is said to have been driven by the present operators and they have mined a width of 100 feet for a distance of 400 feet upstream. The lower end of the ground is said to be rich, but a section of channel 2000 feet long is too low to be worked through the present tunnel.

Operations were nearly stopped by lack of water the past two seasons. The mine is supposed to have a normal supply of 800 inches of water, but this water right is in conflict with the Paradise Irrigation District. When sufficient water is available, mining is done by piping water to the breast and washing the gravel in sluices laid in the tunnel. The property is equipped with a compressor, 4200 feet of 10 inch to 2 inch pipe and 1700 feet of 14 inch x 16 inch sluice boxes.

Emma and Alder Springs Mines. Nimshew Gold Mining Company, owner; Chas. H. McDonald, lessee, Nimshew. The property consists of the Emma, Alder Springs and other patented claims totaling about 600 acres, in sections 14, 15 and 22, T. 23 N., R. 3 E.; five miles by road from Magalia and at an elevation of 2300 feet.

There is an old tunnel about 5900 feet long through which the narrow pay channel was worked up to the place where it was cut off by a later lava channel. A new tunnel 4 ft by 7 ft. in cross section is now 1500 feet long and is being driven ahead with the hope of picking up the channel again.

Some water is developed from the channel and more can be bought from Pacific Gas and Electric Company. At present only two men are working. Square set timbers costing $5 a set are used where required. There is plenty of timber on the property.

Hupp and Indian Springs Mines. Henry S. Porter, lessee; E. F. Woodworth, manager, Chico. The Indian Springs mine consists of 130 acres, patented, in sections 3 and 10, T. 23 N., R. 3 E., and the Hupp Mine contains 580 acres, of which 500 acres are patented, lying north of the Indian Springs on the same channel. The properties are five miles by road from Magalia.

When the last previous work was attempted on the Indian Springs mine, the owners of the Hupp obtained an injunction on account of alleged trespass. The present plan is to work through the old 6500 ft. tunnel on the Indian Springs property. Comparatively little has been done yet on account of the scarcity of water during the past two

years. Square sets and cap and post timbering are used. There is a blacksmith shop, blower, small Rix air compressor, 250 feet of sluice, 500 feet of water pipe and 6000 feet of air pipe on the property. Gravel is hauled out in trains by a mule. Electric power is available 300 feet distant, and a normal supply of 50 inches of water, but less in dry years, comes from the tunnel. The gravel formerly mined is said to have paid $2.50 a car for a height of six feet and the channel was breasted 80 to 100 feet wide.

Kirby Mine. Geo. W. Kirby, owner, De Sabla. The property covers 3500 feet along the course of a lava capped channel in the E. ½ of section 34, T. 24 N., R. 3 E., 7 miles by road north of Magalia. Later work consists of a shaft 4 ft. by 8 ft. in cross section, 175 feet deep, and a tunnel 5 ft. by 7 ft. in cross section and 300 feet long. The gravel is free wash, but hardly enough work has been done to show its width, depth and tenor.

Little Johnny Mine. Elmer Johns, owner, Stirling City. The property contains 120 acres, covering ½ mile along the supposed course of an ancient channel, in section 20, T. 25 N., R. 5 E., twenty miles by road north of Stirling City at an elevation of 6200 feet, in the highest portion of the county. The gravel channel is 150 to 200 feet wide, and the bank is 20 feet high, the lower 5½ feet being gravel. The property is worked by ground sluicing with snow water during the spring thaw. There is ½ mile of ditch and pipe line, taking water from Brown's Ravine.

Royal Drift Mine. Royal Drift Mining Company, Napa, California, owners; R. M. Butler, president; Forrest H. Snow, superintendent. Properties comprise about 1000 acres, unpatented, 24 miles by road northeast of Chico in Forks of Butte district, in T. 23 and 24 N., R. 3 E., at elevations of 2200 to 2600 ft. The Double Eagle, Weed and Straughn mines, former producers but now idle, have been bought by this company. There are a total of 6000 feet of drift workings and 2000 feet of inclines on the holdings and some hydraulicking has also been done in former years. The present company's work is still in the development stage. There is a hoisting and pumping plant on the property and water is obtained from springs and from an old tunnel.

Steifer Mine. P. B. Steifer Mining Company, Magalia, owners. Comprises 80 acres, patented, in section 12, T. 23 N., R. 3 E., 3 miles by road from Magalia and at an elevation of 3000 feet.

The company has done no work since the last report, but the property was recently leased to B. J. Klarman of San Francisco.

LIGNITE.

Lott Ranch. C. F. Lott, owner, Oroville. The property is 8¼ miles by road from Oroville in section 12, T. 20 N., R. 3 E., in Coal Cañon, at an elevation of 500 feet. There are reported to be two strata of brown lignite at depths of 20 feet and 30 feet below the surface, but the old workings were obliterated by a washout and landslide several years ago, and the beds in place underground are not now accessible, although there is considerable of the lignite buried in the old mine dumps.

Between 1860 and 1880 the lignite was mined through an adit and was hauled to Oroville, where it was heated in retorts to furnish gas for lighting. A few of the very old buildings in the town still contain the old gas pipes, but there is no one alive in the neighborhood who knows the extent of the underground workings on the coal bed. The best sample possible was taken for analysis, but returns showing the character of the lignite have not yet been received. There is little doubt, though, that it will prove to be similar to the lignite mined at Lincoln and near Carbondale. Other beds of this lignite have been found in several wells bored for water and in search of oil, in the Oroville district.

CALAVERAS COUNTY.

This county's principal mineral products are gold and copper. Small quantities of asbestos, clay, chromite, lead, marble, mineral water, ocher, platinum, silver, and stone of various kinds have been produced in recent years.

Gold and copper mining have both been in a depressed condition during 1920. Many of the largest gold mines in the county have always had low-grade ore, and there has been no incentive to reopen these under present conditions. There have been, nevertheless, a number of gold mines on which work was resumed during the year. Among these may be noted the following, which were not visited by the writer on account of the unusually early storms:

Late in the fall the old Bishop drift mining property at Vallecita was being reopened with encouraging results. The Blair mine, a mile and a quarter west of Angels Camp, is being reopened by the Triple Lode Gold Mines Company, and late in the fall a mill was being put on the property. The Golden Gate Exploration Company have been prospecting and developing the Sheep Ranch mine during the past three years and have installed much new surface equipment, including a 20-stamp mill and cyanide plant. This mill is said to have been put in operation during the present month (January, 1921). A 3-stamp mill was started on ore at the Port Arthur mine near Angels Camp about November 1. The Ranier Drift mine east of Altaville and about a mile from Angels Camp, was being unwatered in November. A 30-stamp mill has lately been moved to the Waterman mine near Angels Camp.

No county has felt more keenly than Calaveras the hardships forced on the gold mining industry by rising costs of operation and the stationary price of their product, and none would be more benefited by the passage of the McFadden bill. The gold production from quartz mines in this county in 1920 was almost entirely from the Carson Hill Mine.

Copper mining, too, has been in an especially bad way during 1920, and production for the year will be only a fraction of that for 1919, which in turn was less than one-third the yield for 1918. For many years Calaveras County was second only to Shasta County in copper production, but for three years past has been in third place, and far outdistanced by Shasta and Plumas counties. Many of the smaller copper mines on the Foothill Copper Belt were equipped during the war and gave promise of profitable careers, and the high price for copper also induced the larger companies to mine out their ore reserves as fast as possible.

The slump in price after the cessation of hostilities was accentuated by the increasing accumulation of refined copper, which could not be marketed because Germany in particular, and also other foreign countries, were unable to buy. The price of copper has now reached a point where few, if any, of the California mines can produce this metal at a profit, unless the ore carries sufficient gold and silver to help pay operation costs. The price of copper will improve with changes in the exchange rate in favor of those countries which have formerly been our principal copper customers.

The Campo Seco smelter of the Penn Mining Company was closed March 1, 1920, and has remained idle. The Calaveras Copper Company at Copperopolis also reduced their operations, and suffered a further set-back late in the summer from an underground fire. This company had already cut down their production over half in 1919. The smaller companies have made little production during 1920.

The following notes on quartz mines summarize the more important developments at the properties named, since the last report:

QUARTZ MINES.

Angels Mine. Estate of James V. Coleman, owner. Consists of seven patented claims, over 100 acres, in Angels Camp townsite.

This well-known mine was closed March 1, 1918, on account of the death of Coleman, the former owner. At time of closing, the deepest level was at 1050 feet, and ore was being mined on the 200, 400 and 500 levels. There is said to be considerable low-grade ore on the 1050 level, which is, however, quite a distance from the shaft. Costs of mining have been so high as to discourage reopening the mine. When running just previous to the war, this mine had a record for very low cost of operation, and was making a profit from low-grade ore. J. Fullen, superintendent, states that from September, 1914, to March 1, 1918, the mine produced $550,000.

The mine and mill equipment, described in last report, is still on the property. The mine hoist, etc., are in good condition, but the 40 stamps are light, compared with the up-to-date mills on the Mother Lode.

Angels Camp Deep Mining Company, 743 Call Building, San Francisco; John C. Benson, president. The property is partly in Altaville townsite, near Angels Camp, in section 33, T. 3 N., R. 13 E., and comprises the Demarest, McCauley, Pioneer, Martinusen, Johnson, Hale and Smyth claims.

There were some old shafts and crosscuts on the claims, including Pioneer shaft 187 ft. deep with 487 ft. of crosscuts on No. 2 level and Smyth shaft 140 ft. deep with 400 ft. of crosscuts on No. 1 level and 292 ft. of crosscuts on No. 2 level. The present company has sunk the Pioneer shaft to 500 ft. on an angle of 83° with stations at 300, 400 and 500 ft. and has crosscut 50 ft. on the 400 level and 135 ft. on 500 level. The veins strike 54° to 60° E. and dip nearly vertically between black slate and greenstone walls. The stringer lead formation varies from 5 ft. to 37 ft. in width on the second level. The northeast crosscut is bulkheaded off 75 ft. from the shaft, presumably on account of water. There are said to be other veins exposed in the crosscut beyond the bulkhead. The reported assays from this level indicate $5 to $6 ore. Late in October, 1920, no higher grade ore was reported from the lower levels.

Twenty stamps and 10 Frue vanners from the old Harvard mill at Jamestown have been moved to the Pioneer shaft and installed in a substantial mill building. There is an Angels Iron Works hoist operated by a 75-h.p. motor, a Giant air compressor operated by a 40-h.p. motor and an old Smith-Vaile double compressor with 100-h.p. motor.

No ore has been blocked out or milled and the mill is not supplied with power yet.

Black Wonder Mine. Calaveras Mining and Milling Company, F. P. Ferguson, president, 228 South Fifteenth street, San Jose, California. Comprises 2 patented claims and other patented land covering 3200 feet along strike of vein and totaling 160 acres, 9.2 miles by road southeast of West Point and 30 miles from Valley Spring railroad station. Property is on the East Belt.

Two well defined fissure veins averaging 18 inches to 2 ft. wide, striking N. 18° E. and dipping 70° W., have been developed. The walls of vein are hard siliceous Calaveras slate and mica schist. The ore is base; analysis of a carload shipped to Selby smelter by present operators showed 42% iron sulphides, 9% lead sulphide, and 1% to 2% zinc sulphide.

Former operators stoped the vein for 800 feet on the strike, above the upper tunnel. Present company sank a shaft 130 ft. deep on vein 5 ft. wide and of good grade. This is 1360 ft. north of point where a crosscut exposes apparently same vein 2 ft. wide. The carload of ore shipped came from the shaft and is said by superintendent to have contained 3 oz. gold and 17 oz. silver per ton. The shaft and upper tunnel were both giving considerable water. A lower crosscut tunnel was being driven which is to be 1300 ft. long when it strikes vein and will be 210 ft. below the collar of shaft.

Calaveras Mine. Under bond to Carson Hill Gold Mines Company, Incorporated, 614 Crocker Building, San Francisco. Property is near Melones and on the slope of Carson Hill, and the depths of levels are measured from the apex of vein on New Year claim, near top of Carson Hill.

The vein has been developed by an adit called 1000 level, entering hill near Melones and following vein nearly north for nearly 2000 feet with frequent crosscuts. A winze from 1000 level 950 ft. in, connects with 1123, 1250 and 1375 levels, on which several hundred feet of drifting has been done, mostly to the north of winze. The vein has a swelling footwall of amphibolite, and heavy amphibolite hanging wall, and averages 15 ft. wide, of which an average of 7 ft. is said to be ore. The ground has to be timbered closely and is hard to hold open long, so it is desirable to stope out as fast as possible and let it cave.

Some ore was stoped under contract in 1919 but work has since been suspended and mine is idle. Ore mined on lower levels was said to run $5 to $7 a ton. The ground above 1000 level is in bad shape and nothing has been done there by the present company; there was an old shaft 600 ft. deep and surface workings.

Finnigan Mine. Talbot Brothers, of Carson Hill, owners. Under bond to Lewis, Gilman and Moore, Hobart Building, San Francisco. Covers 2100 feet on the Mother Lode on north side of Carson Hill, adjoining Reserve and Enterprise claims of Melones Mining Company.

The vein previously mined is on the footwall of the bull quartz, and is same vein as worked by Melones Company, whose immense glory hole adjoins the Finnigan. This ore body, consisting of a stringer lead and impregnations of the amphibolite schist wall rock, has a maximum

width of 100 ft. in the glory hole and is low grade, but was worked before the war by both these companies at a small profit.

The present operators have been prospecting the property off and on since late in 1919, and for some months encouraging reports have been given out. There are 2 old tunnels known as Hawkins tunnel 465 ft. long and Talbot tunnel, 400 ft. east from glory hole; besides this old work, the operators have started a winze and done some new crosscutting to east vein.

Gold Cliff Mine. Utica Mining Company, owners. It lies just west of Angels Camp on a west spur of the Mother Lode. There are 8 claims in the group, which has been owned by the Utica Company since 1884, but has been known and worked since 1850.

The Gold Cliff ore body is a thick chimney of solid white quartz and crushed mineralized wall rock, lying at the juncture of two veins. The footwall is amphibolite schist, broken, highly mineralized and not well defined; the hanging wall is smooth, hard amphibolite schist, deeply grooved by movement. The shoot dips 30° to 65° N., averaging 45° to the 1600′ level. Between 1600 and 1700 levels there was a horizontal fault throwing ore several hundred feet north; at 1700 level they started a winze which was sunk 270 ft. when mine was visited late in 1919, but has been sunk deeper. Stoping was going on from 1700 and 1900 levels. The vein had a width of 25 feet on the 1700 level. It is stoped in large chambers, with little timber. The gold is said to be 65% in the sulphides of the schist, and the solid quartz is usually low grade. Sulphides form as high as 10% of ore.

The mine and mill were closed down in April, 1920, and have been idle since. Superintendent states the company stopped operations because of high costs, and inefficiency of labor. They feel that the ore can best stay in the ground till conditions improve. They see no advantage in producing gold at the fixed price of $20.67 an ounce during a period when the prices of mining supplies are two to three times normal, and mining labor only fifty per cent efficient, or less, even though operations were yielding some profit.

This mine is in condition to resume operation promptly. It, as well as many others on the Mother Lode, would no doubt be worked if the McFadden bill were passed.

Lightner Mine. Lightner Mining Company, Alex Chalmers, manager. One fractional claim, lying between the Angels and Utica mines at Angels Camp. Unwatering the mine was begun in February, 1920, but work ceased September 1, 1920, on account of restrictions laid down by the state power administrator, which are alleged to have made it impossible to get enough power to operate the pumps. The shaft is about 1000 ft. deep, and had been almost cleared of water when work ceased.

Melones Mine. Melones Mining Company, owner. This company has done no work during the year, but some of the underground workings which connect with the Morgan mine, and the electric traction equipment, have been leased to the Carson Hill Gold Mines, Incorporated, for use in developing the Morgan mine and in delivering the ore from the mine to the mill near Melones on the river.

Morgan Mine. Carson Hill Gold Mines, Incorporated, owner; W. J. Loring, general manager, 614 Crocker Building, San Francisco; A. D. Stevenot, superintendent at mine. The property covers a portion of Carson Hill, adjoining the camp of same name and the Melones mine. The mine was discovered in 1850, and is said to have yielded $2,800,000 between February, 1850, and December, 1851, to the discoverer, Hance, and his six partners, for one of whom the mine was named.

The operation of the property during 1919 was briefly noted in our Preliminary Report No. 6. Since then the mine has been operated steadily. The mill has been crushing about 9000 tons of ore monthly in recent months, and 10 stamps have just been added to it, which will give it a capacity close to 15,000 tons a month, as the average stamp duty is over 15 tons a day, due to coarse crushing followed by use of Hardinge mills.

Early in 1920 the company leased part of the Melones mine and their electric traction equipment. Melones shaft, which is near the south end-line of the Morgan mine, is being used to develop the lower portion of the Morgan ground, and some of the tunnels are used in hauling the Morgan ore to the mill near Melones.

Besides the 100, 200, 300, 360, 425, 550, 675, and 865 levels, which were open in 1919, the work has been done on the following levels: 985, 1100, 1200, 1350, 1450, 1600, 2800, 3275, and 3375. The use of Melones shaft has, of course, made it possible to open the ground so rapidly, and has greatly reduced development expense. The 985, 1100, 1200, and 1350 levels had each been drifted north for distances of 200 to 350 feet in October, 1920, and short drifts had been run on the other levels.

In sinking on the hanging wall vein they have encountered what they call "flat veins" on the 1100, 1350, and 2800 levels. These are the fillings of fault fissures which dip the same way as the main vein, but at a flatter angle, and throw main vein up. There is payable ore in these flat veins, but it is much lower grade than the hanging wall vein. The flat veins strike N. 70° W., and dip 30° E. Work has been done on the upper flat vein on 1200, 1300, and 1600 levels. A stope on it on 1600 level is 60 ft. long and 10 ft. wide.

On the hanging wall vein, the stope on 550 level is 225 ft. long; on 675 level, 320 ft. long and with a maximum width of 41 ft., on 865 level, over 300 ft. long and on 1100 level nearly 200 ft. long. Besides the work on flat vein and hanging wall vein a stope 200 ft. long has been opened on the 550 level on the footwall vein. During six months up to November 1, 1920, over 6000 feet of development work and 1000 feet of diamond drilling has been done on the properties controlled by this company, including work done on the Calaveras and Adelaide.

In last year's report (Preliminary Report No. 6) the writer estimated that if the Melones workings could be used to handle and transport ore from the Morgan mine, "the cost of operation could be reduced probably to about $4.75 a ton." The company states that the average total operating cost for nine months in 1920 was $4.84 a ton, due to reduction of transportation cost, the elimination of shaft work incidental to use of Melones workings, and the handling of increased tonnage. The ore is hauled now 4000 feet by electric locomotive. The average tenor of mill-heads has been reduced, partly because of lower grade of some of the ore, but the total yield for the year will be about the

same as in 1919, giving a production of about $2,100,000 for the two years since the mine has been reopened.

GREENSTONE.

Greenstone has been quarried at the old Ghost Mine during 1920 by Charles Lillie. This old mine is located near Angels Camp. The rock was crushed and shipped to Richmond where it is used for surfacing prepared roofing.

MARBLE.

The **Eagle Marble and Lime Company** was organized during last summer to work a marble property in section 29, T. 3 N., R. 14 E., a mile and a half east of Vallecita. This property, formerly known as the Eagle marble quarry, has made a small production of marble in the past, but has been idle for several years. The new company planned to put in some marble cutting machinery and to begin operation soon.

The Calaveras marble belt, including the above and other small properties, is a continuation of the deposit quarried at Columbia in Tuolumne County.

EL DORADO COUNTY.

The gold mines of El Dorado County, famous since Marshall made his discovery in 1848 at Coloma, only 8 miles from Placerville, the county seat, have shown during the past few years the full effect of the adverse conditions everywhere confronting the industry. The Mother Lode traverses the county from near Nashville on the southern boundary to the Middle Fork of American River, a distance of about thirty miles, and on into Placer County. The many mines opened along this gold belt years ago have all been idle, except for limited prospecting work, in 1920.

In the northern part of the county where the Jurassic slate belt carrying the Mother Lode veins is split by an immense intrusion of what is now mostly amphibolite schist, there are found the "seam diggings", where the amphibolite and slate are filled with numerous narrow veins and stringers of quartz and calcite, in places carrying considerable free gold. The veinlets themselves are not continuous, but the belt as a whole is rather extensive on the strike, and has been worked successfully in years past by hydraulicking the decomposed upper portions. Considerable interest has been roused this year by work being done on this belt at Spanish Dry Diggings.

The drift and hydraulic mines which were early operated on an extensive scale are far from worked out, although it is true that the more accessible and easily worked ground has been mined. Here, as elsewhere, successful drift mining calls for the investment of adequate capital, and the day is past when a pick, shovel and sluice were machinery enough. Unprospected or only slightly developed deep gravel deposits, that would require shafts or long tunnels are found near Newtown and Pacific, and many miners maintain with apparent reason that there is a channel extending many miles westward under the ridge from Pacific that has never been opened; there are also deposits at Indian Diggings, Fairplay, Omo, and northeast of Georgetown. There is only a little activity in drift mining to record for the past year.

There has been some prospecting of copper properties on the foothill copper belt, but no production of copper noted in 1920. Most of the chromite properties have been idle with one property producing concentrate up to the last quarter of the year.

The county has immense resources in limestone and there has been steady production during 1920. The excellent deposits of black roofing slate near Placerville and Kelsey have remained unworked this year although it was stated in Placerville late in October that one quarry was to be equipped and opened. Soapstone for various uses has been shipped from three properties near Shingle Springs and Latrobe.

The following notes on individual properties are intended to indicate briefly the progress of mining in the county during 1920.

GOLD QUARTZ MINES.

Armstrong Mine. Armstrong Mining Company, Ninth and Broadway, Oakland, California. Prospecting two claims 2½ miles from Grizzly Flat and adjoining the line of the Diamond and Caldor Railroad. A

vertical shaft 100 ft. deep and an inclined shaft 114 ft. deep reported sunk and 180 ft. drifted in the summer of 1920, on a narrow quartz vein in granodiorite. Work was planned further to prospect the supposed intersection of the north striking vein with an east striking vein. Equipment, 40-h.p. steam boiler, 3 ft. Pelton wheel, 30 h.p. Joshua Hendy hoist, Rix air compressor, 2 drill capacity. P. A. Paulsen, Grizzly Flat, manager.

Grit Mine. W. A. Bucknam, Spanish Dry Diggings via Greenwood, owner. Grit Gold Mining Company, 410 Bryte Building, Sacramento, lessee with option to purchase. Comprises five claims, two of them patented, and covering a large part of the old Spanish Dry Diggings, 17 miles from Auburn in section 30, T. 13 N., R. 10 E.

The property has been owned by the Bucknam family for about 40 years and was previously worked by Spaniards, who took the dirt down the steep cañon side to the American River for washing. In the Grit claim in 1865 a mass of beautifully crystallized gold was found which weighed 101.4 ounces troy. This was found in a shaft a few feet below the bottom of the old hydraulic pit. The upper decomposed portion of the auriferous zone in this mine and in similar properties in the vicinity of Georgetown was worked successfully by hydraulicking, ground sluicing and shallow underground workings down to average depths of 125 feet to 150 feet, where hard rock was encountered. Such ground, handled as a whole, paid handsomely, going at times $2 to $3 a yard.

The gold here occurs free in narrow quartz and calcite veins or seams, in amphibolite schist and slate. The occurrence of zones rich in iron in the amphibolite schist may have influenced the deposition of the gold. The present working entry, an adit driven from the river slope possibly 150 feet below the original outcrop, was driven years ago and was connected with the surface by a shaft which was presumably sunk on ore. The adit was on the vein for about 75 feet. King and Compton, working under a lease from the owner previous to the formation of the present company, began sinking in the floor of this drift, and at the time of the writer's visit (November 10) had put down two winzes, each 18 feet deep and 30 feet apart. In one of these winzes "specimen" ore was found and some of it could be seen in the bottom. From this winze a drift on the formation had gone about 18 feet. The vein appeared to be increasing in width with depth, and consisted of quartz and calcite with a good gouge on one wall. The amphibolite and slate walls carry considerable coarsely crystallized pyrite, said to be auriferous, but no assays of this were available. Not enough work had been done to indicate the probable extension of the vein on the strike, but it seems probable that the specimen ore will be found in a relatively narrow chimney.

The mine needs to be equipped with a little machinery to permit sinking an additional 100 or 150 feet directly in the ore. The "formation" between walls in the bottom of the winze where pay occurs is about 3 feet wide. The showing seems well worth following, and the ground deserves intelligent prospecting for other pay crossings. All the underground work to date has been with hand tools, and the rock in depth is too hard to permit much progress by such means. Six men were employed when visited and stock was being sold. The total reputed output of the property under past operators was about $300,000.

Hines-Gilbert Mine. Hines-Gilbert Gold Mines Company, 510 Bryte Building, Sacramento, California. This prospect is in the west ½ of section 24, T. 13 N., R. 9 E., 20 miles from Auburn via Spanish Dry Diggings, the last mile being steep trail. The five claims lie partly in Placer County and partly in El Dorado County, in the steep cañon of Middle Fork of American River. It is estimated that 3 miles of new road, up the south bank of the river, would cut the distance from the railroad in half. The veins occur between slate and amphibolite schist walls, where the Jurassic slate belt which contains the Mother Lode veins is split up by intrusives. The prospecting work has been on the El Dorado County side.

Two veins, called Hanging- and Footwall veins, have been prospected, of which the former is thought to be the more promising. This vein has been traced about 400 feet on the surface. It strikes N. 20° W. and dips 80° NE. The development on it consists of short tunnels and open cuts, one tunnel running 81 feet parallel to vein, with a raise in the vein to the surface. All the work is superficial and well up on the hillside. The vein averages 5 ft. to 6 ft. wide, and the unoxidized ore is reported to run $6 to $9 a ton. A crosscut 240 feet long was run to the Footwall vein near the river. This is now caved about 100 ft. in. A raise toward the surface from this tunnel lost the vein about 20 feet up; raise is also caved. Some other shallow work has been done this year near the mill, in the slide material, which yielded some broken quartz at times carrying free gold, but no vein in place was found.

The mill was run a few weeks during the past summer and some ore yielded about $4 a ton in free gold, it is reported. The sulphides were not saved.

Water is taken from Cañon Creek through 6 miles of flume and ditch of perhaps 35 miners inches capacity. There is about 600 feet fall at the mill and a 3-ft. Pelton wheel furnishes power. Mine equipment includes an Ingersoll Rand 3-drill compressor, 750 ft of 11-inch pipe, 750 ft. of tramway, and dwelling and compressor houses. Mill contains 10 medium weight stamps, Hendy 10-inch Blake type rock breaker, and 2 old Wilfley concentrators, all operated by 3-ft. Pelton wheel. Reports have been made on the mine for the company by Lewis Hinds and the late J. F. Parks. Property idle in November, 1920. Capital stock 1,000,000 shares par value 10 cents each.

Josephine Mine, near Volcanoville, 8 miles north of Georgetown, has been prospected during the year by the Nevada-Pacific Exploration Company. A new level 400 feet below the old workings and 720 feet below outcrop was started and driven over 300 feet late in the summer when encouraging indications were reported.

This mine was profitably worked until the winter of 1889-1890 when a landslide wrecked the 20-stamp mill. The vein shows ribbon structure and lies between serpentine and slate walls. In places it shows mariposite, generally an indication of good ore. J. A. Shields, Auburn, owner.

Red Rover Mine, 3 miles southeast of El Dorado, has been prospected by E. C. Montgomery of Auburn and associates during the past year. After clearing some of the old works, a little drifting was done

that promised to open ore, but work was discontinued before positive results were obtained and the property is idle (December, 1920).

Wiedebush Mine, in section 20, T. 13 N., R. 11 E., northeast of Georgetown, has been worked during the year by Edward Spencer and Adolph Krauger of Vallejo under lease and bond. There is reported to be an ore shoot 70 feet long developed by a tunnel, with good ore still in the face, and said to be 3 to 4 feet wide. The ore is being milled under difficulties in a small roller mill, as water has to be pumped up about four hundred feet for mill use. Seven men are employed.

DRIFT MINES.

Hook and Ladder Mine. Owners, Selah, Joseph and Ellen Chamberlain, 850 Mills Building, San Francisco; lessees with option to purchase, Daniel M. Burns, 715 Call Building, San Francisco, and Bert L. Bryan, Smiths Flat, California. Property is in S. ½ of NE ¼ section 10, T. 10 N., R. 11 E., ½ mile from Smiths Flat on the Lake Tahoe highway.

This mine is on the ancient channel system worked profitably years ago under Smiths Flat. It had been abandoned for a long time previous to 1918, when reopened by Bryan. His preliminary work led him to believe there was still pay gravel that had been untouched. The former operators are said to have quit work when they came to a point where the stream narrowed and gravel was cut off by a reef of hard bedrock. Driving downstream past this, Bryan came again into pay gravel, about 80 feet above the old deep channel.

To work the gravel downstream (southward) from the present shaft, it was necessary to take up 32 feet of bedrock to get a grade of 4 inches in 100 feet for the bedrock working tunnel. The channel is estimated to have an average grade of 1 foot in 100 feet. With the 32-ft. depth to start, they believe they will have ample grade to run their tunnel 1500 feet, the whole length of the ground, and mine the gravel by raises.

The shaft is 145 feet deep, in rhyolite ash and granite. Two tunnels have been driven, the old upper tunnel 380 ft. long and the new lower one 330 ft. long. Where first cross-cut, the gravel is reported 50 ft. wide, 1 ft. to 2½ ft. thick and partly cemented, and consists of rotten granite and medium sized quartz wash lying on decomposed granite bedrock.

The first raise from the bedrock tunnel into the gravel was started the last week in September, and probably the first run will have been made before Christmas, 1920.

The mine is equipped with a 20-h.p. steam boiler, wood fired; 15-h.p. hoist, small hoist room and blacksmith shop, mine pump and about 100 feet of sluice. The mine yields enough water for the boiler, and a water ditch crossing the claim 10 ft. from the hoist can supply water for washing gravel.

Pacific Channel Mine. Owner, J. H. Zimmermann, Pacific; lessees, J. E. Sexton et al.; office, Palisade, Nevada; superintendent, W. E. Christian. This is the old Zimmermann Mine, beside the Lake Tahoe highway ¼ mile below Pacific House, and 18 miles from Placerville. The property has mineral rights along 2 miles of the supposed course of an ancient channel.

The channel courses southwest, is capped by 130 feet of andesite and lies on granite bedrock. Zimmermann worked the upper gravel through tunnels, but is said to have never bottomed the channel. At time of the writer's visit, late in September, 1920, the present operators had driven 1000 ft. of new tunnel and were expecting to break into the deep channel at any time. Three raises had been put up, encountering low grade rim gravel. The upper portion of the deposit as worked by Zimmermann was said to be 700 ft. wide; works now inaccessible.

Equipment and plant includes a 4 ft. x 4 ft. barrel gravel mill with automatic feeder, operated by Pelton water wheel, 50-ton gravel bin, and small mill building; small blacksmith shop, 10-h.p. Fairbanks-Morse gas engine, 7½″ x 6″ Chicago Pneumatic Tool Company air compressor, and 600 feet of 6-inch pipe. Mine workings yielded about 4 inches of water and more could be bought and brought in through 2 miles of ditch.

Rising Hope Mine. S. M. Warren and Company, Exchange Place, New York City. Mine is 3 miles by road southeast of Placerville, on Texas Hill in section 15, T. 10 N., R. 11 E. The property was operated for ten years by the present company and was closed during the past summer following the death of the manager, Geo. W. Englehardt. The property comprises 220 acres, 200 acres of which are patented, and covers 3500 feet along the course of an ancient channel which is buried under 240 feet of andesite and lies on slate bedrock.

The great amount of development work done by this company did not reveal any important amount of good pay gravel. Workings included Main North Tunnel No. 1, over 3500 ft. long, East Main Tunnel No. 1, about 3000 ft. long, and shorter tunnels, numbered 2, 3, 4, etc. Raises were put up from the drifts in several places to breast out fragments of terrace gravels, but these generally did not pay.

The property was supposed to be on the junction of the Smiths Flat and Newtown channels, but work done did not prove this, although the Newtown channel appeared to have been bottomed when the property was last visited. The gravel was cemented, medium sized and gray colored.

Property was equipped with a 50-ton barrel mill, compressor and building, blacksmith shop and office, and water and electric power were available. The barrel mill did poor work and would have been replaced if development had warranted.

Roundout Mine, also called the **Danaher,** which was in operation in 1919, was closed without any recorded production and remains idle. This property is 2½ miles northwest of Smiths Flat. The mine formerly produced considerable pay from a shaft 148 feet deep and 1000 feet northeast of the new shaft.

The recent work was through an inclined shaft 400 feet deep (100 ft. vertical) from which a drift had been driven 600 feet nearly east when mine was last visited. There was still estimated to be 300 feet to drive to strike gravel, and the operators thought they would have 500 feet of ground upstream to the old shaft. Workings were in granodiorite capped by andesite.

Equipment included hoist operated by 40-h.p. electric motor, pump operated by 25-h.p. motor and blower with 5-h.p. motor, blacksmith shop and cars. Richards and Fairchild, owners.

Wabash Deep Channel Mine. E. W. Claresse, Georgetown, owner. Contains 160 acres in section 26, T. 13 N., R. 10 E., northeast of Georgetown and 21 miles from the railroad at Auburn. This property was worked in 1856 and operation was discontinued when the channel was lost in 1867. It was relocated in 1907 and the owner is driving a bedrock tunnel in search of the channel. The tunnel has reached a length of 350 feet. There are also 4 old shafts on the property.

COPPER.

Big Buzzard Mine, also known as the **Derrington Ranch Mine,** about 10 miles northeast of Folsom, is being developed by the W. P. Black Company. Work has not yet passed below the leached and oxidized zone, but recent assays are reported to be very encouraging, indicating gold, silver and copper in paying quantities, with some lead and zinc.

Voss Mine, also called the **Camel Back Mine.** Owner, J. D. Voss, Elk Grove or Pilot Hill, California. Was under option during the past summer to Gold and Copper Holdings Company but has reverted to the owner without any new work being done. The property consists of 680 acres of patented land, mostly in section 11, T. 11 N., R. 8 E., about 11 miles by road from Auburn on Burner Hill.

A massive quartz vein striking N. 32° E. and dipping 65° to 80° west, can be traced at intervals for 3500 feet on the slope leading to the river. The vein has a maximum width of 28 feet at the surface but has not been exposed its full width in the tunnel. The vein has been prospected by two tunnels 65 feet apart vertically, the lower tunnel being about 300 feet below the highest point of outcrop. There is also a shaft 25 feet deep on this vein. No. 2 (upper) tunnel is a drift on the vein 123 feet and No. 3 tunnel is a crosscut for 165 feet then 67 feet on the vein, so that none of the workings have gotten entirely beyond the zone of surface oxidation and leaching. The quartz at the face of workings is of a peculiarly sugary texture and shows considerable chalcopyrite and pyrite, with some bornite, and shows indications of downward leaching. The vein here is so promising as to warrant further drifting southward toward the higher part of the hill, where depth sufficient to get below the leached zone might be attained on these levels.

The owner has the record of a great many assays which he states came from this vein and which indicate an average sufficiently rich in copper, gold and silver to make a good milling ore. To date, however, not enough has been done to give any hint of the possible amount of ore available. The sulphides have been completely leached out of the outcrop. So-called dikes crossing the vein appear to be pyritized zones in the amphibolite and may have influenced mineralization of the vein.

On the east slope of the hill about ½ mile due east of the above there is a parallel vein of quartz as much as 18 ft. wide in places, which has been opened by a 200 ft. shaft, now caved, and a shaft 40 ft. deep connected with a crosscut to vein. Farther south are several short tunnels

in bad shape showing possible ore on the dumps, the best of which was outside a caved tunnel about which nothing could be learned. There is no machinery or equipment on the property, and only one small dwelling.

CHROMITE.

Placer Chrome Company Plant, is located near Rattlesnake bridge, 7 miles from Newcastle. This company's old mill, described in our Bulletin No. 76, was finally dismantled and abandoned in February

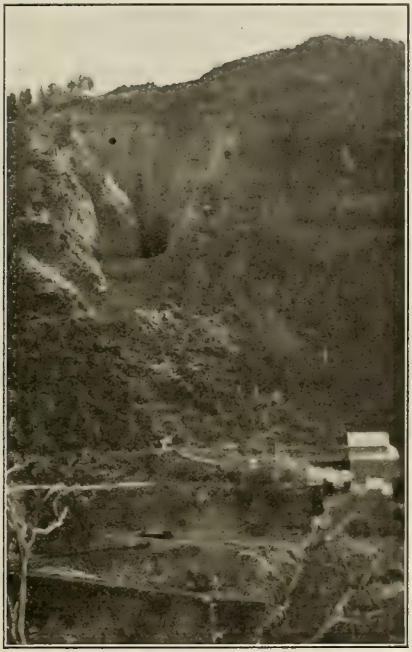


Photo No. 55. Quarry and loading plant at Mountain Quarry property of Pacific Portland Cement Co., on Middle Fork of American River in El Dorado County.

1920. A new mill building was put up at the foot of the 1700 ft. gravity tramway, and part of the machinery from the old mill was put in it. Milling began in January or February and continued till November, as orders came in; plant closed in November.

The reduction equipment consists of gyratory crusher, Hendy 50-ton ball mill, 4 Overstrom concentrators and a small ball mill to regrind middlings. Electric power was used. The ore as mined averaged about 15% Cr_2O_3 and the plant turned out about 5 tons of concentrate a day

when working, but was only operated when orders were received. Ten men were employed when running full handed. Concentrate ran 50% Cr_2O_3, or better, and was used a good deal for chemicals and tanning. Product was hauled to Newcastle at a cost of $1.75 a ton, for shipment.

LIMESTONE AND ITS PRODUCTS.

El Dorado Lime and Minerals Company continue operation at their quarry and plant on the Placerville branch of the Southern Pacific Railroad a few miles west of Shingle Springs. This property is about 130 miles from San Francisco. It furnishes a very high grade white limestone at a low price for many industrial uses.

Farmer Lime Company. Blake and Farmer, Newcastle, California. Quarry, crushing plant and kilns are near Alabaster Cave, 7 miles east of Newcastle. This company is working a large upright lens of pure gray limestone, by open quarrying. The product is hauled in auto trucks either to Newcastle for railroad shipment or to local users.

The plant for grinding raw limestone comprises a Dodge crusher, Beers roller mill, belt conveyor, and bins for coarse rock and ground product. Capacity is about 20 tons daily, to pass ¼-inch screen. Electric power is used. For burning lime there are 3 upright oil fired kilns with a capacity of 150 tons a month each. Ground raw limestone is sold chiefly as a soil corrective and fertilizer. Burnt lime is sold locally to cyanide plants, and to farmers for tree spraying and fertilizer; it also finds a market through the foothill country.

Pacific Portland Cement Company continues the operation of its immense Mountain Quarries, on the south bank of the Middle Fork of American River 2 miles due north of Cool. The limestone is shipped to the company's cement plant at Cement in Solano County. The quarry is connected by the company's own broad gauge railroad with the main line of the Southern Pacific Railroad about a mile below Auburn. This road crosses the river on a concrete bridge and was an expensive work, which was justified by the immense amount of limestone available and the needs of the company. The limestone is blasted down from the open quarry face, now several hundred feet high, and falls through a shaft to bins and thence to cars hauled by trolley locomotive to the storage and loading bins, which deliver to the railroad cars.

There are large undeveloped limestone deposits in the county, particularly in this same belt extending from the river south past Cool.

SOAPSTONE.

Brandon Soapstone Deposit. Leased on royalty to C. S. Swift of Latrobe and W. S. McLean of San Francisco. It is about ¼ mile from Brandon spur on the Placerville branch of the Southern Pacific Company. A fair grade of grey soapstone had been found by a short crosscut and drift, but the lens seemed to be pinching down, being only about 2 feet wide when property was visited in May. A carload had been shipped to San Francisco.

Shingle Springs Soapstone Deposit. Leased on royalty to A. W. Prouty, Silas Granger and Cyril Heusner, all of Shingle Springs. Pit is about a mile east of Shingle Springs station. Four men including 2

of the lessees and a teamster, were employed when the property was visited in the summer. Soapstone was being shipped under contract to roofing manufacturers. A lens of greenish fissile soapstone had been traced for several hundred yards and had been worked in places by shallow pits. It was wheeled in barrows to a dump, loaded on wagons and hauled to the railroad for shipment. Buyers require a rock free from iron oxide stain so a good deal of hand sorting is done.

Swift Soapstone Mine. C. S. Swift, owner, Latrobe. The mine is about 300 yards from Swift spur on the Placerville branch of the Southern Pacific Company. The soapstone has been opened to considerable depth by a crosscut tunnel 350 feet long, with a drift 250 feet long in soapstone, with stopes and raises for mining. Some of the workings are going to prove hard to hold open. The rock is mined by hand labor using augers and drills, and is hand trammed to the bins beside the railroad where it is loaded into the cars. This is the largest operating soapstone property in the northern part of the state and is the best located.

The rock is hard and somewhat gritty, but has a uniform light gray color, which is an important property. The output is contracted to a large San Francisco firm for years. On the surface the rock is stained considerably by iron oxide but this defect does not appear in the mine, as in depth the iron minerals appear as black unoxidized specks.

NEVADA COUNTY.

This county was long the leader in gold production but of late years has been alternating with Amador County for second place, both of them falling behind Yuba County because of the adverse conditions which have been felt more severely in lode mining than in dredging. However, Nevada County far exceeds all others in point of total gold production.

With most of the hydraulic mines in the county closed, most of the gold comes now from the deep quartz mines at Grass Valley. There is some prospecting of drift mines, but although several of these promise early returns, none of them are producing on an important scale at present. Copper properties have not been worked in late years, although there are several former producers on the Foothill Copper Belt in the western part of the county. Asbestos, barite and chromite have been produced on a commercial scale lately. A granite quarry has been opened near Nevada City.

The mines of the county have been described at such length in this Bureau's report, entitled "Mines and Mineral Resources of Nevada County," which was published in 1919, that it is only intended here to summarize some of the happenings in the indusry during the past year.

ASBESTOS.

Sierra Asbestos Company, office, 710 Union Savings Bank Building, Oakland; mine address, Washington, California. The property is 2½ miles northwest of Washington by road and 21 miles by road from the railroad at Nevada City.

The property, and the methods of operating the mine and milling the ore, were described by the writer at some length in the report cited above. During the past year the company has been devoting its time to the development of the mine and the enlargement of the milling plant. They have developed a new quarry, and have installed a new aerial tram, besides the one formerly operated. Larger screens and fans have been put in the mill, and a set of 42-inch crushing rolls have been installed. These additions give the mill a daily capacity of 250 tons of crude ore.

BARITE.

Off-color barite occurs near Wolf, on Spanish Ridge 6 miles north of Washington, and a mile by trail from the Liberty Hill Hydraulic Mine. The first two deposits mentioned are too far from the railroad to be available at present.

Democrat Mine. William Maguire, Nevada City, owner. This mine is in section 24, T. 16 N., R. 10 E., about 6½ miles from the railroad at Alta and a mile by trail northeast of Liberty Hill mine.

This is a large deposit of off-color barite of good grade. It outcrops on the point of a hill at an elevation of 3450 feet, overlooking the steep canyon of Bear River.

During the past two years the property has been worked during the dry seasons and important production has been going on. During 1920,

Metals and Chemicals Extraction Company operated the property and shipped the ore to their plant at Melrose. It was treated there and the refined white barite was sold for use in lithophone and paints. The percentage of barium sulphate in the crude ore was high enough to permit shipment just as it was broken down in open cut workings. There is no overburden on the deposit. The only impurity, besides a minute amount of coloring matter, is silica, which occurs mixed with the barite in parts of the deposit. The ore was hauled to Alta in trucks for shipment. The hauling season is six to seven months.

GOLD QUARTZ MINES.

The year 1920 has been a very discouraging one for the mines of the county, and particularly for the quartz mines. There have been shutdowns, directly attributable to the unfavorable labor situation and to continuing high costs of power and materials. In the late summer and fall there was a power shortage which occasioned a so-called apportionment of power. This forced a curtailment of mining and milling operations. A great deal of dissatisfaction was evident in the county regarding the orders of the power administrator. They felt that their industry was not receiving the consideration to which it was entitled by virtue of its importance and the conditions under which it is being carried on. During the past summer an attempt was also made by the power company to deprive the mines at Grass Valley of the water supply which they had been using for power purposes since the early days. The rights of the mining companies and riparian land owners were so firmly established by use and so well grounded in justice that this effort failed. In cases of this kind it is unfortunate that the mining industry, in spite of its prime importance, is represented by such meager voting strength. The mining industry needs a state organization which will have to be as watchful of its members' interests as are the labor unions, for example, in legislative matters. The first step in this direction is to break down the wall of reserve and independence which characterizes mining operators, a condition surviving the old days when the state was in the making, and there were no interests adverse to mining which had to be met.

Alcalde Mine (Kenosha or Seven Thirty). Operation on a small scale was continued through 1920. After it was found that the old mill and hoist on the property were worn out and inadequate, a 10-stamp mill, hoist, etc., were moved to the mine from the Golden Gate property. Small finds of "high grade" were reported from time to time. The largest of these, found early in September, was said to contain several thousand dollars.

Allison Ranch Mine. No valuable ore bodies have been found in the property by the present company, although a large sum has been spent for exploratory crosscuts during the past two years.

Champion Mine. North Star Mines Company. This mine, 1 mile from Nevada City, was closed the first of July, 1920, after having been operated several years without profit. The Champion produced in 1919 $261,546, at a cost of $250,450 for operation and $25,053 for develop-

ment. The closing of this property left the Nevada City district without a single producing quartz mine.

Delhi Mine (Consolidated Mine). Four miles north of North Columbia. After several attempts to reopen the mine in recent years, work was begun late last fall to use the water for generating electric power to sell to a local power company. The mining company has 14 miles of ditch and rights to 1200 miner's inches of water which can be delivered under 263 feet head.

Empire Mine. Because of its strong financial condition and the high grade of ore, this company has been able to continue work at full capacity throughout the year, except for curtailment caused by the power apportionment. Operations have been consolidated by adding 20 stamps to the Empire mill and abandoning the Pennsylvania mill. Ore from the Pennsylvania mine is now taken to the Empire mill by electric tram.

Grass Valley Boundary Mines Company, M. J. Brock, superintendent. The property is in the western part of the town of Grass Valley, and comprises about 30 acres. There are some old shallow shafts on the property, which have been cleaned out. Specimen ore was reported in the bottom of one of these at a depth of 100 feet. A five-stamp mill and a vanner were put up during the summer of 1920, and some rock from the dumps and from the shaft was milled.

Idaho-Maryland Mines, J. A. Fulton, manager. The main shaft was unwatered to the 1000-ft. level early in 1920, and it was believed that the work of cleaning out the lower levels would be under way before the end of the year. However, the curtailment of electric power delayed work and the lower workings have not yet (January, 1920) been unwatered below 1400 feet. Some progress has been made in clearing the levels above 1000 ft. A 20-stamp mill has been moved from a neighboring property owned by the same company and some ore taken from the old upper workings by tributers has been milled. The company has bought the Eureka and Roannaise properties since the last report.

Le Duc Mine is 2 miles southeast of Grass Valley. The Le Duc Mining Company has been prospecting this property for eleven years in a small way, but to date have found no pay shoots, although about 4,000 ft. of drifts and crosscuts have been driven. There are five veins on the property, but these are covered by andesite on the northern portion. The Alta gravel channel also crosses the property.

Norambagua Mine. Three Sevens Mining Company; K. R. Pell, secretary, 452 Fifth avenue, New York City. Mine is 4 miles south of Grass Valley, near the Auburn highway. The property was worked during 1919 and the first four months of 1920. The vein here averages only seven inches in width, strikes N. 30° E., and dips east 12 degrees near the surface, but steepens to 33 degrees in depth. Both walls are hard granodiorite. When the mine was visited late in 1919 the Oriente (main) shaft was 1100 feet deep on the dip of the vein, giving a vertical depth of 414 feet. When visited in October, 1920, the plant was

closed, but the shaft was said to be down to 1300 feet. The vein was stoped out above the 500 level by former operators. New levels called 600, 800 and 1000 levels were opened in 1919 and 1920, and each of these was drifted several hundred feet. There is also a drain tunnel called Campbell Adit, 900 feet long. The Redmange winze from this adit level is 350 feet north of Oriente shaft, and is connected with it by a drift on the 700 level. This drift is said to be on a new vein which is 20 feet from main vein at the Oriente shaft. The vein carries very fine free gold and auriferous pyrite and arsenopyrite. The ore in the shoots was high grade, carrying sometimes as much as $100 a ton.

During the early part of 1920 the property was equipped with a new mill, containing twenty 1250-lb. stamps and 4 Wilfley tables, and a complete mine plant, including hoist and compressor, all supplied with electric power. The mill was run only a few days in April and the results were reported unsatisfactory. Following this the property was closed.

Normandie-Dulmaine Mine. Leased to Normandie Mining Company, with which are identified E. A. Featherstone, Mack Sennett, A. B. Greenwald et al. The property comprises 102 acres in Deadman's Flat district, 3½ miles southwest of Grass Valley.

Desultory work has been done here for the past two years. There is a small mill on the property. Three veins have been worked in the past through shallow shafts and cuts. The veins carry some small bunches of free gold and auriferous pyrite, chalcopyrite and galena. Lately, work has been planned in search of the Alta gravel channel, which they think extends across the property.

North Star Mines. North Star Mines Company, Grass Valley district; A. B. Foote, manager.

This property has been operated at about one-third capacity during 1920, only 20 stamps of the 60-stamp mill having been in use most of the year. At the end of 1920 only about 110 men were employed, as compared with a full crew of 350 in normal times. Several reasons were given for reducing their operations. First it was felt that many of the miners were not doing a full day's work. It was also claimed that the company was unable to get miners for development work at wages they could afford to pay. Being unable to break enough ore to keep the entire mill running, it was necessary to drastically reduce the force in all departments. During 1918 and a large part of 1919 no development work was reported. The gross production for the fiscal year ending in April, 1920, was $917,999. After paying all expenses and writing off the annual allowance for depreciation of the plant and depletion of the mine a net loss of over $134,000 was reported for the year's work. The cost of producing an ounce of gold at this property is said to have increased from $9.51 in 1913 to $18.04 in 1919, and was still increasing at the end of the latter year, as evidenced by the following figures for the cost of mining and treating a ton of ore:

Total cost per ton treated—
1914, $4.94; 1917, $6.70; 1918, $7.80; 1919, $7.94; last six months of 1919, $8.40.

About the beginning of 1921 the scale of operation was increased somewhat. The lowest level is at 6300 feet on the dip of the North Star vein, or 2500 feet vertical depth. On this level the North Star vein

meets the west-dipping "X" vein, which seems to be going down. The stoping during the last two years has been on the 3400, 4000, 4700, 5000 and 5500 levels principally.

The tailings excavator described in the last report was not a success, and the course of Wolf Creek past the cyanide plant has recently been changed to leave room for tailings storage adjoining the plant.

Red Ledge Mine. Washington district, 3 miles from Washington, near the Nevada City road.

This mine has a record of producing considerable coarse crystallized gold in past years. During the war the owners ceased gold mining and produced a large amount of high grade chromite from the property. The search for gold has been resumed since the price of chromite fell. An old lower crosscut has been extended during the past season, and a little high grade ore has been reported. There are a small mill, compressor and hoist on the property. The mine is owned by Williamson Brothers of Washington, and is being operated now under the direction of Lewis Hind.

St. Louis Mine (Neversweat Mine) is in Willow Valley district, three miles from Nevada City. H. H. Estee, manager.

Considerable new work has been done during the past year. Years ago an ore shoot 200 feet long was stoped from the old tunnel level to the surface. The ore carries a good deal of silver. Estee moved a 10-stamp mill from the old Jenny Lind gravel mine to the St. Louis mine during the past summer and was prepared to begin milling in the late fall.

South Star Mine. South Star Gold Mines Company, A. W. Johnson, president. The property comprises the South Star and Mill Site patented claims and Sumner and Alta locations, in Rough and Ready district, sections 30 and 31, T. 16 N., R. 8 E., 3 miles from Grass Valley.

There are three old shafts on the property which yielded a little specimen ore years ago. The present company has cleaned out the old workings and has done some prospecting to a depth of 100 feet in two of the shafts, one of which they plan to sink deeper.

Sultana Mine. Grass Valley district, adjoining the Empire mine. The 20-stamp mill at this property was in operation during part of 1920.

DRIFT MINES.

Alta California Gravel Mine. Rough and Ready district. Work has continued on a small scale at this old mine during 1920 and a small production was reported.

Alta Combination Mines Company (Baltic Gravel Mine). H. L. Ostrander et al. The property is in sections 20, 29 and 30, T. 16 N., R. 8 E., 3 miles west of Grass Valley. The tunnel used years ago to work the Baltic quartz vein was being cleaned out during the past summer. It is planned to extend this tunnel in search of gravel.

Gold Lead Placer Mines. North Bloomfield district. Oscar Coffin, superintendent. Covers old claims formerly called the Hawkeye and Renown, which were producers years ago. There is an old tunnel about 1400 feet long and some drifts in rim gravel.

During the summer and fall of 1920 some of the old works were being cleaned out and a camp was being established, in preparation for exploring the channel.

Penn-California Mining Company. C. L. Walther, president, Woodlawn, Pennsylvania; A. W. Hoge, general manager, Nevada City. The property is in Willow Valley district, 3 miles from Nevada City by road, at an elevation of 3000 feet. The property is a consolidation of the Doolittle, Lone Star, Cold Springs, Buckeye, West, South and East Buckeye, Montana, North Montana and Montana Extension, Willow Valley and Fountain Head claims, containing in all 948 acres, of which all save 25 are patented. The Doolittle, Cold Springs and Fountain Head are drift mining properties and the Buckeye-Montana-Willow Valley group are quartz claims. The first named have been partially opened and mined, and the latter group has been prospected and mined through a number of shafts, as described in our past reports.

The company has been driving a new bedrock tunnel starting about 1000 feet east of the Cold Springs tunnel, which is said to be the most easterly of the old workings on the main Harmony Channel. This tunnel has been driven probably 1500 feet by the end of 1920; when visited late in May, 1920, it was 1250 feet long. It is in granodiorite all the way. About 1200 feet in, a raise was put up 55 feet to the west, and a drift run 165 feet. Raises from the latter broke into old workings which were badly caved but are connected with the surface through an old inclined shaft. These old workings are supposed to have been run by a man named Doolittle, who is said to have mined a channel 80 feet wide for a length of 200 feet. It is not considered by the operators to be the Harmony Channel; it is reported that two channels were cut in the Cold Springs tunnel and this is thought to be the smaller of the two. The course of the main Harmony Channel is not definitely known after leaving the Cold Springs property, so the exact distance the new tunnel will have to be driven before striking it is problematical; A. W. Hoge estimates the tunnel will have to be 2150 feet long.

The property is equipped with a 50-h.p. motor, air compressor of 2 drills capacity, a mill containing 2 rock breakers and fifteen 900-lb. stamps; there are 1500 feet of T-rails and a few ore cars in the tunnel and a blacksmith shop.

Union Mine. Chris Jorgensen, operator. It lies in Relief Hill district, 4 miles from North Bloomfield. This old producer has been worked on a small scale by Jorgensen in recent years. One monitor is used in washing the gravel brought out of the tunnel. Jorgensen met accidental death at the mine in February, 1921.

There has been considerable work done in the You Bet, Red Dog and Quaker Hill districts in the past three years, but water supply and labor conditions have not been favorable, and as far as known there has been no recent production.

The Quaker Hill Mines Company did considerable work in 1920.

The You Bet-Red Dog Gold Mines Company has been preparing for hydraulic mining, and has procured permits for hydraulic mining.

Work has also been done clearing the old Nevada Tunnel at Red Dog. Lately this company transferred its lease, covering about 1300 acres, to Sydney B. Wood.

HYDRAULIC MINES.

Liberty Hill Mine. William Maguire, owner. W. S. Bliss et al., lessees. The mine is 6 miles from Dutch Flat, on the west side of Bear River. After the mine had been equipped and ditches and reservoirs had been repaired, a few short runs, amounting in all to less than a month's work, were made during the past two seasons. The water supply, particularly last year, was insufficient to permit much piping. Mining was resumed in the winter of 1920-1921.

Omega Mine. This property is 3 miles southeast of Washington. Theodore Larsen continues the operation of the mine on a small scale.

PLACER COUNTY.

Clay of various grades, chromite, coal, copper, gold, granite, limestone, marble, quartz, and iron have been produced here in commercial quantities. A little asbestos has been produced and magnesite and ocher have been prospected. Silver occurred with the gold in the veins in the Ophir district and on Duncan Hill but has never been mined separately. Molybdenite has been noted in different granodiorite areas, usually remote from the railroad.

CHROMITE.

Dan Sullivan of Alta has shipped several carloads of high grade chromite from Alta during the past summer. The chromite was mined about ten miles from Alta and had to be packed part of the way.

There is considerable good quality chromite still available in this county but market conditions have not encouraged mining it.

CLAY.

The clay resources of the county have been discussed in this Bureau's Preliminary Report No. 7 "The Clay Industry of California," published in January, 1920, which may be had free from the main and branch offices. Placer's clay resources are only partially developed and railroad facilities offered by the two lines of the Southern Pacific Railway are favorable for the expansion of the industry.

COAL.

Lignite was mined at and near Lincoln thirty to forty years ago and was shipped to Sacramento where it was retorted for the gas it contains. These lignite beds are rather wet and required considerable timbering.

Lincoln Clay Products Company owns land 1 mile from Lincoln which is partly underlain by lignite. Drilling has revealed two bodies of the lignite, lying at depths of from 48 ft. to 70 ft. below the surface. The lignite beds are from 7 ft. to 15 ft. thick with a pink clay roof and blue clay floor. The beds are nearly flat and the lignite is similar in origin and character to that in Amador County. Old shafts and caved ground on this property indicate that an area of perhaps 6 to 8 acres has been mined. The competition of other fuels and the increasing cost of labor and timber are said to have caused suspension of operations. There were other old workings directly under the town of Lincoln.

COPPER.

The foothill copper belt traverses the western half of the county. There has been no copper mining here during the past year, although there were formerly producers at several localities, particularly in the foothills east of Sheridan and Lincoln, near Ophir and a few miles northwest of Clipper Gap.

GOLD.

This county's drift and hydraulic mines particularly have been heavy producers of gold. The recorded production of about $32,500,000 in the past 40 years, together with an equal or greater amount produced in the 30 years preceding 1880, came chiefly from surface placers, drift and hydraulic mines. It was stated in 1868 that the mines within rifle shot of the express office at Forest Hill had produced at least $10,000,000.

In spite of such a splendid past history, there has been comparatively little gold produced in Placer County for several years, and most of that produced has come from one dredger on American River and one quartz mine in the Ophir district. Conditions prevailing in recent years have been unfavorable for all forms of gold mining, and particularly for the investment of considerable sums of money in mining. Placer County has many drift, hydraulic and quartz properties which offer fair promise to anyone equipped with sufficient money and experience to carry development to a conclusive point. Few of the quartz mines have been opened to depths greater than 600 feet.

QUARTZ MINES.

The history of the county's quartz mines has never been adequately covered; but the aim of the State Mining Bureau is to keep in touch with current mining development as well as to record past operations. As little quartz mining has been done in the county in 1920, only a few properties are mentioned. Some notes on mines not previously covered in detail are included because they have been the subject of inquiry during the past year.

Booth Mine. Slosson and Spinney Estates. Address E. P. Slosson, Auburn, California. Located on Duncan Hill in sections 8, 9, and 16, T. 12 N., R 8 E., about 2 miles by road from Auburn. Comprises 10 acres, patented, covering 338 ft. in width and 1600 ft. on strike of vein.

The vein strikes a few degrees north of west and dips 62° S. It has an average width of 40 inches and is a solid quartz vein, filling a fissure in amphibolite and diabase near the surface but probably passing into diorite or granodiorite in depth. The Booth vein appears to be the east extension of the Bullion vein. This mine was located about 1871. There is a shaft 180 ft. deep on dip of vein and 4 levels were opened at 40, 70, 90 and 150 ft. deep. The vein was drifted 240 ft. west and 150 ft. east on 40 ft. level, 92 ft. east and 26 ft. west on 70 ft. level, 25 ft. east on 90 ft. level and 25 ft. east and 98 ft. west on 150 ft. level. The past production reported as amounting to over $60,000, came from the shaft, from the surface, and from about 50 tons stoped near the shaft to a depth of 90 feet. Slosson reports numerous high assays from the vein in place, notably $39 a ton from the 70 ft. east drift and an average of $12 a ton for 46 assays, included in which were 12 assays from the 150 level. These included the vein as it came; some spots are rich in galena and pyrite. An average not including any specimens is thought to be $4 gold, $1.50 silver and $4 lead and copper (at pre-war prices). No zinc or antimony was reported. There are said to be 4200 tons ready to stope between 150 level and surface, as soon as the water is pumped. Property is equipped with a small engine and pump and

dwelling. A water ditch and electric power line cross one end of the property.

Centennial Mine. Wm. Walsh, Auburn, owner. Contains 10 acres, covering 1600 ft. of vein, in section 17, T. 12 N., R. 8 E., on Duncan Hill, 2 miles southwest of Auburn. The vein is about 30 inches wide but pinches down at intervals and fills a fissure between a hard footwall and a heavy hanging wall, both of amphibolite schist. It strikes N. 80° W. and dips 70° S. and has been proven over the length of the claim by 11 or 12 shafts. After these shafts were sunk, a tunnel was started and was driven the whole length of the claim, evidently with the idea of milling the whole vein. This tunnel was in two sections, 900 ft. and 700 ft. long, connecting a few feet apart vertically, with one of the old shafts. A heavy gouge, said to be 10 ft. wide was encountered on the hanging wall about 300 ft. inside tunnel, as a result of which the tunnel is now badly caved.

The production at this property was from the shafts, which were sunk to about the tunnel level (180 ft. below outcrop). The ore occurs in small rich shoots, 2 ft. to 50 ft. long, and the formation of these rich bunches appears to be influenced by "iron crossings," the miner's term for zones rich in pyrite and chalcopyrite in the amphibolite. These zones dip east, and the rich shoots, lying in the intersections of the iron crossings with the vein, pitch east and are said to cross the vein diagonally from hanging wall to footwall in their downward course.

A winze put down 80 ft. from the portal below the tunnel level is said to have yielded several hundred dollars, tending to indicate that the pay continues.

The quartz near the rich bunches is a greyish, dead looking rock carrying only a little pyrite. The estimated average value of the ore in the rich shoots was $8 to $12 a ton, but the vein as a whole is low grade, considering present costs of operation. The Centennial is credited variously with a production of from $150,000 to $400,000.

Conrad Mine. Wm. Walsh, Auburn, California. The mine is in section 17, T. 12 N., R 8 E., 2 miles from Auburn, a few hundred feet south of Centennial Mine on Duncan Hill.

The claim covers about 1200 feet along the vein, and like the Centennial was worked at times from 1868 to 1890. The vein dips 40° to 50° south and is parallel to the Centennial. It averages about 2 ft. wide but pinches down at places. It lies between amphibolite walls.

The mine has been worked through a tunnel 784 ft. long (180 ft. below outcrop) which is open all the way, and shafts have been sunk from the surface and raises put up from tunnel level wherever pay was found. There is a winze about 60 feet below tunnel level, but it is said to be off the pay shoot. The largest pay chimney was found 30 ft. above the tunnel and yielded $15,000. The property is credited with about $50,000 production.

The ore resembles that in the Booth more than the Centennial, and is said to run from $4 to $8 a ton away from the rich chimneys.

Crandall Mine. Owner, T. F. Jull, Auburn, California. Lessee with option, Unitania Mining Company. Property comprises Cox and Denton patented claim 300 ft. x 1400 ft., Sacramento (agricultural patent) 230 ft. x 1320 ft., and North Star and Florence May locations,

2 full claims in section 8, T. 12 N., R 8 E., on Duncan Hill adjoining Booth mine on the west, and two miles from Auburn by road.

The Crandall tunnel has been driven 410 ft. on the Crandall (Cox and Denton) vein; a shaft has been sunk 90 ft. from the surface and a winze has been sunk 65 ft. from the tunnel, giving a depth of 245 ft. on this vein. The vein pinches and swells, but runs about two feet wide. It appears to be in line with the Booth vein, but there is a break at the end of the Booth; this may be only a surface slide. Other smaller veins called the Hunter and Sacramento average about one foot wide. Hunter vein has been opened by a shaft 85 ft. deep and a tunnel 200 ft. long. Sacramento vein has a tunnel 75 ft. long.

Eleven of the small pay chimneys typical of the mines of Duncan Hill are said to have been found in a length of 400 ft. on the Cox and Denton vein. To a depth of 30 feet the ore milled gave $16 a ton; below that depth it is said to have averaged $6 a ton. Concentrate assays $55 to $100 a ton and makes up 2% to 4% of the ore. The same mistake has been made in the past at the Crandall as at other mines in the district, namely the attempt to mill the entire vein. In view of the fact that payable ore has been found at mines nearby at depths twice as great as those so far attained in the Crandall and other mines mentioned above, it appears entirely possible that such ore may be found in depth here. It has been claimed that the Booth and Crandall vein is the same as the Bullion vein worked in the Oro Fina Mine. This is quite probable but has not been proven, as the outcrop can not be traced continuously, and there are several parallel veins at both ends of the system.

There is a mill of five 1200-lb. stamps, a 10″ x 14″ Blake crusher, an old Deister concentrator and a 12-h.p. Bull Dog gas engine, on the property. There is an electric power line 800 feet distant and water for milling is available.

Canada Hill Mines. Henry Snyder, E. Armstrong, et al., Nevada City, owners. Metals Exploration Company, lessee, 120 Broadway, New York City. The claims are in Canada Hill district, in section 9, T. 15 N., R. 13 E., 24 miles by road from Forest Hill and 44 miles from Auburn. Elevation 6225 feet at Beauty shaft. There are two groups of claims, called Beauty Group, containing 10 claims and Nob Hill Group of seven claims, each covering 4500 feet on the strike of the veins.

A shaft was put down 30 feet on the vein on the northeast end of the Beauty claim, and an upper tunnel was run about 200 feet. These are said to have exposed a vein of quartz 1½ to 3 ft. wide, striking northeast and giving a good prospect. During 1919 and 1920 the lessee drove a lower tunnel 800 feet westerly and northwesterly to strike the vein below the shaft. This is a crosscut for 600 feet. It struck heavy ground about 650 feet in and follows a crooked course thence to the face. The face in October, 1920, showed a few narrow quartz stringers and a gouge one foot thick. The property was idle at that time.

Several prospect tunnels have been driven on the Nob Hill claims There are several outcroppings of quartz here, varying in strike from N. 10 W. to N. 20 W. These veins were of fair width and assayed well on the surface.

There is a good building near the Beauty claim and a 5-h.p. gas engine, blower, two ore cars and 800 feet of track at the lower tunnel.

Elizabeth Mine. John Watson, Penryn; lease and bond to E. C. Montgomery of Auburn, and others. This old mine is at Stewarts Flat about one mile east of Penryn by road, on Secret Ravine. It consists of one fractional claim.

The vein is quartz, 12 to 20 inches wide, strikes N. 7° E., and dips nearly vertical. It was opened in the early '60s to a depth of about 120 ft. and the vein is said to have been drifted 380 feet in good pay ore, which kept a 5-stamp mill in operation from 1862 to 1864. Both walls of vein are granodiorite. The quartz carries 1% to 2% pyrite and galena. A cyanide plant was put up on the property about 25 years ago and ran long enough to treat ore from the old dump, but this company is said to have broken up without having taken any ore from the mine.

A small headframe has recently been erected and a pump and gasoline engine have been installed. The shaft has been cleaned out and unwatered to a depth of about 90 ft., after considerable difficulty, as it is in a good sized drainage basin. It is hoped the old workings will soon be cleared and the vein prospected.

The surface of this district was rich placer ground and the adjoining Chicago Quartz Mine was worked to a depth of about 600 feet.

Oro Fina Mine. Oro Fina Mining Company. Haines Gridley, secretary and treasurer, Auburn, California, is in charge of the mine, which is in Ophir Mining District, in sections 7 and 8, T. 12 N., R. 8 E., about four miles by road west of Auburn. The property contains 96 acres, patented, covering about 4500 feet along the strike of vein. The vein pinches down in places, but runs as a rule about 2 ft. wide, having a width of 16 inches where it enters the granodiorite on the 700 level. It strikes a little north of west and dips 65° S. Both walls are amphibolite in the upper levels. The mine is near the granodiorite contact, but work on the 700 level has not gone far enough to show whether the granodiorite is the main dome lying to the south, or is a dike branching from it. The vein appears to continue into the granite without lateral displacement or loss in value.

The new shaft on Bullion No. 1 claim is 730 feet deep on an angle of 72° in the hanging wall. Six levels are open, called 200, 300, 400, 500, 600, and 700 levels. This company began work in 1913 and sank all this shaft but 50 feet. It connects on 300 level with the old Bellevue shaft, 312 ft. deep. No. 2 level is open 1080 ft. east and 130 ft. west; No. 3, 1400 ft. east and 800 ft. west; No. 4, 1250 ft. east and 200 ft. west; No. 5, 300 ft. east and 500 ft. west; No. 6, 900 ft. east and No. 7, 100 ft. east.

Ore shoots have been worked on both sides of shaft, for lengths of 150 to 250 ft. The vein just west of shaft was of low grade, but apparently not cut off, in the contact zone between 600 and 700 level, at the granodiorite contact. It is said to be of good grade in the bottom, where it passes into the hard granodiorite. East of shaft, No. 7 level must be driven several hundred feet to strike the large ore shoot worked above the 600 level. This region is still well above the contact zone. The vein carries a small amount of sulphides, averaging 1% pyrite, worth $60 a ton.

The mine is equipped with an Ingersoll Rand Imperial air compressor, capacity 600 cu. ft. of free air a minute, operated by 100-h.p. motor, hoist with depth capacity of 1200 ft.; operated by 50-h.p. motor, drill sharpener and oil fired forge. There is a pump with capacity of 200 gal. a minute on 500 level, one of 150 gallons capacity on 300 level and a sinker pump on 700 level.

The mill was built in 1915 and contains rockbreaker, ten 1000-lb. stamps dropping 6½ to 7 inches 100 times a minute, and one each Deister sand and slime concentrators. The capacity of mill is 35 to 40 tons in 24 hours.

A comparison of costs of operation (not including any charges for depreciation of plant and depletion of ore), for the years 1916 to 1919, inclusive, shows the constantly increasing weight of those conditions that have forced or hurried the closing of nearly every mine with low or medium grade ores in California.

Operating Costs at Oro Fina Mine, 1916-1919.

(Courtesy of Haines Gridley.)

Costs per ton mined	1916	1917	1918	1919
Mining	2.92	3.37	4.44	4.52
Milling	.79	.95	1.04	.99
Concentrating	.12	.10	.11	.13
Other costs (pumps, insurance, etc.)	.85	1.25	1.25	1.57
Total, exclusive of development	4.68	5.67	6.84	7.21
Development	.87	2.18	.58*	None done
Total operating cost	5.55	7.85	7.42	

*Very little development done in 1918; no development done in 1919.

Timber which cost $14 a thousand feet in 1916 now costs $43. The price of electric power has been raised repeatedly. First there was the 20% surcharge. This was followed by a raise of ¼c per k.w.h. On top of this, another 15% increase was levied. It is said to cost $68 a month now to run the pumps, hoist the skip occasionally, and satisfy the "stand by" charges.

This mine has produced about $430,000 in the past five years. The property was closed down on December 31, 1920, but underground work was resumed in February, 1921.

Rising Sun Mine. Rising Sun Consolidated Gold Mining Company has a lease and option to purchase; John Zeeman, president; E. C. Klinker, manager. The mine lies in section 33, T. 15 N., R. 9 E., about a mile and a half west of Colfax, by road, at an elevation of 2300 feet. Property includes the Rising Sun patented claim 3000 feet long, and other patented land; total 440 acres.

The vein, which averaged 18 inches wide in the upper levels, but is wider in the bottom, strikes northeast and dips 85 degrees south to the 7th level, where it rolls over and reverses its dip in 20 feet. Below this roll, the vein increases in width and becomes softer. Above the 7th level, vein was said to have been extremely hard in the old workings. It lies between hard diabase walls.

The mine was opened in 1866 and was operated until 1874 with a 5-stamp mill, and from then till 1880 with a 10-stamp mill which crushed 12 to 15 tons of ore a day, six days a week. The deepest shaft is 749 feet deep, and there are ten levels. There are two other shafts west of the above, one sunk to the fifth level, the other to the third. Levels are said to have been driven about 150 feet west and 400 feet east of main shaft. On west of shaft there was a pay chimney about 40 feet long which was so rich in free gold on the first four levels that the gold is said to have literally held the quartz together. A north and south crossing apparently bounded the rich ore on this side and had probably influenced its deposition. East of shaft the pay was in stringers. The production under previous operators was over $2,000,000. The mine has been idle since 1884 until 1919, when the present company began work.

The workings had been completely unwatered early in the summer of 1920. A new headframe, compressor, hoist, and electric motors have been put in, and a new ten-stamp mill has been installed. The company is capitalized for 250,000 shares of a par value of $1 each.

Snowbird Mine. Nevada-Pacific Exploration Company, N. K. Cooper, president, 319 First National Bank Building, San Francisco. The property is near Sugar Pine Mill, on the Forest Hill Divide.

The serpentine and peridotite belt passing through this region in a northerly direction is characterized by the occurrence of free gold, sometimes in attractive quantities, but often in a talc or talcose schist gangue, from which its recovery is a problem requiring a plant beyond the means of the average owner.

The above company has put up a 50-ton plant the past summer and has opened the property to a depth of 175 feet. They are said to have made a small production from high grade ore and there is said to be a promising showing in the lower workings.

DRIFT MINES.

Big Dipper Mine. McGeachin Placer Gold Company; lease and bond to Stanislaus Development Company, 1321 Baker Detweiler Building, Los Angeles; A. D. Hadsel, superintendent at mine. Contains 165 acres, 3½ miles by road from Iowa Hill and 12 miles from Colfax.

The property includes the Irish and Bryne claim, and Harmon claim, both patented. The old deep channel was supposed to have been worked out years ago. Mr. Hadsel believed there was a section of it left, where the channel turned and old works passed over it. He has done considerable work in the past 3 years including a long cut made with a drag-line scraper, and some prospect shafts. Several thousand cars of gravel from terraces off the old workings have been washed. Two to four men are employed part time.

The property is equipped with an old plant operated by water power. There are a rock breaker, grizzly, ten 950 lb. stamps, 24-inch, 36-inch, and 72-inch Pelton wheels, air compressor (capacity 2 drills) 700 ft. pipe line, drag line scraper and old buildings.

Blue Eyes Mine. S. S. Caples, and Mrs. Ella Caples, Sacramento, owners. Blue Eyes Syndicate, comprising F. A. Moss et al., have a 35 years lease with option to purchase. The property contains about

2800 acres and covers four miles along a ridge covered by andesite and glacial debris, lying northwest of Duncan Canyon, 20 miles by road and trail (2 miles trail) from Westville.

Unusually early snow and an impassable road prevented a trip to the property last October. A new section of road will be open next season which will greatly benefit the mines east of Canada Hill.

The property has been worked in a small way as a hydraulic mine. Moss's efforts have been confined to the development of a drift mine. A prospect tunnel 5 ft. x 6 ft. had been driven 800 feet in October, 1920, on the Gold Dollar claim. Gravel was first encountered in the present works in August, 1920, and was found to prospect well in gold. A small crew of men was employed and supplies were taken in to permit working through the winter. Cost of tunneling is reported at $3.50 to $4 a foot in soft ground and $8 to $10 near the face, in lava. A winze put down 55 feet near face of tunnel is in lava ash the first 35 feet and in fine gravel for 20 feet, with considerable water coming in. The tunnel will be driven ahead, as it is thought they are now crossing a deep hole and will bottom the channel ahead.

The channel is supposed to course northwest. The bedrock is slate and hard quartzite and quartzitic sandstone. The pay gravel is believed to be 50 ft. to 60 ft. wide. The tunnel is at an elevation of 4650 ft. but the property extends along the ridge to an elevation of 5800 ft. Water has not been brought in yet, but can be obtained from Spruce Cañon in sufficient quantity. By putting in a pipe line water could be taken from Spruce Cañon to Duncan Cañon giving a fall of 800 ft. for generating power. F. A. Moss, superintendent, Michigan Bluff.

Carmack Placer Mines (formerly called **Pacific Blue Lead Mine**). George W. Carmack, Seattle, Washington. The mine comprises 350 acres in sections 4 and 5, T. 15 N., R. 13 E., 24 miles by road from Forest Hill via Westville, or 44 miles from Auburn, at the head of Big Secret Cañon at an elevation of 6200 feet.

The probable course of the channel is west, but work done to date has not been sufficient to give an adequate idea of the dimensions, direction, or character of the deep gravel channel believed to exist here. Leo Harris, a former operator, drove an adit 350 ft. east from near the buildings and this adit, which is caved most of the way now, is said to have crossed above a section of deep channel which has not been bottomed. Through this portal he worked a bench or remnant of free white quartz gravel, 20 ft. by 60 ft. in area and 2 ft. to 4 ft. deep and evidently from the rim. This is well above the deep gravel and is possibly part of an earlier channel that has been cut by the deep gravel. The willow-covered flat between the house and county road seems to be worth prospecting for more of this older gravel.

Beside the creek, in a place where the chert, slate and quartzite rims are only a few hundred feet apart, Carmack has sunk an incline 70 ft. deep at 45°. In the bottom of this shaft the volcanic overburden comes down directly upon water-worn chert, seeming to show that the shaft has struck the rim bedrock.

Work was suspended October, 1920, but will be resumed next spring. Property has 2 cabins, a blacksmith shop, one 6-h.p. gas engine, a Gould

pump, cars, rails and tools. There is ample timber and water for mining.

Excelsior Mine. (See Mascot.)

Glenn Mine. Geo. McAulay, A. K. Robinson, Auburn, et al., owners. Leased to Frank Tillotson. It is six miles east of Last Chance on a lava-capped ridge northwest of Duncan Cañon, in the south half of T. 15 N., R. 13 E. The lower workings are in the NW. ¼ of section 34. The road from Westville to Last Chance crosses the property. As originally located the property contained about 650 acres. It lies at about 5000 ft. elevation.

The channel courses southeast and south. The work has been done on the south end of property, on the NW. ¼ of section 34 and adjoining part of section 27, on Grey Eagle and Outlet claims. A total of nearly 8000 ft. of underground work has been done on the mine. The tunnels have encountered a steep channel, interrupted at frequent intervals by falls, where abrupt rises, devoid of gravel, are found. The bedrock is schist and quartzite with pot holes, and the pay gravel, ranging up to 100 ft. in width, is cemented in the bottom and carries some glacial wash. The pay taken out lately has been mined chiefly by two sublessees, who have a piece of ground estimated to be enough for a year's work, and said to carry $5 a ton. Tillotson has had a small crew engaged on development work. The property is equipped with buildings, blacksmith shop, etc. Rich gravel was entered by Tillotson in March, 1921, in the lower adit, but the extent of the strike is not yet known.

Greek Mine. Martin, Burner, et al., of Forest Hill, lessees. On Little Secret Cañon, about a mile by trail from the old Secret House, in section 1, T. 15 N., R. 12 E., and 46 miles from Auburn by road. The Greek mine is supposed to be worked out up to the line of the Macedon property. The gravel channel passing through these two claims is thought to be the same as the one mined years ago in the Black Cañon workings about 8000 feet west. The Greek tunnel was run downstream, and would be out of grade in a distance of about 500 feet farther if continued into the Macedon. The old Greek tunnel, about 600 feet long, and the water right on Little Secret Cañon which has been used at the Greek mine, would be of limited use, therefore, in working the Macedon property.

Macedon Mine. Dr. C. W. Richards, et al., Sacramento, owners. In the southwest quarter of section 1, T. 15 N., R. 12 E., adjoining the Greek mine on the west. This property contains the westward or downstream extension of the channel worked at the Greek mine. The channel here has been worked only where touched in the Greek tunnel. A tunnel started on the Macedon years ago would be too high if continued to the channel.

Mascot Mine (formerly **Excelsior Mining Company**). Haines Gridley, Auburn, is trustee for the owners. The mine is about ½ mile southeast of Forest Hill. This property is thought to still contain 1500 feet of channel on the Blue Lead, which was worked in the Mayflower and Paragon, to the northeast, in years past, at a good profit.

The present operators, for whom Gridley is superintendent, have driven about 800 feet of new drifts and have advanced about 400 feet upstream. They work through the old tunnel. The gravel they have opened has been mostly low grade, and is thought to be in a long hole in the channel.

The property is supplied with electric power from a plant at Horseshoe Bar. Machine drills are used. There is a small stamp mill on the property, but the present company has not crushed much gravel.

Ralston Divide Gravel Mine. California and Hawaiian Development Company, owner; J. S. McCandless, president; office 859 Mills Building, San Francisco. The property consists of about 15 sections, 9600 acres, in townships 13 and 14 N., R. 12 E., and townships 13 and 14 N., R. 13 E., on Ralston Divide, between Long Cañon and Middle Fork of American River. The claims cover a length of about 14 miles. Of the total holdings, 1060 acres are patented and patents for more have been applied for. The mine is reached from Auburn via Michigan Bluff by 30 miles of road and 9 miles of trail; or via Georgetown to Barton's Cabin by 30 miles of road and 8 miles of trail. There is also an old road from Soda Springs station.

The present company has had the property since 1908, and has expended to date probably over $150,000 for equipment and development work on the portion for which patent is being sought.

Geologists and engineers believe that the channel under this property is the extension of the channel mined in the Paragon at Bath. The series of interstratified layers of gravel and rhyolite tuff is 160 feet thick or more, and is much wider than at Bath.

The portal of tunnel No. 1 is in the northeast ¼ of section 5, T. 13 N., R. 12 E. This tunnel is 7 ft. by 8 ft. in cross section and about 4700 feet long. About 2500 ft. of drifts and 1000 ft. of raises were run from this tunnel, and 15 diamond drill holes were put up. This work cost nearly $75,000.

Tunnel No. 2 is somewhat over a mile south, a little west of No. 1. It is 145 feet long, with an incline 153 feet long, and a crooked drift about 280 feet long from the foot of the incline.

Tunnel No. 3 begins near the center of the northwest ¼ of section 8, T. 13 N., R. 12 E., and has probably reached a length of 1600 feet by this time. It runs nearly northeast; 775 feet from the portal, a raise of 14 feet connects with the drift from the bottom of the incline from No. 2 tunnel. A good deal of this later work is along the channel. No. 2 and No. 3 tunnels are 8 ft. by 8 ft. in cross section.

There is a power house generating 100 h.p. on the lower part of Brushy Creek, from which a power line runs south nearly two miles to supply power for the compressor at No. 3 tunnel and for other needs. There are also blacksmith shops at No. 2 and No. 3 tunnels, sluices and camp buildings. All the above workings and plant are at Ralston's on the western end of the divide.

Besides the above, considerable has been done at the Goggins hydraulic pit, in the southeast ¼ of section 22, T. 14 N., R. 13 E. The hydraulic pit here is 500 feet long, 90 feet wide and 60 feet in average depth. A tunnel driven from this pit is 755 feet long in the direction of the channel (NW. and SE.) with about 750 feet of branch drifts. There is also a compressor house and compressor, blacksmith shop,

sluice boxes, camp and hydraulic equipment. The Lambert ditch, 22 miles long from French Meadows on the Middle Fork of American River, can deliver an ample supply of water for hydraulicking. There is an abundance of good timber on the property.

HYDRAULIC MINES.

There was no activity in hydraulic mining in the county during 1920. A little preliminary work was done at the mine named below early last year. This property has never been adequately covered heretofore in the Bureau's reports, and as it appears to be well worthy of attention, some data are given here about it.

Lost Camp Hydraulic Mine. Located in sections 22 and 23, T. 16 N., R. 11 E., 2 miles by road from Blue Cañon at an elevation of 4300 feet. There are 440 acres of patented land in the property, of which about 140 acres is mining ground. Under lease and option in 1920 to J. S. Day et al., trust deed held by E. T. Robie, Auburn.

The deposit contains interbedded layers of rhyolite tuff and auriferous quartz gravel lying on slaty bedrock. The best pay is said to be well above the bedrock. The direction of the old stream was westward. The gravel is free wash, carries no overburden, and the boulders are mostly of quartz and medium sized. A good amount of water is desirable in piping on account of the quantity of tuff in the bank. The ground lies on a bench between Texas Gulch and a branch of Blue Cañon Creek, and there are steep cañons on both sides.

The Slums Cut on Texas Gulch was on the rim on the northeast. It is said to have paid well for ground sluicing. The Miller Cut is on the rim on the southeast and is about two acres in area. It is said to have paid $80,000 for hydraulicking. The Boston Cut on the Blue Cañon side, is estimated to be about 600 feet long, 300 feet wide and 100 feet deep, covering about four acres in area. The total yield of the property is locally reputed at "several hundred thousand dollars," but it has been worked over such a long period by so many different small operators that a definite figure is hard to arrive at. Day made a short test run in the Miller Cut early last year and claims the result was very satisfactory. There is about one-third of a mile of channel remaining unworked between the east and west pits.

The property is equipped with 1500 feet of old pipe from 14 inches diameter down, one giant and a few hundred feet of sluices. A water right on Blue Cañon is owned but the two miles of ditches are in bad shape. Water can be bought during six months in winter and spring from Pacific Gas and Electric Company. The present pipe line gives 100 feet fall, but needs to be replaced. There is ample room for building a series of dams in Blue Cañon Creek for storing tailings. The bedrock cut in Boston Pit should be deepened to give grade for more piping on that side.

GOLD DREDGERS.

There is only one dredger in operation in the county at present. The dredger formerly operated by the El Dorado and Placer Counties Gold Mining and Power Company on the Middle Fork of American River, and the one operated by Lawrence Gardella at the old placer

mining camp of Virginia, between Newcastle and Lincoln, have both been out of commission several years.

Pacific Gold Dredging Company, 582 Market street, San Francisco, California. The dredger formerly operated by this company near Mammoth Bar on the Middle Fork of American River, finished work there about three years ago and has been moved to the North Fork of the river below Applegate. This dredger is now the principal gold producer of the county.

GRANITE.

Granite quarries were opened at Penryn and Rocklin immediately following the building of the Central Pacific Railroad and were in full operation until 1890. Many of the finest buildings in the state, including several in old San Francisco, were built of stone from these quarries. The demands of stonecutters for increased wages, the competition of manufactured building materials, and other causes, strangled the industry which formerly employed about 300 men.

The Placer quarries are advantageously located as regards transportation, being only 110 to 117 miles from San Francisco, and the stone is pleasing in appearance and of fine quality. That at Rocklin is fine grained and light colored, with only a little of the dark minerals in it. The stone at Penryn is coarser grained and with more hornblende. There is also a quarry beside the road two miles southeast of Penryn, where a beautiful gabbro, locally called "black granite," has been worked in a small way. This stone takes a fine polish and has been used for urns, vases and other larger work.

California Granite Company, Rocklin, has been operating its quarry at Rocklin during 1920. They have been filling an order for granite for the new Bank of Italy Building in San Francisco.

There are a number of small operators at Rocklin who employ one to three men each intermittently on small jobs.

IRON.

Hotaling Iron Mine. John Barnicott, Newcastle, owner. Property is 3⅜ miles by road west of Clipper Gap.

This deposit was found in 1866 and was worked until 1885, but the principal production was from 1880 to 1885. The ores were hematite and magnetite, containing from 40% to 65% iron. The principal workings were No. 1 shaft and cut, 250 feet deep on a hematite ore body 30 feet wide and 150 feet long, located 100 yards south of the old furnace site, and No. 2 shaft, which was 150 feet deep on a magnetite ore body 50 feet wide and 150 feet long, running 40% to 50% iron. The deposit is near the contact of granodiorite and the altered sedimentaries of the Calaveras formation.

The smelting plant between 1880 and 1885 included a blast furnace with 60-ft. stack and several bee-hive coke ovens, surrounded by a good-sized camp. Limestone for flux was quarried a few hundred feet from the furnace. Wood for charcoal was cut off an area of 25,000 acres adjoining the property. The high-grade hematite was mixed with the magnetite to give an average iron content of 55% in the

furnace charge. The furnace produced 30 to 35 tons of pig iron a day. Except for a period of three months required for rebuilding the plant after a fire, the furnace is said to have been in steady operation for the five years.

The pig iron was of high quality, and brought a price of about $35 a ton. It was used by the Southern Pacific Company for car wheels and axles. The property was closed largely on account of the competition of cheaper Alabama pig iron, which undersold the local product in the San Francisco market. The iron ore is not thought to be worked out, but the grade of ore remaining available would be considerably lower than that heretofore smelted unless new bodies of ore, now unknown, are found. There are several other small iron ore deposits in the vicinity of the Hotaling mine, and when the old furnace was running, the low-grade ores from these were often mixed with the

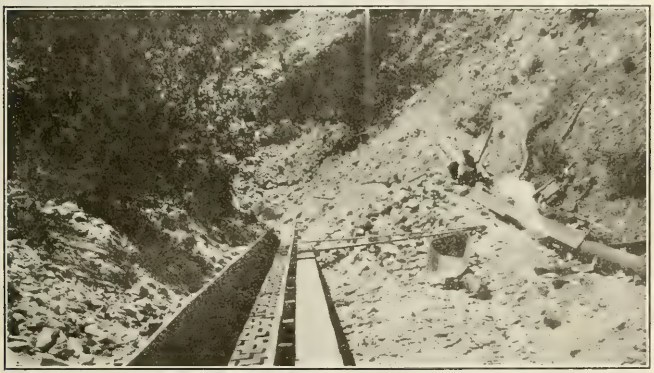


Photo No. 56. Pit and Sluice, Australia Hydraulic Mine, near Spanish Ranch, Plumas County.

higher grade ore from the Hotaling mine and smelted in small quantities.

LIMESTONE.

There are many deposits of limestone in the county, but none of them are being worked at present.

The **Dunlap Property.** Address Boutwell Dunlap, Auburn. This is the westerly portion of the large lens that is being worked by the Mountain Quarries in Eldorado County. This lens is cut in two parts by the Middle Fork of American River. The Dunlap property is on the Forest Hill road, five miles from Auburn. It is the southernmost of a series of limestone bodies that outcrop at intervals to within a mile of Clipper Gap.

Another belt of detached limestone outcrops extends from the North Fork of American River northwest of Butcher Ranch, to Applegate. The most accessible of this group is the **Spreckels**

Deposit, owned by the Spreckels Sugar Company, Spreckels, California. This property is a mile by road from Applegate. It is a good quality gray limestone and has been worked considerably.

There was formerly a lime kiln on a deposit four miles west of Clipper Gap, on a crossroad between the Grass Valley highway and the Colfax highway.

D. J. Sullivan, Dutch Flat, and **Mrs. Cora H. Linder,** 2022 Brush street, Oakland, have a large deposit of good quality limestone in the steep cañon of American River, near Gorge. This rock could best be delivered to the railroad by tram.

MARBLE.

Dark gray marble, with jet black veining, was found near Bear River, two miles west of Colfax, in 1866. This stone takes a high polish and some of it was used for counters and interior work in the early days. It has been idle in late years, but it was reported late in 1920 that some work was to be done on it.

Verde antique, or serpentine marble, has been found in two localities, one near Butcher Ranch, the other in section 1, T. 13 N., R. 9 E. These properties are 8 and 16 miles respectively from the railroad at Auburn and have never been worked.

White marble occurs in small deposits at several places, notably near Auburn and at the old Hotaling iron mine, 3½ miles west of Clipper Gap. Both these deposits have been worked a little.

PLUMAS COUNTY.

MINERAL RESOURCES.

This county is now the principal copper producing district in the state. Its drift and hydraulic mines have produced a great deal of gold in the past, but in common with the gold mines elsewhere in the state, are in a quiescent state, and the gold production for many years past has been dwindling, although for the period 1880-1920 the recorded gold yield has been a little over $18,000,000. Silver is recovered as a by-product from gold and copper refining. During the war manganese ore and a little chromite were shipped, some of the manganese ore having been of especially high grade. The county has entirely undeveloped iron ore deposits and considerable limestone, as well as deposits of industrial minerals, which have received little attention because of distance from possible markets.

Because of the great interest shown in mining and prospecting for copper here in the past few years, most of the writer's time while in the county the past summer was spent in visiting the copper properties and as many as possible of the gold mines which have not been covered in the Bureau's recent reports.

GOLD.

Australia Placer Mine (formerly the **Erickson Mine**). Owned by Australia Placer Mining Company; Wm. C. Wolf, president, Quincy, California. In section 1, T. 24 N., R. 8 E., 3 miles by road from Spanish Ranch.

This property was worked intermittently by Erickson in a small way as a drift mine for 40 years, and was sold to the present company of 20 partners in 1918. It comprises 90 acres, 70 acres of it being patented, and covers ⅝ mile along supposed course of channel.

The company fitted up for hydraulicking last winter, but ran the giant only 111 hours, as they were interrupted by the logging operations of a lumber company, which has now finished work nearby. The small pit opened on the rim of channel shows loose gravel of slate and quartz on black slate bedrock. The cut was about 40 ft. deep, but gravel is deepening and is not capped. The gravel carries a great deal of pyrite, and finely broken quartz derived from the stringers in the slate bedrock. The upper 15 ft. of bank is brown gravel and balance blue gravel. The company was handicapped by inexperience and the short run made was not enough to prove the value of the ground, as the pay is thought to be principally in the deep channel, within a few feet of bedrock.

There are 800 feet of 22″ to 11″ pipe, 2 giants and 100 feet of sluices on the property. Eight hundred inches of water under 220 feet head is said to be available through 8 miles of ditch, and the company claims this water will be had free of cost for five years. There are new buildings and cabins sufficient for housing a full crew. The property is in well-timbered country at about 3800 feet elevation. Tailings are impounded behind a dam in Wauponsie Creek, which crosses the claims.

Apex and Pensotti Claims. C. M. Root and P. Pensotti, 428 Broderick street, San Francisco, were prospecting in July last near the

summit close to the Quincy-La Porte road in section 29 or 32, T. 23 N., R. 10 E., about 2 miles north of Onion Valley. They had opened some shallow pits on one narrow quartz vein and were driving a tunnel on another. Quartz taken from a small vein near the road had been crushed in a Gibson mill and a little free gold was saved.

Cameron Claims. Owner, R. M. Cameron, Seneca. Three unpatented lode claims on unsurveyed land a mile and a half north of Seneca in the steep cañon of North Fork of Feather River. Stringers of quartz 3″ to 2 ft. wide cross a "formation" 25 feet wide between walls of slate and greenstone. The best pay is said to occur in pockets at the junctions of narrow "iron crossings" with the vein. Cameron has followed the vein for 200 feet in 2 tunnels, the lower of which is about 150 feet below outcrop. He also does some ground sluicing.

Davis Group. Formerly **Smith and Scott Mine.** Owner, Edman Davis, Crescent Mills. Consists of 40 acres of placer ground with 2 overlapping quartz locations, in the NE. ¼ of section 7, T. 26 N., R. 9 E., at an elevation of 5280 feet and 5.6 miles by steep mountain road from Greenville. There is a stand of good pine timber on the claims and the owner was involved in a dispute at time of visit, with timber men.

This is a residual placer resulting from the alteration and weathering in place of diabase, with resultant freeing and breaking up of numerous auriferous quartz veinlets. There is a capping of 1 to 2 ft. of soil covering a layer of pay dirt 1 to 3 ft. thick which carries rough, angular quartz and diabase lying on clay, that has been derived from diabase. This pay dirt covers a large portion of the claims. Some of the gold pieces washed out weigh ½ ounce, and 50 cent pieces are common. The writer panned some of the dirt and judges $1 a yard is a moderate estimate of its value. The gold is rough and angular.

The only water available now for washing is from melting snow in the spring. There are 2 miles of small ditches and 450 feet of 12″ sluice boxes on the claims. A few hundred cubic yards have been worked.

Gianella Claims. Savino Gianella and seven partners, 701 San Bruno road, South San Francisco, have located 640 acres of placer claims in sections 29 and 32, T. 23 N., R. 8 E., adjoining the Greenbower property. A lava-capped channel is supposed to pass through the property, but no work had been done to explore it up to the middle of 1920.

Gold Mountain Hydraulic and Dredging Company of 201 Grant Building, Los Angeles, California. G. W. Fagg, manager, Buck's Ranch via Meadow Valley. Comprises 440 acres 3 miles by road south of Buck's Ranch in sections 14 and 15, T. 23 N., R. 7 E., at an elevation of 5400 feet.

A bed of unassorted, angular gravel 3 ft. to 11 ft. deep, carrying a great deal of sand and silt, and lying on steep bedrock has been hydraulicked over an area of possibly 20 acres and a maximum width of about 700 feet. For several seasons past, mining operations have been limited more than usual by short water supply. Mining is carried on during the spring thaw and the early summer, the 1920 run having been from May 3 to July 7, with 4 men employed and 1000 yards or less moved daily.

There are 2 ditches 3 miles and a mile and a half long, respectively, which carry 300 inches of water and there are several thousand feet of 24-inch pipe which delivers the water under 120 ft. head. In the pit there are two small giants and about 700 feet of 14″ to 8″ pipe and 1500 feet of sluices. There are 6 houses, a blacksmith shop and small sawmill on the property, and a fair stand of pine timber.

Tailings are stored behind a dam in Willow Creek.

Great Divide Mine. Geo. Brunk and Wm. Roddy, of Greenville, owners. The two owners are working an old high stream bar on Onion Creek, a branch of Rush Creek on unsurveyed land about 2 miles downstream from the White Horse Mine. They are reported to have taken out several thousand dollars with rockers and to have found some nuggets, the largest of which was said to be worth $1,446.

Greenbower Mine. Owner, Henry Greenbower, Meadow Valley, Plumas County. There are 18 association placer claims totalling 2880 acres, claimed by Greenbower. The property covers the lava capped ridge extending from Mt. Ararat to the Middle Fork of Feather River, between Willow Creek and Bear Creek and includes parts of township 23 N., R. 7 E., township 22 N., R. 8 E., and township 23 N., R. 8 E. Work lately has been where the ancient channel breaks out on the steep north slope of the river cañon. Here a camp is located and hydraulic equipment has been set up and one test run, the only one ever made on the property, was made last spring. About 1800 feet of tunnels have been driven in this ground; 3 crosscuts 270, 360 and 400 feet were driven in the upper gravel but are said to have been too high, and tenor of gravel in the deep trough is unknown as the water prevented sinking winzes. This is all old work. All except 600 feet of drift are caved. Greenbower states the hydraulic run of about 800 yards made last season gave a return of 70 cents a yard without cleaning up the bottom. This was on the rim, where the gravel is about 50 feet deep. The total width of channel is 270 feet to 400 feet. The rim gravel is tight but not cemented and carries some large boulders. The owner estimates there are 500,000 cubic yards of gravel that can be hydraulicked between the place where channel breaks out and where the lava overburden becomes too heavy to pipe. He considers this a bench and believes there is a main deep channel further in the hill. The claims cover 5 miles of the possible course of channel, which flowed south.

This is virgin ground and appears to offer great possibilities. The owner has been working single handed here for 20 years, but without capital has never been able to adequately prospect it, and the same thing was true with the previous owners. The ground is well located for hydraulic mining. The bedrock elevation in the pit is about 4800 feet and there is a steep slope thence to the river, which flows in its cañon a mile and a half away at an elevation of 2400 feet.

The mine at present has 3 miles of ditch giving a maximum of 550 inches of free water from Little Bear Creek under 80 ft. head. Six miles of new ditch to Willow Creek would give an estimated additional flow of 800 inches and a working season of 4 to 5 months as compared with a present season averaging less than 3 months. There is ample good pine timber on the claims. The camp is reached by 9 miles of road from Bucks Ranch. A portion of this road was built last year.

The trip can be made by auto in the dry season. The mine is equipped with a giant, 200 feet of new pipe and 250 feet of new sluice 2′ x 3′ with an undercurrent, and there is a new house large enough for a working crew.

Jenkins Claim. (Quartz.) G. W. Jenkins, Seneca, owner. This is an unpatented lode claim in the steep cañon of North Fork of Feather River ½ mile from Seneca. The vein, possibly an extension of the Seneca-Eureka, has been only slightly prospected by 2 tunnels 142 ft. and 56 ft. long. The owner works alone.

Long Valley Mine. (Quartz.) Formerly the **Stauffer Mine.** Address J. A. Holley, Greenville, California. Located 6½ miles from Greenville by road in section 6, T. 26 N., R. 9 E., at an elevation of 5250 feet, near top of divide between North Fork of Feather River and Indian Creek. Consists of 4 unpatented claims covering a zone of auriferous quartz stringers on and near the contact of serpentine with micaceous schist and altered intrusive rock. Work on the mine began in 1902. There is an old inclined shaft 250 feet deep giving vertical depth of about 200 feet, and the formation was worked for a length of about 250 feet from this shaft and probably the entire depth of 200 feet; there were 3 levels off this shaft but the old workings are caved and the headframe down. A new inclined shaft was down 65 feet and 50 feet of new drift had been driven at time of visit, to connect with an adit near creek level. There is no defined quartz vein and the "pay" is followed usually by panning, the gold being very fine, and free, as the work is in the oxidized surface zone. About 3 ft. in width of the soft clayey material is payable, it is said.

The mine was formerly equipped with a 10-stamp mill, which operated during 3 years and is said to have produced about $100,000. At present there is a mill of five 750-lb. stamps run by a gas engine. Holley states he has milled between 300 and 400 tons that have yielded $6 to $11 a ton at a probable cost of $2 a ton for mining and milling. There is a good cabin on the property. Three men employed in July, 1920.

Morington Mine (River Flume). Morington Mining Company, 617 Pacific Building, San Francisco; Julius Becker, manager. Reached only by steep trails from Enterprise, Butte County, or from Greenbower Mine via Bucks Ranch, Plumas County. Mine address, Enterprise, Butte County. Officers and employees of The Foundation Company are reported to be stockholders. The property comprises 40 acres, covering 1797 feet along the bed of Middle Fork of Feather River in the steep cañon at and just above Hartmann's Bar at an elevation of 2400 feet on unsurveyed land in T. 22 N., R. 7 E. The deposit is loose wash gravel of unknown depth on hard granodiorite bedrock in the present stream. The manager stated that a diver and a drill used to prospect the ground had not proven satisfactory and that he had no definite information at hand as to gold content. There is a hard reef of bedrock across the stream at the lower end of the claim, that forms a natural dam and the stream bed above this is confined to a narrow rock-bound channel which has never been worked. Just downstream and on higher ground on the north bank, were the rich diggings called Hartmann's Bar.

The project contemplates the diversion of the river at the upper end of the claim by means of a log crib, hydraulic and rock fill dam, the water to be passed thru a wooden flume 9 ft. wide and 6 ft. high and 1797 ft. long. It is planned to lift the gravel from the streambed by a clam shell bucket and wash it in sluices leading from the main flume.

The construction work was being done at time of visit July, 1920, by The Foundation Company, who had erected a good sized camp and were employing 69 men. Water from Willow Creek under 200 ft. head runs an electric generating plant containing a 36-inch water wheel, a 480 volt, 90 ampere alternating current generator, and a 125 volt 16 ampere direct current generator. There are a 150 cu. ft. air compressor, 3 jackhammers and 12 boring machines, and a small saw mill and donkey engine. Timber was being cut on adjacent land in the National Forest.

The dam, on which work had just begun, is to be 120 ft. long on bottom, 160 ft. long on top and 43 ft. high and to rest on a concrete foundation 40 ft. wide which is to fill the inequalities of the bedrock. The bottom section is to be filled with coarse rock and each succeeding section will, under the present plan, be filled by hydraulicking in the loose rock and soil of the adjoining slope. The log crib will be fastened with $\frac{3}{4}$″ x 30″ drift pins and faced with 2 layers of 3″ x 12″ planks placed vertically and lapped. For passing the water during construction, 2 doors 5′ x 8′ for tunnels are provided. After the dam is finished, these are to be closed, and the tunnels to be filled from the downstream side with rock. The spillway will be 107$\frac{1}{2}$ ft. long and 15 ft. high.

The niche for the flume was blasted from the solid rock. Approximate specifications for the flume are as follows:

Length 1797 ft. with a drop of 7.9 ft. width 9 ft., height 6 ft. Sides and bottom of 2″ x 12″ planks. Typical cross section shows one 2″ x 6″ top brace and two 2″ x 6″ side braces, and 6″ x 6″ side timbers (4 ft. apart). Floor beams 6″ x 8″ resting on three 6″ x 10″ stringers on 8″ x 8″ cap which is supported by three 10″ log posts which have their bases concreted into hitches in the solid rock. Cracks in floor and sides to be covered with 1″ x 4″ battens. All pine timber. The flume was about half finished July 15, 1920, and there was no probability of actual mining beginning this year.*

On account of the uncertainty and meagerness of data at hand regarding the amount and tenor of gravel in the stream here and the question as to whether or not the water can be controlled and the ground can be worked profitably by the proposed means, considering the hard bedrock and other physical conditions, this appears to be a particularly speculative venture.

Rich Point Mine. (River placer.) Rich Point Mining Company, E. N. Hawkins, Strand Hotel, San Francisco, and Thomas Powers. Located on Middle Fork of Feather River at mouth of Bear Creek in section 35, T. 23 N., R. 8 E. Fifteen miles from Meadow Valley of which 14 miles is pack trail. This property was not visited, but in July, 1920, it was reported the company was preparing to build a barge of 2 inch planks to carry a Diesel engine, 4 inch gravel pump,

* Author's Note. The dam was erected and hydraulic fill piped in November 1. Subsequent high water is said to have torn out one end of dam and washed out the filling.

diving outfit, etc. The trail was being enlarged to a road. They planned to pump the gravel from the holes and crevices in the bedrock of the river channel.

Rogers Mine. (Quartz.) Four miles by steep mountain road from Bucks Ranch in section 14, T. 23 N., R. 7 E., near the Gold Mountain hydraulic mine. The owner, A. L. Rogers, works the claim alone in summer and has a small prospecting mill. He has crushed a few tons of ore said to run $30 to $40 a ton. Property was not visited. Ore is said to be a stringer lead carrying considerable arsenopyrite.

Sanhedrin Mine. (Deep placer.) Sanhedrin Mining Company, A. W. Craig, secretary, 1371 Oak street, San Francisco. Formerly the Star of Plumas mine. In section 8, T. 23 N., R. 8 E., 4 miles from Buck's Ranch by steep road. This mine has not made any production recently although reputed to have paid about 20 years ago. A few men have been working lately. There is a tunnel that has reached a length of 1000 feet. This property is thought to be on the "back-channel" which passes thru the Greenbower mine. Assessment No. 6 was levied on stock in April, 1920.

Seneca Eureka Mine. (Quartz.) Formerly called the **Hazzard Mine.** On unsurveyed land one mile by trail from Seneca on east side of cañon of North Fork Feather River. Owner, C. D. Hazzard, Quincy, California.

There are 13 unpatented lode claims but most of the work has been done on one or two of the claims and none on many of them. The vein is a stringer lead striking northwest and dipping 55° south in the main tunnel but apparently having an anticline, with the vein flat in the third tunnel and the other limb dipping about 45° north, as shown in the fourth tunnel. The footwall is greenstone and hanging wall black slate, and the deposit is similar to the Mother Lode stringer leads in many ways. The maximum width of the vein revealed in the workings is 41 feet. There has been post-mineral movement on the hanging wall.

The vein has been explored by 5 tunnels, all within a few hundred yards of one another, the highest of which is 800 feet long, being a crosscut for 100 feet and a drift on vein the rest of its length, with fissure decreasing in width near face. Four other tunnels lower down expose the vein which pans well in free gold where the pyrite has been oxidized. These tunnels are now open 50 to 90 feet each although one of them was formerly opened for 230 feet. The lowest opening is about 200 feet vertically below the highest and the outcrop of similar vein matter can be traced to the summit of the ridge in the general direction of the strike of the vein; this higher ground has never been prospected. The ridge rises over 1000 ft. above the highest tunnel.

Assays from the vein are reported to run from $6 to $25 a ton. It seems strange no mill test of the vein has been made, as there is considerable quartz available for crushing if it proves to be ore. The content of sulphides is 2% to 4%. There is a small cabin on the claims.

Seneca Consolidated Mine. (Quartz). Formerly the **Del Monte Mine.** Seneca Consolidated Mining Company, J. J. Reilly, manager, Seneca. On the North Fork of Feather River ½ mile upstream from Seneca, at an elevation of 3700 feet.

There is a 4000 ft. tunnel on the property which is said to have encountered only a base vein, carrying a good deal of arsenopyrite, after passing the vein now being mined. Work underground at time of visit in July, 1920, was confined to breaking ore 55 ft. above the Del Monte tunnel, 800 feet in. This stope is about 137 feet below the surface. The quartz was 16 ft. wide in the stope and was broken so badly as to require little powder. It carried traces of copper, some free gold and very little rusty pyrite. The deposit appears to be pockety, with small bunches of rich ore, but averaging low grade.

Some years ago the Del Monte Mining Company sued the adjoining White Lily Mining Company for alleged invasion of ground and won the suit. This resulted in closing the White Lily, then a producer, and taking over their mill by the other company. The White Lily tunnel, about 600 ft. long, drains the immense flow of water which comes in near the face of the Del Monte tunnel, and flows uncontrolled.

The mill of ten 1000-lb. stamps and 2 concentrators was being run one shift, and the manager was not optimistic about the outlook. Four men were working underground and 10 to 12 tons of ore a day were being mined and milled. Electric current for power and lighting is generated by water from the river. The property comprises 1500 acres and there is ample good pine timber on it.

Wheelock Mine. (Quartz.) Leander Wheelock and J. G. Reynolds, owners, Crescent Mills. This is one unpatented claim at the edge of the town of Crescent Mills. A vein with a maximum width of 2 feet strikes west and dips north. It has been drifted on for 50 feet, at a depth of about 25 feet below the surface. It was opened by a tunnel about 200 feet long, 150 ft. of it crosscut. There is also an inclined shaft 55 ft. deep that has not encountered vein, and a winze had been sunk 16′ on the vein in the drift, and a block 20′ x 2′ x 16′ had been stoped.

A Joshua Hendy triple discharge mill with two 880-lb. stamps, to be run by a gas engine, was being installed late in July, 1920. The ore is stated to run from $5 to $30 a ton and a mill run of 30 tons yielded $485, according to Reynolds.

White Horse Mine. (Placer.) James and J. G. Reynolds, Crescent Mills, owners. On unsurveyed land (in what would be section 12, T. 26 N., R. 8 E., if surveyed), in Long Valley district, 8 miles from Greenville by steep road, and at an elevation of 5550 feet.

There are 2 claims, one placer and one quartz, but the placer is probably the more valuable, as the quartz vein has been prospected and abandoned. The placer ground is on the slope near the top of the divide just west of Long Valley reservoir. It is a residual placer, similar to the Davis Group (which see). There is a capping of about 2 ft. of soil underlain by from 2 ft. to 14 ft. of loose, angular residual material carrying gold and lying on the clayey, altered diabase bedrock. The gold is rough and coarse and derived from the disintegrated quartz stringers in the diabase. The greater part of the claim is covered with such material which is thought to be rich enough to work.

Reynolds states 1000 cubic yards which he has ground sluiced has yielded $1 a yard. He has been able so far to work only during the

spring thaw, with water from melting snow. He has a plan for putting water on the ground by pumping into an old ditch and thence into a mining reservoir. This plan, if carried out, would permit 6 or 7 months' work each year. The cost of the equipment for pumping and ¼ mile of new ditch is estimated at $1,500. The water supply would come from Long Valley reservoir. Present equipment is 200 ft. of 12″ x 18″ sluice boxes, some small water pipe and hand tools. The sluice is laid in a tunnel and there is a race 600 feet long.

COPPER.

The copper mines and prospects described below lie in the belt extending from the Walker mine near Mt. Ingalls to and including the Engels group of mines on the north, an airline distance of 17 miles across rugged and mountainous country. The writer visited personally nearly all of the properties where any work was going on. Prospecting here has been encouraged by the development of fine ore bodies in the Engels and Walker mines, which are the principal producers.

Beardsley Copper Prospect. Beardsley Copper Company, A. L. Beardsley, manager, Genesee. In section 14, T. 26 N., R. 11 E., 9 miles by steep Taylor Lake road from Viramont on the Indian Valley Railroad. Elevation 5900 feet. Consists of the Telge Group of nine claims covering 4500 ft. along outcrops striking a little north of east, and Big Injun Group of 5 claims and Copper Bullion claim, covering 3000 ft. north and south on east of Telge Group, in all about 260 acres of unpatented land in Plumas National Forest.

The mill, and most of the work at time of visit, was on the Big Injun claims. Not far from the mill on a steep slope 3 crosscuts have been driven. No. 1 (upper) crosscut is 120 ft. below the outcrop and had been run 198 ft. to the vein, then drifted 50 ft. each way on vein which strikes N. 10° E., and 18 ft. past vein on one end into the hard footwall. This vein dips 60° E. and is 6 ft. wide. There is a raise on vein to surface, 120 ft. No. 2 crosscut, 160 ft. below the outcrop, strikes at a distance of 180 ft. what is apparently another vein carrying very finely disseminated chalcopyrite and bornite. No. 3 crosscut is a little over 200 ft. below the outcrop and at a distance of 50 ft. from portal cuts a vein 9 ft. wide, which is evidently the same one found in No. 2. No. 3 crosscut was in 268 ft. at time of visit, and still had a little over 100 ft. to go to strike the vein found in No. 1 crosscut. The veins are parallel, 320 feet apart, and can be traced by the surface outcrop about 300 feet.

The veins appear to be diorite dikes inclosed in hard walls of basic diorite, and do not show any quartz. The finely disseminated copper sulphides are scattered rather sparingly through the dike rock and no high grade streaks of ore had been found. One shift was employed in No. 3 crosscut, making about 2 ft. a day.

A new mill building houses a steam boiler and small air compressor which supplies the machine drills. There is a small blacksmith shop and a boarding house. A flotation plant was planned, but none of the equipment for it had arrived at the end of July, 1920. There is a good stand of timber on the claims for mining use. Water is taken from Taylor Lake through 4 miles of ditch and 600 ft. of pipe. For active

operation the lake level would have to be raised 10 ft. Nine men were employed.

Bonanza and Bobtail Claims. S. P. Jacks and G. M. Cooksie, owners. Property comprises 2 unpatented claims in section 20, T. 27 N., R. 11 E., near the Taylorsville-Engels road, 3 miles southwest of Engels and 1 mile from spur on Indian Valley Railroad. It was idle in July, 1920, and was not visited, but the owners stated they had shipped lately part of a car of ore carrying 7% to 8% copper and 40 oz. silver a ton, which was taken from a small high-grade vein near the surface. The Snowstorm mine adjoins on the north.

Calnan Group. Formerly called **Little Joe** and others. Owner, M. J. Calnan, Genesee. Located in sections 11 and 14, T. 25 N., R. 11 E., about two miles from Genesee by road, at an elevation of 4300 ft. There are 8 unpatented claims, called Little Joe, Baltimore, Keystone, Mother Lode, Gold Fish, Evening Star, Home Rule and True Friend, covering about 5000 feet along copper-bearing outcrops.

These are mostly old locations and some prospecting or mining has been done on all of them. The ores are carbonates and sulphides of copper carrying some gold and silver. There are massive quartz veins on some of the claims that have never been prospected. On the Keystone claim a tunnel was driven 210 ft. and 90 ft. below the outcrop on a vein a few inches to one foot wide, carrying malachite. There are 2 old shafts 30 ft. and 80 ft. deep and an open cut 40 ft. by 100 ft. on the Little Joe claim, which has a record of 30 tons production of sorted ore in 1906 that is said to have carried $300 a ton. There are 2 shallow shafts and 240 ft. of drifting on the Baltimore claim, a 30-ft. shaft on the Gold Fish, and a tunnel 160 ft. long on the Mother Lode claim, but no known production except on the Little Joe. W. W. Adams of the American Smelting and Refining Company had an option on the claims for a year, but gave them up. In July, 1920, preparations were being made to promote the property. J. W. Rowell, Claus Spreckels Building, San Francisco, was interested. The Five Bears mine adjoins on the west, and the Gruss mine is 1500 ft. north. There is good pine timber on the claims and enough water flows past the Keystone tunnel for milling, with the possibility of developing some power from a nearby creek. The electric power line to the Walker mine crosses one claim. There is no equipment on the claims.

Copper Group. Under bond in July, 1920, to Thomas Lane, Angels Camp. Eight unpatented claims in sections 11 and 14, T. 25 N., R. 11 E., 4 miles from Genesee, east of the Calnan Group. Elevation about 5000 feet.

There are 2 old tunnels and a winze driven years ago and about 50 feet of later work on a lower tunnel which is said to be several hundred feet below the outcrop. The ore, principally tetrahedrite, carrying gold and silver, occurs in bunches in a quartz vein 4 ft. wide. Idle in July, 1920.

Copper King Group. Sobero Brothers, Genesee, owners. Comprises 8 unpatented claims in sections 12 and 13, T. 25 N., R. 11 E., about 5 miles from Genesee at elevation from 5000 to 5500 feet.

The United States Smelting, Refining and Mining Company bonded the claims recently and found a bunch of 4% copper ore 30 ft. deep, 22 ft. long and 22 ft. wide, according to one of the owners. They sank through this bunch, drove past it, and gave up the bond. Idle in July, 1920.

Engels Mines. Owner, Engels Copper Mining Company, 393 Mills Building, San Francisco, California. The property consisted of 23

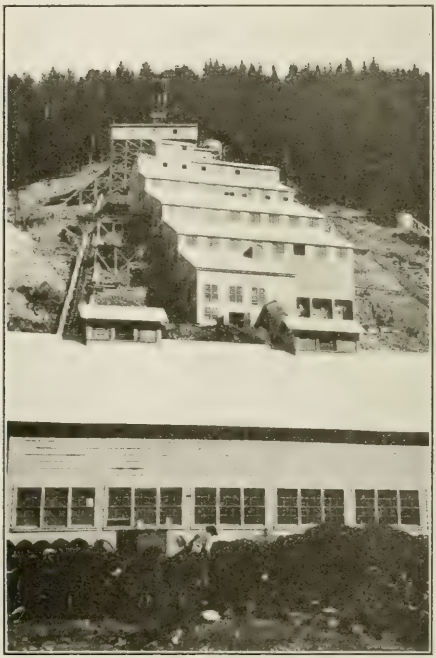


Photo No. 57. Mill of Engels Copper Mining Company, Engels, Plumas County.

patented claims and 131 unpatented claims in July, 1920, a total of about 3050 acres, at and near the northern terminus of the Indian Valley Railroad. Elevation at Engels Shaft is 5263.47 ft.

The geology of the ore deposits at the Engels and Superior Mines has been studied, first by H. W. Turner and A. F. Rogers[1] and later by L. C. Gratton and D. H. McLaughlin[2] and their conclusions are summarized in this Bureau's report on "Mines and Mineral Resources of Plumas County," 1918, so this phase need not be exten-

[1]See Economic Geology, Vol. 9, No. 4, 1914.
[2]See Economic Geology, Vol. 12, No. 1, January, 1917.

sively covered here, especially as there appears to have been no recent evidence found to dispute materially the conclusions in the later of these two papers. The big difference in the ore coming now from the two mines is that the Engels ore is mainly disseminated and relatively low grade, while that from the Superior is more often in stringers and veins of higher grade and more of it is secondary.

In the Superior Mine the open cut was still being worked late in July, 1920. No. 2 level, entered by a tunnel 570 ft. long is 270 ft. deep and was the deepest level worked. The shaft had reached a depth of 80 ft. below No. 2. In the Engels Mine the shaft has reached a depth of 60 ft. below No. 7 level, or 782 feet. Levels No. 1 and 2 are caved; No. 3 is open for 240 ft.; No. 4 is 1240 ft. in length but caved for 160 ft.; No. 5 (above No. 4) is open for 720 ft.; shaft level open for 1280 ft.; No. 6 open for 2360 ft.; and No. 7 had been opened 60 ft.

The Engels ore body strikes N. 60° E., dips 75° N. and rakes NE. 50° and the shoot lengthens with depth. It has a maximum width of 120 ft., average width 60 ft., average length 800 feet and is narrowest in the center. A fault plane striking N. 30° W. and dipping 60° SW. and with vertical throw, traverses the ore body and the section south of the fault is oxidized. The ore is nearly all removed above the fourth level and workings caved. The ore body naturally has no well defined walls.

Stopes are carried 120 ft. long and are cut to rib pillars 20 ft. thick. Levels are far apart, No. 7 being 202 ft. below No. 6, and No. 6 is 240 ft. below the shaft level. Grizzly chutes are used, as the superintendent thinks ore can be handled much more cheaply through them than on shovelling platforms. Above No. 4 level the ore shoot has been stoped 800 ft. long, 60 ft. wide and 180 ft. high, and is being stoped from No. 6.

Ore from Engels Mine is broken in a 24″ x 36″ Allis-Chalmers crusher and hauled by electric trolley 3000 ft. to the ore bin. An aerial tram 9800 ft. long with 56 buckets of 1000 lb. capacity each makes the round trip from Engels Mine to the mill at Superior Mine in 55 minutes, dumping all the ore in a 900-ton circular steel receiving bin at the top of the mill. The mill heads are thought to run not less than $2\frac{1}{4}$% copper, but vary widely depending on which mine the ore is coming from.

No complete flow sheet of the mill has been prepared but the following indicates the principal steps in ore treatment. Ore from receiving bin goes over a 30″ belt conveyor to a 4-inch grizzley, oversize on grizzley going to a No. 8 Traylor gyratory crusher. Ore over $1\frac{3}{4}$ inches passes over another grizzley to a belt conveyor and to two No. 5 gyratory crushers, crushing to $2\frac{1}{2}$ inches. Belt conveyor delivers to a trommel, with 1 inch to 2 inch screen; oversize from trommel to 54″ x 20″ Superior rolls; undersize from preceding grizzlies and trommel and product of rolls delivered to four 900-ton circular steel ore bins.

The ore from bins is fed by belt and band conveyors to three 8′ x 36″ Hardinge mills moving 23 r.p.m. and a No. 86 Marcy mill moving 26 r.p.m. Feed in Hardinge mills is 80% solids. Model D classifiers moving 27 strokes per minute classify ball mill product; oversize goes to three tube mills (2 of them 6′ x 12′ and one 7′ x 10′) and an 8′ x 36″ Hardinge mill. The product of these mills is from 100 to 200 mesh

and 50% is finer than 200-mesh. Fines from above classifiers and product of last mills is diluted to 30% solids and fed to 12-cell 24-inch low-level Minerals Separation flotation machine. Product of first 3 cells is taken off as concentrate; product from next 4 cells is sent to a Callow cleaner unit, and product from last 5 cells goes to a Callow rougher and thence to Callow cleaner. Callow cleaner tailing, classified, etc. Concentrate from Callow cleaner is thickened in Dorr thickener, filtered on an Oliver filter and all the concentrate passes down a long belt conveyor to the loading shed at railroad. The oil mixture for flotation consists of 45% fuel oil, 40 to 45% crude turpentine, and 10% gasoline for thinning. Distillate could be used for thinning in place of gasoline if obtainable, but coal oil will not do. Air under 4 lb. pressure is used; less than 1 lb. oil per ton of ore is required. The mill also contains twelve 18-inch high-level Minerals Separation flotation cells.

Concentrate assays .08 oz. gold, 8 to 10 oz. silver per ton and 30% copper. This new mill is presumed to have a maximum capacity of 1500 tons a day but was handling 650 tons a day of ore and producing 210 tons of concentrate a day at time of visit. Shortage of good miners was hampering operations. A total force of from 380 to 400 men was employed.

Five Bears Mine. Five Bears Mining Company, G. H. Goodhue, manager, address, Indian Falls via Paxton, California. Located near the Gruss mine in sections 23, 25 and 26, T. 25 N., R. 11 E., 3 miles southeast of Genesee by road. Contains 9 quartz claims and one placer claim, all being patented except one. The total area is 204 acres, covering 8100 feet along the lode.

The property is described in this Bureau's last report on "Mines and Mineral Resources of Plumas County." Like some other mines nearby, the ore near the surface in the oxidized zone, was valuable principally for its gold and silver content, but in depth becomes a copper sulphide ore, which was yielding about 2.6% copper in the last operations.

The mine was worked through a tunnel 1400 feet long, 900 feet below the outcrop. It was equipped with a mill of ten 800-lb. stamps, 2 Eccleston concentrators, small compressor, etc., all operated by Pelton wheels receiving water from Ward's Creek.

The property has been worked only irregularly in late years, and was idle when visited in July, 1920. Considerable of the equipment had been removed and the buildings were in run-down condition. The Gruss mine, on the north, is on the same lode.

Gruss Mine. Formerly called the **Genesee Mine.** Owner, Gruss Mining Company, address, room 704, 381 Bush street, San Francisco. W. J. Gruss, president and superintendent at the mine. Located in the SW. $\frac{1}{4}$ of NW. $\frac{1}{4}$ of section 14 and SE. $\frac{1}{4}$ of NE. $\frac{1}{4}$ of section 15, T. 25 N., R. 11 E., 3 miles by road from Genesee. Contains 9 unpatented claims, covering two sections of the lode, 2700 ft. and 1500 ft. long, respectively. Elevation 3800 ft. at mill.

The geology of the mine as disclosed in the upper workings is described in this Bureau's last report on "Mines and Mineral Resources of Plumas County" (1918). Since that report the shaft has been sunk

to 400 ft. vertical depth. The lode strikes N. 10° W. and dips 65° W. and has been traced 1300 feet on the surface. There were 3 levels at 70, 200 and 400 ft. when visited by the writer, July 27, 1920. The 200 level had been driven north 275 feet, and south 175 feet, and the 400 level north 245 feet and south 250 feet. The shaft passed into the footwall between 200 and 400 levels. The 200 level north shows a stringer lead of quartz and calcite between a grey slaty schist hanging wall and meta-andesite footwall, with some bornite disseminated through the hard grey wall rock. From No. 1 crosscut on the 200 level south, which is not drifted on the vein, they had exposed the formation 16 ft. wide and had raised 45 ft. on it. On the 400 level south, the drift was not on the vein for 200 ft., but at that distance from the shaft they cut a black slate gouge carrying quartz stringers and had drifted on it 50 feet. On the 400 level north, the footwall is hard, dark green meta-andesite and hanging wall is slaty black schist. There was no



Photo No. 58. Mill building and headframe at Gruss Mine, near Genesee.

gouge north of shaft. The superintendent claimed the "slate" was gold ore, with the gold presumably in the pyrite.

Three men were working underground when visited. The mine gives considerable water, nearly all of it coming in along the shaft. There is a 10″ Cornish pump in the shaft and an 8″ lift pump on the 400 level. The shaft and mill are on the Genesee claim in the SE. ¼ of NE. ¼ of section 15, and so far as known no work was being done on the other claims. On the 400 level a crosscut had been driven 245 ft. east in search of the Cooper vein, and it was though it would require 155 ft. more crosscut to reach it. No pay shoots had been blocked out as far as known, when the property was visited, although Gruss stated they had mined an ore shoot in years past which was 150 ft. long 125 ft. above the 200 level north.

Hoisting is done in a cage. Ore is crushed in a McCully crusher in the headframe and drops into the mill bin. The mill contained 10 light stamps and 2 Eccleston concentrators that had just been brought from the Five Bears mill. A 50-ton Minerals Separation flotation plant

was being prepared for. A force of 9 men were working on the surface. Power is furnished by water from Wards Creek under 145 ft. head, taken through $\frac{3}{4}$ mile of ditch and 2700 ft. of 16″ pipe. There is a small hoist, an 8″ x 8″ Ingersoll Rand air compressor in use, and one 12″ x 12″ not in use.

Lena Group. Sobero Brothers, Genesee, California. Six unpatented lode claims, 7 miles by road and trail from Genesee in sections 6 and 7, T. 24 N., R. 12 E., at an elevation of about 6700 feet, near the summit of range on the west slope.

A quartz vein reported to be 16 ft. to 20 ft. wide striking SE. and dipping east, carrying chalcopyrite, bornite and chalcocite, has been prospected by adits. An upper adit 75 ft. below the outcrop is a crosscut for 210 ft. and then drifted for 50 ft. on the vein. The lower adit is 350 ft. below the outcrop and 360 ft. distant on the strike from the upper adit. It is a crosscut 1200 ft. long, said to be in ore at the face. A winze was sunk 85 ft. deep from the upper drift and a shaft 25 ft. deep from the surface. The ore found was apparently in bunches. The United States Smelting, Refining and Mining Company did most of the work on the claims, but gave up their bond. Since then parties supposed to represent the same company have located claims surrounding the longer adit and were having their claims surveyed in July, 1920. The Walker mine is nearby in sections 5, 6, 31 and 32 on the north.

Pilot Mine. Formerly called the **Borden Mine.** Goodhue Brothers, Genesee. In sections 14 and 15, T. 25 N., R. 11 E., about 3 miles by road from Genesee. The property contains 2 unpatented claims.

The upper portion of the vein was worked years ago by John Borden, who crushed the ore in an arrastra to recover the gold and silver.

The lode strikes N. 10° W., and dips 65° W., and the ore so far worked was from a few inches to 18″ wide, consisting of seams of bornite and grey copper sulphides carrying some gold and silver, in quartz.

There are 2 tunnels on the property, the lower being a crosscut about 600 feet long to vein, and about 360 feet on the dip below the upper one. The shoot was worked from the upper tunnel by Borden. From the lower level there was 20 ft. of drift on the vein and a small stope, this lower working being recent. There have been 2 small shipments of sorted ore from the mine since October, 1918. It was idle at time of visit but was reported to have been bonded, together with the adjoining Cooper group, by Thomas Lane of Angels Camp. The mine lies between the Gruss and Five Bears mine on the same lode.

Reinmiller Group. Reinmiller Copper Mines Company, John Reinmiller, president, Engels, California. The property contains 56 unpatented lode claims, located north of the Engels mine.

To date, comparatively little work has been done on the claims, but as far as prospected, indications are reported very encouraging. Late in September, 1920, a shaft had reached a depth of 65 feet and was reported to be in milling ore, and the vein was said to be traceable east and west on the strike for 400 feet. There is an adit 70 feet on

the vein 140 feet west of the shaft and another short adit farther west. A third adit was planned, which is to be a crosscut 700 ft. south of the shaft and is designed to strike the vein 400 feet below the collar of the shaft on the dip.

Ruby Mine. Formerly called the **Williams and Stark.** Ruby Copper Company, 717 Kohl Building, San Francisco; H. E. Bush, manager; J. L. Williams, superintendent at mine. The property comprises 17 unpatented claims in the Moonlight district, in sections 13 and 24, T. 27 N., R. 10 E., 5 miles from Engels by road and 2 miles by road from a siding on the Indian Valley Railroad, at an elevation of from 4500 to 5500 feet.

The mine was operated 3 years by Williams and Stark and ore to the value of $16,000 was produced and shipped, according to Williams, before the present stock company took hold of the mine in October, 1919.

The ore is principally bornite. A basic dike about 5 ft. wide strikes N. 25° W., and dips 65° E., in hard diorite country rock. The ore as far as developed at time of the writer's visit, July 24, 1920, occurs as stringers of high grade from 1″ to 18″ in width, crossing the dike and following the foot or hanging wall. This dike had been followed for a distance of 300 ft. by an adit driven 200 ft. below the outcrop, and it was claimed that the ore had been traced 500 ft. ahead of the face of drift on the surface, so the adit was being extended. The gangue of the ore is the broken dike rock and a subordinate amount of quartz. One stope 35 ft. long and 75 ft. high has been worked above the level. The ore is stated to run as high as 30% copper at times, with usually one ounce of silver for each per cent of copper.

When visited, a gravity tram 1600 ft. long was being built to send the ore from the mine to the mill, and was expected to be finished by August 15. A mill of five 1000-lb. stamps, one Wilfley concentrator and a vanner, was being put up. The operators hoped to crush from 20 to 25 tons of ore a day, but it is doubtful if they can handle over 15 tons a day, as the ore is very hard. There is a chance to handle some of the ore by coarse crushing and jigging. The mine is equipped with machine drills, a 11″ x 12″ Rix air compressor run by a 50-h.p., 440-volt motor, and there are a small blacksmith shop and several camp buildings. Fourteen men were employed. Water is available from Moonlight Creek. There is ample good pine timber on the claims. Electric power is supplied at the property by the Great Western Power Company. The Trask and Coffer mine adjoins on the south.

Snowstorm Mine. Feather River Copper Company; Geo. W. Long, president; H. E. Bush, manager; home office, 15 Central Building, Phoenix, Arizona; mine address, Engels, California. The property consists of 22 unpatented lode claims, containing about 450 acres, surrounding the corner common to sections 17, 18, 19 and 20, T. 27 N., R. 11 E., a little over a mile south of Engelsby road and ½ mile by road from a siding on the Indian Valley Railroad. Elevation 4580 ft. at tunnel portal.

This company at time of visit had not found an ore body. They were basing their work and their expectations entirely on the fact that their tunnel is only 1000 feet southeast of Engels Superior No. 2 claim,

and that it is being driven in rock of the same character as that carrying the Superior ore body.

Late in July, 1920, their crosscut was 1200 ft. long and it was planned to continue to a length of 2000 ft., where the depth below the surface will be 1000 feet. The work up to that time was in hard granodiorite. The property is equipped with a Sullivan air compressor, 307 cu. ft. free air capacity, a 9-inch suction blower for ventilation, and machine drills. Electric power is supplied by Great Western Power Company. There is good pine timber on the claims.

Trask and Coffer Mine. Formerly in part known as the **Beetle Mine.** Trask and Coffer Mining Company, E. C. Trask, President, and C. L. Eaton, manager, Engels, California; E. R. Solinsky, secretary, Call Building, San Francisco. The property contains 16 unpatented mining claims, with an area of about 300 acres, covering 4000 feet along outcrop. It is in sections 24 and 25, T. 27 N., R. 10 E., and in sections 19 and 30, T. 27 N., R. 11 E., in the Moonlight district, 3 miles by road from siding on Indian Valley Railroad, at an elevation of 4225 feet.

The Beetle claim was worked as early as 1874, and some ore was smelted at Genesee. It was relocated in 1906, but the present company and their immediate predecessors have been working it for the past four years.

The country rock immediately surrounding the present workings is basic igneous, probably diorite and andesite principally, although there are some indications of ore in a flinty chert south of the mill. The vein, which has a maximum width of 2 feet, but averages 4″ to 6″ wide, follows a fine-ground basic dike in places 8 ft. wide. The vein consists of quartz, calcite and dike rock, carrying tetrahedrite, bornite and chalcopyrite, and considerable silver, as well as $2 to $3 gold per ton. The vein strikes N. 20° W. to north and dips east at a very steep angle. It follows the footwall usually, but crosses the dike in several places to the hanging wall.

The vein has been followed by a tunnel. This is a crosscut for 175 feet and a drift on the vein for 800 feet, reaching a depth of 200 ft. below the outcrop. There is a fault dipping 45° south that crosses the vein on the south about 50 ft. from point where crosscut strikes vein. There has been no work south of fault on this level. Two winzes have been sunk on vein in the floor of the drift. They are 400 feet apart, and 70 ft. deep and 30 ft. deep respectively. In the block of ground below the level and between the winzes there has been about 50 ft. in length stoped. This ground was partly under water at time of visit but Trask stated there is 8 inches of solid ore in the face that assays 15% copper and 60 oz. silver per ton. He said 160 tons of ore have been shipped that yielded an average of 10% copper, 40 oz. silver and $3 gold a ton. Above the level there are some old stopes and chutes and work has broken through to the surface. The vein at the face of level is very narrow, but they claim that 300 ft. ahead of the face they have an outcrop 50 ft. wide carrying disseminated bornite and can trace a copper-bearing outcrop 6 ft. wide for 3000 ft. farther on the strike, so the vein evidently persists. There is also an east-striking outcrop south of the fault, which carries some copper near the surface, but is unprospected so far.

The mine is equipped with a 12″ x 14″ Chicago Pneumatic Tool Company air compressor, run by a 40-h.p., 50-amp., 440-volt motor, and machine drills are used.

The mill contains 5 Union Iron Works 1000-lb. stamps, and a Frue vanner, and is operated by a 35-h.p., 50-ampere, 440-volt motor. There is also a gas engine. Electric power is furnished by Great Western Power Company. There are several new camp buildings on the property.

The richest ore is the tetrahedrite, which is sorted and shipped. Concentration tests gave a product carrying 10% iron, 16% copper, 64 oz. silver and $3 to $4 gold a ton. Little milling has been done.

There is ample good timber on the claims and enough water for milling and camp uses. The Ruby mine adjoins on the north. Property was idle when visited July 24, 1920.



Photo No. 59. Flotation Plant, Walker Copper Mine, Plumas County.

Walker Mine. Controlling interest owned by International Smelting and Refining Company, a subsidiary of Anaconda Copper Mining Company; main office, 618 Kearns Building, Salt Lake City, Utah; mine address, Portola, California; V. A. Hart, manager; J. S. Hazen, superintendent. The property comprises 53 lode claims, about 1060 acres, partly patented, covering 13,500 ft. along the strike, and is in sections 5 and 6, T. 24 N., R. 12 E., and sections 31 and 32, T. 25 N., R. 12 E., 21 miles by road from Portola, a station on the Western Pacific Railway, or 8 miles by steep mountain trail from Genesee, in Plumas National Forest. The upper camp is at an elevation of 7004 ft. and lower camp and mill are 4800 ft. distant and 800 ft. lower.

The present company began work in 1916, previous to which little was done. They prospected the property over two years before buying control of it. The flotation plant of 85 tons capacity was put up in October, 1916, and was enlarged in 1918 to 160 tons daily capacity. Concentrate up to this season has been hauled to Portola by auto

trucks. The plant was in full operation when the writer visited the property in July, 1920, but in November, 1920, operations were greatly reduced.

Eruptive rocks cover the surface immediately above the workings, but the condition of the vein on the south end of No. 3 level (210 ft. deep vertically) suggests it is near the old surface, as the sulphides are leached and oxidized. The vein is a strong, well-defined quartz filled fissure in hard diorite walls. It averages 20 ft. wide on No. 3 level and 45 ft. wide on No. 4 level. There is no gouge on either wall. The vein strikes S. 30° E., and dips 70° E., and has been proven so far for 2400 ft. on the strike.

Five levels, numbered 1, 2, 3, 4 and 8, have been opened in the mine. The first four levels comprise the present upper workings, which are worked through the vertical and inclined shafts, with exit at very nearly 7000 ft. elevation, and which at present are not connected underground with No. 8 level. There is a crosscut 1360 ft. long from surface to vein at No. 2 level (125 ft. deep). No. 3 level is reached by a vertical shaft 210 ft. deep, and No. 4 level is 150 ft. below No. 3 on the dip of vein and is reached by an inclined shaft. No. 8 level, elevation 6200 ft., is a crosscut adit for 3661 feet and had been drifted on vein for 1100 feet at time of visit (July 22, 1920), and was being advanced at the rate of 4 ft. a day.

The present shoot is said to be worked out above No. 2 level. No. 3 level is a drift on the vein for 1200 ft. north of inclined shaft. On the south end, as noted above, the sulphides in the vein have been leached and oxidized and the metal content is too low to make ore. The ore shoot on this level was opened for 900 ft., running 580 ft. south and 320 ft. north of vertical shaft. The stope was up 45 ft. above the level, on ore 20 ft. in average width, with a streak of higher grade 5 ft. to 6 ft. wide on the hanging wall for several hundred feet on the north end. A fault on this level threw the vein about 6 ft. Going north on this level beyond the leached ground the ore contains from 1½ to 10% copper, averaging probably 3½% copper and .1 oz. gold, .6 oz. silver per ton. No. 4 level is drifted 1200 ft. south of the inclined shaft. There is a fault 200 ft. north of the face and vein on south of the fault was lower grade, containing only 1% copper at the face. The fault relations on this level were obscure and had not been solved yet. From the fault north for 300 ft. the ore was of good milling grade, then for 140 ft. a high-grade streak came in 5 ft. to 6 ft. wide and assaying 15% to 17% copper. In the stope being started on this level the vein was 45 ft. wide and was said to be all ore. Diamond drilling on this level struck a heavy flow of water, which was shut off with difficulty.

Chalcopyrite is the most prominent copper mineral in the ore, but it carries considerable bornite and in the richest streaks pyrite is plentiful. The writer noticed some barite in the vein on the 3rd and 4th level, but it is not plentiful.

On No. 8 level, which will be the main working entry when connection is made with the upper levels, the vein was struck 3650 ft. from the portal. About 1000 ft. from portal was in heavy and running ground; where considerable water was struck. The first ore shoot was drifted on for 300 ft., then a stock of granite or granodiorite 30 ft. wide was encountered, and the rock for 250 ft. beyond it was low grade. They then came into the second shoot, and it had so far been drifted on

for 800 ft. and was said to show 4% copper in the face. No crosscutting had been done on the vein on this level in July. A fault on this level throws the ore a few feet east, looking north. These faults appear to be associated with the later intrusions of granodiorite. A raise from No. 8 to No. 4 was up 165 ft. When this is finished all the ore will be brought through No. 8 tunnel, and the upper works, and tramway connecting the two camps, will not be needed.

Mining is done by the shrinkage system, raises being put up every 15 ft. for chutes, which open into the big stope, which was 900 ft. long on No. 3 level. Shovelling platforms were in use. Nearly all the work of breaking ore in the mine was being done on contract at a big saving to the company.

Electric power is supplied by Great Western Power Company over a line 14 miles long from Viramont and the mine is also equipped with steam power for hoisting. The upper works are equipped with 100-h.p. motor, 2 air compressors of 750 cu. ft. capacity each, steam engine and hoist and Krogh Centrifugal pumps on No. 3 and No. 4 levels. There is a compressor and blower at No. 8 level. Denver Dreadnaught and Ingersoll water drills are used entirely.

Ore is brought from the upper workings by a tram 4800 ft. long carrying 16 buckets. It is dumped on a 6 inch grizzley; crushed in 20″ x 10″ Blake type crusher and 16″ x 41″ rolls and elevated to mill bin. The feed to the 2 Marcy 100-ton mills is about 1½ inch. These mills travel 26 r.p.m. and require from fifteen to thirty 20-pound balls each a day. Dorr classifiers return the oversize for regrinding and the fines are elevated to three Callow primary cells, using 4½ lb. air pressure. One-half the product from these cells goes to settling cones and the balance to 3 Callow cleaner cells. The tailing from the 3 primary cells goes to 6 Callow secondary cells and the product from secondaries goes to the 3 cleaner cells and thence to the settling cones. Tailings from secondary and cleaner cells are impounded. Concentrate from the settling cones goes to a 5′ x 8′ Oliver filter; overflow to Dorr thickener from which thickened product goes to filter and finally by belt conveyor to outside storage for shipment. The feed to the flotation cells is 60% finer than 200 mesh.

For flotation, 4 lb. coal tar and 2 lb. Yaryan pine oil per ton of ore are used. The pine oil runs freely, but the coal tar has to be heated by steam coils to reduce its viscosity, even in summer. The ratio of concentration is 5.7 to 1. The concentrate assays 18% to 20% copper, 7 oz. silver and $4 gold a ton. A recovery of 94% of the copper and 73% to 75% of the gold and silver in the ore is claimed. The present capacity is about 160 tons a day.

SIERRA COUNTY.

There has been about the usual amount of prospecting in the county during the past year, but most of this work has been on mines previously described in this Bureau's reports. Below are listed most of the properties that have been active during the year. Generally speaking, the county's quartz mines are in the development stage. While there are some of them, like the Tightner and Plumbago, that have produced considerable phenomenally rich ore, from pockets, development has nowhere reached a depth of over a few hundred feet.

QUARTZ MINES.

Belmont Mine. Near Alleghany. Two adits have been driven to develop a vein about a foot wide, and Peter Flowers and L. C. Harden, who have been working on the property, planned to put up a small mill last summer.

Bessler Mine. L. and T. Bessler, Downieville. It is at the north boundary of the town of Downieville, on the edge of the serpentine belt that has produced numerous rich pockets, some of which have come from this property. Late in October, 1920, the Bessler Brothers planned to put up a 5-stamp mill, and some ore had already been mined for crushing. The mine is on a steep mountain side, and is developed by adits, with about 150 feet of backs.

Comet Mine. Gold Exploration Company, F. O. Richardson, manager. Located in Jim Crow Cañon, southeast of Downieville. A wide vein carrying free gold and arsenopyrite, has been prospected during the past summer by two adits, 130 feet apart, the lower one of which is about 200 feet below the outcrop. Late in the summer, it was reported the upper tunnel had been drifted on ore for 175 feet.

Cleveland Mine. In Sierra City district, about 3 miles by road southwest of Loganville. This property has been operated by R. G. Gillespie of Pittsburg, Pennsylvania, since 1915. There is a 10-stamp mill and considerable mine equipment, all electrically operated. Gillespie stated late in 1919 that he had made no discoveries of particular interest or importance, although the shaft has been sunk several hundred feet and the mill has been operated. It was reported in September, 1920, that the mine was to be closed.

City of Six Mine. A. E. Hodgkinson, et al. Property is about a mile and a half south of Downieville.

The vein is developed by 2 adits, about 300 feet apart; the upper one is 700 feet long with raises and winzes on the vein, and the other is about 1150 feet long, but not yet in ore. Some work is done every summer on the property.

El Dorado Mine. This mine is in the cañon of Kanaka Creek, adjoining the Tightner mine, about ½ mile from Alleghany. Sinking was in progress last summer to open, if possible, at greater depth the three small, rich shoots previously worked. Ten-stamp mill operated part time.

Kanaka Mine. Ambrose Madden, owner. Located near Alleghany. The adit was advanced during the past season.

Kate Hardy Mine. On Oregon Creek, 2 miles southwest of Forest City. Described at length in our last report.

New equipment was put in the past spring, and a winze is being sunk from the lowest tunnel to explore a prospect found in the tunnel. It was planned to open a level 100 ft. below the tunnel and to continue sinking to 200 feet.

Mariposa Mine. It is in the cañon of Kanaka Creek about a mile from Alleghany. An inclined winze was being put down on the vein during the past summer, from the longest of 3 adit drifts, which were driven years ago and produced high grade. There is a 5-stamp mill (old), an electric hoist and compressed air equipment on the property.

Monarch Mine. Located 3 miles northwest of Sierra City. Mine and 20-stamp mill have been in operation several years, under bond held by R. G. Gillespie, Pittsburg, Pennsylvania. During the past summer drifts were being driven on the 300 level to develop ore found early in the spring. The property is well equipped, having a hydroelectric plant, pole line, sawmill and double drum hoist.

Oro Mine. John Rosenfeld's Sons, San Francisco, owners. Reynolds, Stevens, and Mastick of San Francisco and John Costa, Downieville, lessees. Mine is ½ mile from Downieville by trail.

The vein is a stringer lead of quartz between a slate footwall and slate, accompanied by a basic dike, on hanging wall. Vein has a maximum width of 5 ft., average width 1 ft. The pay so far has occurred in small bunches with a strip about 4 inches wide on hangingwall quite rich at times. The vein is developed by five adits, the lowest of which is possibly 500 ft. below the outcrop. No. 4, the lowest adit, was a drift 800 ft. long with a branch drift 375 ft. long when visited. A winze had been sunk 15 ft. below the level. There is a water blast for ventilation in the drift, operated by water from an old upper adit.

Sixteen to One Mine. This mine is ¾ mile southwest of Alleghany on side of cañon of Kanaka Creek. In the recent lawsuit between this company and the Twenty One Mining Company, the Sixteen to One was given judgment for $60,000 for ore extracted from its property. The Sixteen to One has purchased the Twenty One property and has been running its own mill.

Tightner Mine. The property is just south of Alleghany on the north side of cañon of Kanaka Creek, some of the workings extending under Alleghany.

Work was resumed in the mine early in 1920 under an agreement that a stated amount of money was to be spent in development work; the stockholders agreed to set a stated value on their stock, and if the development satisfies the prospective buyers they are to take up the stock, the current report being that the price would be $400,000.

DRIFT MINES.

Drift mining generally through the Sierras has been almost at a standstill during the past two seasons because of the lack of snow and rain, unfavorable financial conditions, and scarcity and cost of labor. Sierra county has been known particularly for its drift mines for many years. A resume of drift mining operations in the county for the year 1920 can be little more than a list of the properties on which some work has been done, as only a very few of them have made any production.

Arizona Mine. Located in Jim Crow Cañon southeast of Downieville. Hugh McCormack cleaned out part of the old 1800 ft. tunnel and started two upraises early in 1920. He is said to have found good gravel in both these, and a heavy flow of water.

Brown Bear Mine. Owners, H. Tibbey et al., Downieville; lessees, Wilcox and Smith, Downieville, known as Brown Bear Mining Company. The mine is 5 miles by trail north of Goodyears Bar at an elevation of 5100 ft. on the east side of St. Charles Hill in sections 13 and 24, T. 20 N., R. 9 E., and sections 18 and 19, T. 20 N., R. 10 E., containing 260 acres and covering 3 miles along supposed course of channel.

The channel was being sought through an adit 430 ft. long, N. 30° W., leading to an incline 300 ft. long, from the foot of which a tunnel had been driven 480 ft. at time of visit. A raise put up 84 ft. from a point 402 ft. from portal of adit was in pipe clay and a raise 28 feet high from near face of lower tunnel showed gravel with bedrock pitching west, indicating they were on east rim.

The property is equipped with a horizontal steam boiler, 12-h.p.; a vertical steam boiler of 20 to 25-h.p., a 3″ Worthington pump and other pumps, a hoist, saw, etc. The boilers require about 4 cords of wood in 24 hours, necessitating several men for woodchopping.

Assuming a grade of 100 ft. per mile in the channel between this property and the Wehe mine, 2½ miles distant and apparently on same channel, the work should have bottomed channel. That it had not, may be due to channel having a flatter grade than supposed or to it being faulted down between the two mines.

Gibraltar Mine. Gibraltar Consolidated Gold Mining Company, Downieville. The mine is in Poker Flat mining district, 9 miles east of Table Rock.

There is an old adit 1780 ft. long, from which a shaft was sunk 310 ft. deep, from a point 400 ft. in adit. A new tunnel, intended to strike the channel about 400 feet south of shaft, and which was expected to be driven about 1000 ft. before reaching the gravel, has been driven about two-thirds of the distance.

Hilda Mine. Under lease and bond to Hilda Gold Mining Company. This old property, consisting of placer claims, water rights, etc., lies 2 miles in an air line southeast of Sierra City and 62 miles by road from Nevada City. It was being reopened early in the year. It lies at an elevation of 6000 to 6500 feet. Last operation previous to present company was by Holley of Sierra City. It was formerly hydraulicked

but the present company planned to mine by drifting. There were two adits, 500 ft. and 80 ft. long, respectively, when they began work.

Hilo Mine. Located 5 miles north of Downieville. Bernhardt Brothers annually mine and wash 1000 to 1500 cars of dirt, part of it pay gravel, from this claim.

Kirkpatrick Mine. John C. Donnelly, manager. Located 2 miles north of Forest City. A gravel mill was installed at this property about a year ago and has been operated part of the time.

Monte Carlo Mine. In the NE. ¼ of section 26, T. 21 N., R. 10 E., about 9 miles by trail north of Downieville, on Clark Cañon, a small branch of Rattlesnake Creek.

An adit was being driven the past summer by two men, and indications were that gravel would be found early in September.

Mount Alta Mine. Mrs. R. St. Clair, owner; A. T. Hathaway, lessee. Adjoins the Pleasant View mine on south. Has been worked irregularly for several years; some work has been done in 1920. There is a 4000-ft. adit. Some gravel was mined last year, but water was scarce for washing. In March, 1921, it was reported that gravel running $3 a ton had been struck in some new ground.

Nugget Nell Mine. Located on the headwaters of Goodyears Creek, in section 4, T. 20 N., R. 10 E. Some drilling was being done the past summer to locate the channel in this property.

Poor Boy-Bella Union Mines. Located 4 miles by road and trail south of Port Wine in section 32, T. 20 N., R. 9 E. Fred M. Phelps has had a bond on this group for five years and has been prospecting with a Keystone drill. Late in the fall of 1920 it was planned to begin a bedrock tunnel, which it was estimated would have to be driven about 3000 feet to strike the channel.

Sunshine Mine. D. Sullivan, et al., Downieville. It is near Gold Point on the South Fork of North Fork of Yuba River. Water power was brought to the mine the past summer to run pumps for unwatering the incline.

Table Rock Mine. Table Rock Mining Company, Union Savings Bank Building, Oakland. J. H. Hartley, manager. The mine is at Howland Flat. This company has been working for six years or more. They have been taking out pay during the past year through a tunnel over 3000 ft. long. The gold is coarse, but occurs in a sticky clay, making its recovery difficult. The company has spent probably in excess of $100,000 on the property.

Wehe Mine (St. Charles Hill Mine). F. Wehe, Monadnock Building, San Francisco. The mine is on St. Charles Hill in sections 24, 25 and 26, T. 20 N., R. 9 E., 7 miles by trail from Goodyears Bar at an elevation of 4750 feet. Covers 320 acres, and about two miles of supposed course of ancient channel. Portions of this channel were worked years ago, but channel was said to be faulted down 38 feet in the old works and was abandoned after paying up to the fault. This fault was said to be 700 ft. downstream from the present tunnel. A lower tunnel

was driven 820 ft. at time of visit, a raise had been put up 35 ft. and an upper tunnel from top of raise had been run 130 ft. and has since been advanced farther. Raises from the lower tunnel and bore holes from the upper one are claimed to have struck gravel. The channel is supposed to be wet and hard to handle until drained, so it is planned to extend the upper tunnel for drainage.

HYDRAULIC MINES.

Depot Hill Mine. Joubert Company, F. J. Joubert, Camptonville. This hydraulic mine has been worked with profit on a small scale for many years by the Joubert family.

Marysville and Nevada Water and Power Company. This company has built a concrete dam across the North Fork of Yuba River near Bullards Bar and has received a permit to hydraulic the Brandy City mine, north of Camptonville. This mine is described in our last report.

New Council Hill Mine. H. L. Berkey, manager. Located at Scales, on Rock Creek. This property will probably be operated the present season.

TUOLUMNE COUNTY.

The principal developed mineral resources of the county are the gold quartz mines of the Mother Lode and the East Belt, the deep gravel mines and the marble quarries of the Columbia district. Limestone and lime are produced in important amounts and chromite, copper, platinum, and by-product silver (from gold ores) have been produced in small quantities in recent years. Years ago graphite was mined, and there are undeveloped prospects of many of the industrial minerals and building stones.

Activity during the past year has been confined to mining and milling at a few properties on the Mother Lode, the development of some of the East Belt mines and the operation of the marble quarries near Tuolumne. Time did not permit the writer to visit all the active properties this season, but in some cases where visits were made late in 1919 and where there have been no great changes reported, notes taken then are included.

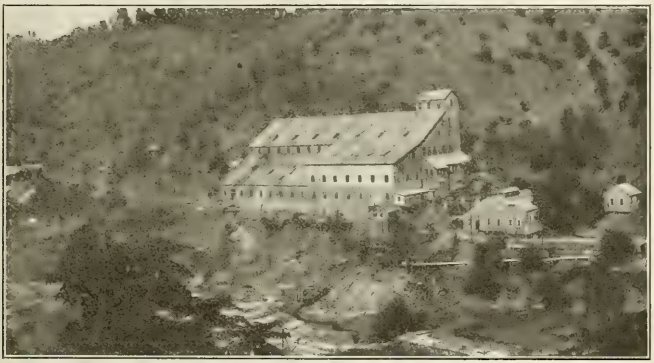


Photo No. 60. Mill at Belmont Shawmut Mine, on the Mother Lode, near Jacksonville, Tuolumne County

GOLD QUARTZ MINES.

Belmont Shawmut Mine. Belmont Shawmut Mining Company, 917 Hobart Building, San Francisco. This company is subsidiary to the Tonopah Belmont Development Company. Mine and mill are on Woods Creek, about four miles from Chinese Camp and two miles from Jacksonville, near the highway to Yosemite Valley.

This property is the largest in point of ore reserves and equipment in the county, and at the same time is so situated that it might be operated even under present conditions at a profit. An excellent article on the mine and mill, describing the property and plant and giving details of mining and milling operations, has been published recently,[1] and need not be repeated here. The property comprises about 2000 acres.

[1] Arthur B. Parsons. The Mine and Mill of the Belmont Shawmut Mining Company. Mining and Scientific Press, October 30 and November 6, 1920.

The ore occurs in a broad fracture zone, filled with quartz stringers and dolomite, on the hanging wall of a basic dike and is invariably accompanied by the bull quartz outcrop. O. McCreaney, superintendent, distinguishes four kinds of ore, namely, banded quartz, impregnated schist, dark and light sulphide ores. The hanging wall is a metamorphic complex of Mariposa formation largely schist, slate and limestone, and the footwall is talc of the Calaveras formation. The intrusive under the vein is a coarse crystalline aggregate composed largely of basic feldspars. The vein strikes N. 32° W. and dips NE. 70°. On the footwall side there is a gouge which swells badly. Between 1100 and 1400 feet the ore and gouge are in contact, but below are separated. The gangue in the deepest levels is mostly dolomite which was first found on the 17th level. The principal pay ore in depth is the dolomite-sulphide ore, which occurs in well defined overlapping lenses 8 ft. to 30 ft. wide. The vein rolls and the ore is on the crests of the anticlines. The ore averages 7% sulphides, the dolomite-sulphide ore containing even more; the sulphide is principally pyrite.

There are three inclined shafts on the property which are 420, 2163 and 720 ft. deep respectively. The present working entry is a crosscut adit connecting with the 2163 ft. shaft 400 ft. below the outcrop, the shaft being caved above that point. The shaft is on the vein to between the 11th and 12th levels then on an angle of 62° to the 18th level, where it is about 80 ft. from the vein in the hanging wall. A winze is sunk 200 ft. deeper, giving a total inclined depth of 2363 ft. Levels open late in 1919 were the adit and 2, 11, 13, 14, 16, 17, 18 and 19. At that time there had been about 30,500 ft. of drifts, 10,000 ft. of raises and winzes and 4120 ft. of crosscuts driven in the mine. Stopes are carried not over 200 ft. long, 10 to 30 ft. wide and 100 ft. high.

The mine was closed August 1, 1920, and the mill two weeks later. Since then the company has employed about 20 men, as compared with a usual working crew of 180 to 190 men. When visited in October, 1920, the superintendent stated they were in position to resume work at any time, as the water was being kept down. The chief reasons given for the temporary closing were the scarcity and inefficiency of underground labor, the electric power situation and high costs.

The mill has a capacity of 450 tons a day but has recently been treating only 300 tons a day. There are twenty 1250-lb. and fifty 1050-lb. stamps crushing to 10 mesh; 8 Butchart tables and 9 Jones Belmont flotation cells. The tables make a sand concentrate which is dewatered in three 28 x 7 ft. dewatering tanks and is worth about $60 a ton. The table tailings are classified in a Dorr Duplex classifier; sands are reground and slimes thickened in 2 Dorr thickeners, passing thence to another classifier, from which the overflow goes to the flotation cells. The flotation concentrate is run over one of the Butchart tables, and is low grade.

Previous to 1920, the present company shipped the concentrate to a smelter. The comparatively low grade of the product, the cost of shipment, and the smelter costs, penalties and requirements became so exacting that they cast about for means of recovering the bullion

on the property. An experimental plant was in use in October for cyaniding old chlorination tailings and some flotation concentrate. They have evolved a method of cyaniding a mixture of roasted table concentrate and raw flotation concentrate, which appears to have solved the problem.

The statement was made by the writer in an article published last year that this company had ore blocked out ready to mine for a long time and did not need to carry on current exploration and development. O. McCreaney, superintendent, takes exception to this statement.

Clio Mine. Clio Vindicator Mines, Incorporated; main office 244 Plymouth Building, Minneapolis, Minnesota; superintendent, Geo. L. Holmes; mine address, Chinese Camp, California. Mine is on Tuolumne River ½ mile below Jacksonville and covers the lode for nearly 3000 feet on the north side of the cañon at an elevation of from 900 to 1450 feet. There are 2 patented claims named Clio and Kershaw, which are 150 ft. wide and 3 unpatented claims and a mill site.

This mine was first equipped with a 10-stamp mill in 1862 or 1863 and was worked five or six years, with recurring periods of activity ever since. It had been idle most of the time since 1912 until the present company began work in November, 1919. The mill has been in operation since April, 1920.

The vein has a swelling serpentine footwall with a heavy gouge and a schist hanging wall. It is a stringer lead with the schist heavily charged with pyrite for an average width of 8 ft. on the 218 ft. level. The vein strikes NW. and dips 69° E.

There are five levels in the mine. The working adit or 218 level is a crosscut driven north from the West Clio about 330 feet to the Clio claim then northwest about 80 feet, where it connects with a shaft giving access to lower levels situated at inclined depths of 306, 361, 473 and 565 ft. Drifts are north of the shaft. The old 218 north drift was about 320 ft. long but was caved over half way and a new drift was driven about 200 ft. long in the footwall, from which a crosscut through the gouge connects with the north end of the old drift. Some small stopes have been started on this end. There is also 130 ft. of drifting on the 473 level and about 350 ft. of work, mostly drifting, on the 565 level. Very little has been done on the 306 and 361 ft. levels. About 25 feet above the 218 adit, and 640 ft. northwest of it, the Heath tunnel, driven east 470 ft. connects with the shaft.

The mill contains 10 stamps, a 10″ x 12″ Blake crusher, and 4 Frue vanners, all operated by a 50-h.p. motor. There is a Leyner compressor, 5 drill capacity, with 75-h.p. motor; and a single drum hoist on the 218 level. Electric power is bought from Pacific Gas and Electric Company. Nineteen men were employed.

The mill was being operated on schist ore from the 218 level in October, 1920. This material is heavily impregnated with pyrite. The vein was pretty well stoped from the old works on the 218 level to surface.

Confidence Mine. Confidence Gold Mining Company, 604 Mission street, San Francisco. The mine is in west half of section 10, T. 2 N., R. 16 E., at Confidence, 14½ miles from Sonora by good road and contains 4 claims.

This is one of the East Belt mines that had a romantic early history and a reported production of five to seven millions of dollars.

The vein is very irregular, ranging from 1 ft. to 15 ft. in width, striking N. 14° W. and dipping 18° to 30° E. between hard granodiorite walls. It accompanies a dike. The gold occurs partly free but largely in rich sulphides, the galena formerly found having run as high as $2 a pound at times.

There are two shafts on the property about 1200 ft. apart, the deepest of which was down to 1210 ft. on the dip or about 540 ft. vertically when property was last visited, the present company having sunk the north or "new" shaft 400 ft. below the old 810 ft. level.



Photo No. 61. The Confidence Mine at Confidence, Tuolumne County.

The original shaft is caved for probably 130 ft. below the collar. There were five levels in the old works and vein was stoped from the 810 level to surface between the shafts. The present company has driven several hundred feet each way on the 900, 1000 and 1100 ft. levels.

Under former operators the problem of ore treatment was never solved, it is said, and the present company is supposed to have met with difficulty of the same kind. The plant which they have erected has been idle a large part of the time. It contains a Marcy mill, capacity 150 tons a day, operated by 75 h.p. motor; Dorr classifier, 2 Senn Panning Motion concentrators, 2 Dorr thickeners, 2 Wilfley concentrators and cyanide treatment plant. The mine is equipped with a Sullivan air compressor 8¾ x 10 in.; a Leyner drill sharpener, and hoist operated by a 22-h.p. motor. Work with a small crew underground has been going on during the past three years.

Dutch-App Group. Under bond to Pacific Coast Gold Mines Corporation, 614 Crocker Building, San Francisco; W. J. Loring, presi-

dent. The property is on Quartz Mountain 2 miles south of Jamestown, and comprises the App, Heslep, Hitchcock, Dutch and Sweeney mining claims and mill sites, 110 acres, with a length of about ½ mile on the Mother Lode.

The present company, which quit work in April, 1920, has been working through the Dutch shaft since November, 1915. They sank this shaft from 1800 ft. to 2350 ft. inclined depth (2070 ft. vertical) and did about 17,000 feet of new development and exploration on the 1350, 1500, 1650, 2050 and 2300 levels on the App and Heslep veins. The 1500 was the main working level, and was extended 1800 ft. Ore was mined and milled from the 1500, 2050 and 2300 levels.

Veins are as follows: West, Footwall (in App), Heslep (hanging wall), Middle vein, and Knox and Boyle. The Footwall vein averaging 10 ft. wide, which was being stoped on the 1500 level, has the bull quartz as hanging wall; the Heslep vein, 15 to 20 ft. wide, is on the hanging wall side of the bull quartz. The Middle vein comes within 5 to 10 ft. of the Heslep vein above the 1500 level, and they were mined as a whole, 30 to 40 ft. wide. The veins strike N. 35° to 45° W.; dip about 65° NE. and the ore is sometimes solid quartz but usually a stringer lead between a footwall of grey schist and hanging wall of black schist. The ore is 8% to 10% sulphide, mostly pyrite, and concentrate is worth about $40 a ton.

The ore treatment was as follows when the mill was visited when in operation late in 1919: Ore from shaft bins was broken to 3 inch size in gyratory crusher under the bins, and conveyed to mill bins from which it was fed to 2 Hardinge mills, grinding to 80 mesh. Pulp passed over plates to amalgamate any coarse free gold; classified, fines elevated and sent over 2 sets of 3 plates each for further amalgamation of gold, then sent to a 16-cell Minerals Separation flotation machine. Flotation concentrate from first 8 cells was cleaned on 2 Wilfley tables, and from last 8 cells was returned to first 8 cells. Flotation tailing was sent to a K. and K. flotation machine, from which the concentrate went to a Dorr thickener, diaphragm pump and Oliver filter and was mixed with the concentrate from Wilfley tables for shipment. For flotation, a mixture of pine oil, water-gas tar, stove oil and beechwood creosote was used. A recovery of 90% to 92% was claimed. The mill was handling 150 tons a day, but had a capacity of 300 tons.

The mines in this group operated for years previous to the war at a profit, on low grade ore, and could no doubt be made to pay again if prices should recede or if relief should be given the industry by proper legislation such as is contemplated in the McFadden bill.

Grizzly Mine. Grizzly Mining Company, Oakland; Otto F. Heizer, superintendent. The group includes the Eureka, Dead Horse, Lady Washington, Grizzly, New Albany and nine other claims 2 miles from Tuolumne in the steep cañon of the North Fork of Tuolumne River.

The properties have been worked at intervals for many years and ore was milled last in 1914 by Paul Morris. The vein is quartz, and well defined, following in part a contact between black slate and granodiorite, and in part filling a fissure in granodiorite, and is associated with a diorite dike. Vein strikes N. 45° W. and dips 50° NE., and varies from 2 to 5 ft. in width. It has a good production to its credit in past years.

The principal workings are the Dead Horse shaft, over 1700 ft. deep on the dip of vein, and the Lady Washington tunnel, which is a crosscut meeting the shaft at the 1165 level, 2400 ft. from the tunnel portal, and from that point is a drift on the vein driven over 900 ft. at the time of writer's visit, and since extended farther. The shaft, which is said to have been full of water below the tunnel level for 20 years has been unwatered during the past summer for the purpose of opening a level at 1750 ft. and exploring the vein. Two shoots were



Photo No. 62. Mill of the Grizzly Mining Co. (formerly New Albany Mill), near Tuolumne.

worked formerly from the shaft to a depth of 1400 ft. and the levels above the Lady Washington tunnel are abandoned.

The reduction plant is nine years old and consists of twenty 1000-lb. stamps, 3 Frue vanners, 2 Hardinge mills and cyanide equipment.

The property has first right to water from the river and the supply is ample for power and milling except in the fall of very dry years. A 14-ft. Pelton wheel using water under 125 lb. pressure operates the air compressor. The mine is connected with the road by a tramway.

OTHER QUARTZ MINES AND PROSPECTS.

During the past summer there has been some prospecting on numerous properties in the southern end of the county and near Tuttletown, as noted briefly below.

Buckhorn Mine, being developed by California Packers Association. A contract to drive 150 ft. of drift was let during the past summer. It is in the Moccasin Creek district south of Jacksonville.

Boitano Mine, near Deer Flat. Six men employed and a 4-stamp mill being put up during the summer.

Harriman Mine. Harriman Mining and Milling Company, an Arizona stock company, capitalized for $500,000. This is a group of 3 claims located on Tuolumne River and on the Yosemite highway near Moccasin Creek. A small compressor was installed, and a shaft was being sunk during the summer, and was down over 100 ft. in August.

McCormick Mine. M. McCormick Co., Stockton, owner. Located south of Shawmut mine, and a mile and a half above Stevens Bar bridge. This property has been a producer of high grade ore in small amounts for over two years. It was first developed by an adit 1700 ft. long on the cañon side above the river and a winze was sunk on the vein. Later an adit 500 ft. lower was driven. There is a small mill on the property. The ore is rich in free gold.

Madelon Mine. J. W. Schiffman, P. E. Mertz, L. S. Grant et al., owners, Jamestown. Under bond to Henry Schmal, superintendent, and others, known as Associated Miners. The prospect is about 3 miles south of the Belmont Shawmut near Stevens Bar bridge.

There is an old shaft near the edge of the river, but Schmal has been driving an adit about 30 ft. above, and has found some good prospects.

National Mine. One mile northwest of Priests. Comprises 3 claims under bond and lease to National Gold Mines Company. There is an old shaft about 300 ft. deep on the property. The present company has done a little mining and has moved a second hand 10-stamp mill and mine equipment from the Champion property.

Patterson Mine. This old property at Tuttletown has been prospected by a winze from the tunnel level and some good assays have been reported during the past summer. A motor, air compressor of 500 cu. ft. free air capacity, blacksmith shop and small hoist have been installed. J. L. Witney, superintendent.

Tarantula-Gold Ridge-Reitz Group. This group includes the Tarantula mine adjoining the Belmont Shawmut on the north and other claims on which Henry T. Gage, former governor of California, had a bond for some time. Early in 1920 Gage transferred his interest to the Tuolumne Giant Gold Mines Company, of Los Angeles. Specimen ore was found in a drift driven at a depth of 80 feet from a shaft sunk 120 ft. on the vein on the Gold Ridge claim.

Preparations were being made in November to extend the Tarantula adit into the Gold Ridge, with the idea of tapping the vein at a greater

depth. Stock in the company is being sold in Los Angeles by the American Securities Company.

Verdun Mine. Solari, June, and Mangante, owners. At Stevens Bar Bridge and adjoins the Harriman mine. It was prospected by the owners who drove an adit 180 ft. long before bonding it early this year. A little work has been going on the past season.

DRIFT MINES.

Little placer mining has been done in the county the past year. Most of the work of this kind has been on the Table Mountain channel system which has been mined since 1850.

Monarch Gravel Mine. Owners, Mr. and Mrs. A. H. Hiatt and Frank B. Hiatt of Confidence; leased to Monarch Gravel Mining Company, Jerry Casey, secretary, 510 Page street, San Francisco. This prospect is in section 4, T. 2 N., R. 16 E., 2 miles north of Confidence at an elevation of 4500 feet.

Work has been done during the summers for several years past. A main tunnel had been driven 1800 ft. and a branch tunnel 455 ft. in rotten granodiorite. At 1200 ft. in, a raise was put up 15 ft. and a drift was run in rather fine gravel for 200 ft. parallel to the main tunnel. This gravel was said to carry $1.50 to $2 a car. They also had fine gravel in the roof of the branch tunnel when visited. It appeared at that time that they had only encountered the rim of channel, the direction and size of which was not known.

There is an Ingersoll Rand air compressor, 9″ x 8″, a 35-h.p. Samson gas engine, small blacksmith shop and machine drills on the property. There is good timber on the property and a water ditch ¼ mile distant.

Springfield Drift Mine. Springfield Tunnel and Development Company, Sonora; J. S. Cademartori, superintendent. Property comprises 1198 acres about 1 mile south of Columbia in sections 9, 10, 15, 16 and 22, T. 2 N., R. 14 E. Elevation at new drain tunnel portal is 2029 feet and at new Richards shaft is 2300 feet.

Portions of the property have been worked off and on since 1852 when pay gravel was discovered on the Fox claim in a shaft only 8 ft. deep. The first tunnel to find gravel under the basalt cap was started in May, 1854, and reached the channel in October, 1855. The Joint Stock, Springfield, Buchanan and other workings, all were extensively opened in the fifties and sixties.

Some years ago this company planned to drive a tunnel 6000 ft. long from the Stanislaus River slope for the purpose of draining the heavy flow of water which hampered shaft sinking. This tunnel was abandoned. In its place a new drain tunnel was started which has its portal a little west of the Saratoga drain tunnel. This tunnel has been completed to the new Richards shaft, 3000 ft. north. It is planned to extend it to No. 2 shaft, 1300 ft. northeast of Richards shaft, as soon as funds are available. In a portion of the tunnel 800 ft. of tarred iron drain pipe 16 inches in diameter was laid and the tunnel was permitted to cave after protecting the pipe. Most of the tunnel was in limestone. It is 5 ft. wide, 6½ ft. high and is said to have cost $12 a ft. It has a grade of ½ of 1%.

The gravel is covered with an average of 180 ft. of latite and andesite and 12 ft. of pipe clay. A series of 30 Keystone drill holes have been driven on the property and the reported returns from some of these are encouraging. All these are quite a distance north of the Richards shaft which is the present working entry. A fine prospect was reported from No. 3 shaft, on the Barry channel, 1500 ft. north of Richards shaft. While working in No. 3 shaft some years ago the superintendent reports he and several miners narrowly escaped drowning when caught by a sudden rush of water and were unable to properly prospect the ground. Three drill holes in the Barry channel near this shaft gave very high returns.

The superintendent believes there are four channels which enter the main Table Mountain channel from the northeast on the property. This belief is based partly on the drill returns. Just where they enter the main channel is conjectural, as there is a great deal of ground unexplored. Looking north, the supposed channels are named as follows from west to east: Table Mountain, Buchanan, Fox, Barry, Slaughter House. Widths indicated by the drill were: Buchanan, 600 ft.; Fox, 60 ft.; Barry, 200 ft.; Slaughter House, 17 ft. The Barry channel where drilled was 62 ft. deeper than the Fox and Buchanan, which may be bench deposits. The drain tunnel passed under the Table Mountain channel and raises were put up into the gravel but it was said to be too low grade to mine. Richards shaft is 265 ft. deep; No. 2 shaft, 242 ft.; No. 3 shaft 279 ft.; O'Hara shaft 230 ft. and old Ranch shaft 125 ft. deep; besides these, there are numerous old workings.

During October and November, 1920, they mined some rim gravel off the old workings 200 ft. north of the Richards shaft. This work was incidental to driving the tunnel ahead to No. 2 and No. 3 shafts and it is hoped the returns will help pay for the tunnel.

The property is equipped with a barrel mill, 2 stage Byron Jackson centrifugal pump, hoist operated by 37-h.p. motor (at Richards shaft), 12″ x 12″ Sullivan air compressor operated by 50-h.p. motor, an old compressor 10″ x 12″, and 2800 ft. of electric power line. Water for milling is pumped from an old shaft.

GRANITE.

Sonora Granite Company. J. E. Hunt, manager, Sonora, California. Located on the Rablen Ranch, near Sonora. Late this fall, the compressor, hoist, other machinery and buildings at the Garfield Mine on the Tuolumne River were being moved to the Rablen Ranch for use in quarrying granite.

LIMESTONE.

Pacific Lime and Plaster Company. Quarry and plant 1 mile south of Sonora. This company was preparing to use wood instead of oil for fuel a few months ago. They produce burnt lime and raw, crushed and ground limestone for industrial and agricultural uses.

MARBLE.

The marble resources of the Columbia district and the adjacent portion of Calaveras County are inexhaustible. The reasons that have

retarded their development are cost of transportation and the prejudices of architects and builders, who are gradually being educated away from the idea that California marble is inferior to that brought in from other states and Alaska or from foreign countries. The cost of getting the home product to market is decreasing with the improvement of roads and development of motor transportation. Increasing transcontinental and ocean freight rates have helped the local producers, notably as regards competition with Alaskan marble, which before the war could be delivered from the coast of Alaska to San Francisco for $1 a ton, as against $3 a ton from Sonora. It is to be hoped that California producers can establish themselves in the market during the readjustment period, and show builders that the domestic supply is always available and of high quality.

Bell Marble Company. Ed. Parke, J. B. Warner and Ed. Hill, owners. The property is lot 18 in Columbia townsite and contains 25 acres, with a known area of marble 350 ft. x 700 ft. This company has been operating since December, 1918. The pit was 40 ft. deep when visited.

Marble in rough blocks containing 6 to 14 tons each is broken out by jackhamers and plug and feather and shipped to San Francisco and Oakland firms. The product varies from pure white to dark veined. It is 80% $CaCO_3$ and 16% $MgCO_3$ and weighs 169 lb. per cu. ft. and has a compressive strength of 22,000 lb. per sq. inch, as compared with 16,000 lb. per sq. inch for the Alaska and Vermont marbles with which it competes. There is about 20% waste in quarrying. Hauling from the quarry to Sonora has cost $2.25 a ton on contract, but can be done cheaper.

The quarry is equipped with a Washington derrick hoist, 15 tons capacity, operated by compressed air; a 75-h.p. motor, Rix air compressor, 350 cu. ft. capacity, and 2 mile electric power line. The output could be largely increased with the present outfit if business warranted.

Columbia Marble Company. W. D. Bannister, Columbia, president and manager. The property contains 160 acres, all presumably underlain by marble and is situated on the cañon side of North Fork of Stanislaus River in sections 2 and 3, T. 2 N. and section 34, T. 3 N., R. 14 E. 3 miles from Columbia and seven miles from Sonora, at an elevation of 1500 ft. The quarry has been worked since 1891.

This property produces a fine quality marble, in any color desired from white to dark veined and black. There are also 2 grades of Portola marble produced; this is a beautiful buff stone with reddish veining. It was used in the Union Trust Building in San Francisco. The product of this quarry is considered equal to any in the country and as regards durability and strength is superior.

The old pit is 150 ft. wide, 200 ft. long and 80 ft. deep. In winter it catches a great deal of water which has to be pumped out at heavy expense, and so this pit is to be abandoned. A new pit is being opened 1200 ft. west of the old one and directly over the river, for convenient drainage. The marble is blocked out with an air drill and channeler and broken with plug and feather. The large blocks are broken into small ones weighing about 15 tons each, which are hoisted from the pit by a derrick. An Ingersoll Rand portable drilling outfit is used.

This consists of an air drill, 5-h.p. electric motor, and small compressor direct connected to the drill, the whole outfit being mounted on wheels, and easily moved about. The drill is mounted on a quarry bar and is said to drill 140 ft. a shift with about 2½ h.p.

The 15 ton blocks are trammed from the derrick to the 8 Merriam gangsaws, which are operated by electric power and use sand for sawing. They saw the marble into slabs an inch thick. A tractor hauls loads of ten tons each to the railroad at Sonora at a cost of $2.50 a ton. The company has its own plant for generating electricity.

This quarry has been worked at only part capacity lately because of the depressed condition of the building industry. The marble deposit is 200 feet wide, 800 feet deep and a mile long and is estimated to contain over 200,000,000 cubic feet.

The **Baxter Marble Company,** 3 miles northwest of Sonora, the **Sonora Marble Quarry,** 1 mile north of Sonora, and the **Warren Marble Quarry,** 3½ miles northwest of Columbia, have all been idle recently.

YUBA COUNTY.

There is not much change in mining to record in this county for the past year. Due to the operation of dredgers in the Yuba River at Hammonton, Marigold and Parks Bar, this county is the leading gold producer in the state. Aside from the dredgers, there is a little hydraulic mining in the Camptonville district.

GOLD DREDGERS.

Marysville Dredging Company. Home office in Boston, Massachusetts. Property and dredgers at Marigold, about 8 miles northwest of Marysville, on Yuba River. This property was operating three dredgers in 1917, but late in 1920 operated only one. Two of their dredgers had 9-cu. ft. buckets and one has 16-cu. ft. buckets. One of the smaller boats is out of commission and the other was expected to go out of use in 1921. The dredger with 16-cu. ft. buckets has a capacity of 750 cu. yds. an hour and has a crew of 18 men. The ground varies from 45 ft. to 66 ft.; the average being about 65 ft. deep. The company in 1917 had 500 acres left to dredge, giving them about 10 years life. The gravel is rather low grade in gold and carries some platinum.[1]

Pacific Gold Dredging Company. Office 528 Market street, San Francisco. Dredge near Parks Bar on Yuba River. This company operates one dredger with buckets of 9 cu. ft. capacity and capable of digging 70 ft. below the water line. This property is on the upstream end of the Yuba dredging field and the ground is rich. The dredger has been in operation since 1916.

Yuba Consolidated Gold Fields. Home office 50 Congress street, Boston, Massachusetts; Geo. L. Huntress, president; R. E. Paine, secretary. Property and plant at Hammonton, 12 miles northeast of Marysville, on Yuba River.

Operations in this district were described in 1917 by the writer.[2] The company has about 3000 acres, covering the channel for a length of 5 miles and a width of $\frac{1}{2}$ to 1 mile. The gravel varies in depth from 25 to 100 ft. About 2000 acres have been dredged and 219,000,000 cubic yards have been handled up to November, 1920. In the annual report for the fiscal year ending February 28, 1920, the yield was said to be 13.66 cents a cubic yard and cost was 6.67 cents a cubic yard. This indicates a decrease in value per yard, although the yardage handled that year was the largest yet. The operations up to June 30, 1920, revealed a further decline in yield per yard to 11.22 cents. Yield for the year ending February 28, 1920, was $3,212,213.

The company is now operating 2 dredgers equipped with 7-cu. ft. buckets and 6 dredgers with 17-cu. ft. buckets. There has been some interruption to dredging, as well as to other forms of mining, during the past autumn on account of power restrictions. Some of the dredgers are equipped with a stacker on each side to permit easier operation when working in the channel, which has to be left clear under the rules of the government; tailings are stacked on each side, leaving an open lane at the rear, in the channel.

This company is the largest single producer of gold and platinum in the state.

[1] See "Platinum and Allied Metals in California," by C. A. Logan; Bulletin No. 85, California State Mining Bureau.

[2] California State Mining Bureau, Bulletin 85: Platinum and Allied Metals in California, 1918.

REDDING FIELD DIVISION.

By C. McK. Laizure.

Part I.

SCOPE OF THE INDUSTRY.

The Redding Field Division embraces the following eight northern counties: Del Norte, Humboldt, Siskiyou, Trinity, Shasta, Tehama, Modoc and Lassen. Of these, Shasta, Siskiyou and Trinity have been recognized for many years as preeminently mining counties. The mineral resources of Del Norte and Humboldt on the west have not been developed to the same extent but they rank as important producers and during the war contributed largely to the 'war mineral' output of the state.

Stockraising, dairying, mining and lumbering are the chief industries in Lassen and Modoc counties. Mining became active in Tehama County during the war, the value of its mineral production jumping from $300 in 1914 to $157,591 in 1918.

The group, as a whole, forms one of the most important mining sections of the state, from the standpoint of actual production. At the same time, due to its large area, much of it unsettled and largely unexplored and the diversity of its mineralization, it probably contains more latent resources and offers more opportunities for successful development along mining lines than any other portion of the state of equal area.

The principal minerals mined are, copper, gold, platinum, silver, zinc and pyrite. The last report of the statistical department shows that Shasta County alone produces commercially sixteen different minerals. If petroleum is not taken into account, it leads all other counties in the state by a considerable margin in the value of its mineral products. Until 1919, when, owing to the Mammoth Smelter being closed, the copper production of Plumas County exceeded that of Shasta, the latter ranked first in copper, second in silver, first in pyrite, first in zinc, and seventh in gold.

Other minerals produced to a greater or less extent in the Northern California field division are: asbestos, barytes, bismuth, cadmium, chrome, clay, coal, gems, graphite, iron-ore, lead, lime and limestone, manganese, molybdenum, mineral water, natural gas, potash, pumice, quicksilver, salt, volcanic ash, marble, granite and miscellaneous stone. There are also undeveloped occurrences of mineral paint, gypsum, sulphur, talc and soapstone. Petroleum has been known to exist in Humboldt County since as early as 1860.

Further development of the Humboldt field is in progress and drilling has also been started during the year in Tehama County where it is hoped to develop a commercial field.

GENERAL CONDITIONS DURING PAST YEAR.

To say that the condition of the mining industry during 1920 was abnormal, is trite. It was, and still is, without precedent.

The past season has added one more to a succession of dry years marked by light snowfall in the mountains and little rain. The consequent shortage of water, which frequently extended even to the

drying up of springs used for domestic purposes during many years, and the acute shortage of hydro-electric power, has deterred mining to a great extent. Lack of water has particularly affected hydraulic and placer operations, but quartz mills and cyanide plants have also been compelled to shut down on account of insufficient water for mill use and power.

Most of the dredges have had sufficient water to meet their digging requirements but some have been severely handicapped by the low stage of the streams.

Enforcement of government power restriction measures affected all branches of the industry purchasing power, with few exceptions, so that even diamond drilling for exploratory purposes and gold dredging operations that might otherwise have proceeded at full force were limited for several months to the use of power between the hours of 5 p.m. and 8 a.m.

The monetary and financial conditions faced by the civilized nations of the world since the great war are not comparable with any in history. The position of the United States is probably better than that of any other nation, but even this country has suffered severely from the depreciated value of gold, measured in terms of commodities. This depreciation has resulted in excessive production costs due to the high price of supplies and high wage scales. The latter brought with it an indifferent attitude among skilled and unskilled labor and individual efficiency became low. Such conditions were particularly burdensome to the gold miner. The fixed price of his product prevented the gold producer from increasing his profit to meet the excessive costs of production and as a result the gold mines have been practically forced to close down to avoid operating at a loss.

Gold production for 1920 will reach a most discouraging low figure in this district. The dredging companies will be about the only operators whose figures will compare with normal output. There is little likelihood of there being any appreciable increase in gold mining except as it may gradually revive with the slow return of more normal or pre-war conditions, or as it responds to legislative measures now being urged before Congress. Proposed measures that have received the greatest consideration are embodied in the McFadden bill, an act designed primarily to prevent depletion of the country's gold reserve by placing an excise tax of $10 per ounce on all gold used in the arts and manufactures, and the payment, from this tax fund, of a premium of $10 per ounce on all new mined gold.

As the amount of gold consumed in this country in the arts and manufactures in 1919 exceeded the total production by over $20,000,000 and the estimated excess of consumption over production in 1920 is not less than $30,000,000, it is obvious that some action must be taken to either stimulate production or curtail withdrawals, if the gold standard is to be maintained in this country. The McFadden bill, if passed, will not affect the monetary value of gold in any way. It is anticipated that the $10 premium will enable many mines, now closed, to operate at a profit and so increase production as to relieve the country from any danger to its reserves, and at the same time preserve the gold mining industry from impending disaster. Reports

from the field indicate that considerable prospecting has begun solely on the strength of the belief that the McFadden bill will become law.

With the exception of the eight dredges, equally divided between Shasta and Trinity counties, that have been kept in commission, though for the most part on a reduced time basis, gold mining has been almost 'dead' in this district during the past year. One or two hydraulic and placer workings in Siskiyou and Trinity counties were more or less active. A few small pockets were found in Trinity and Shasta, usually by leasers working alone, and a stamp mill or two managed to operate at least a portion of the year. Beyond this, 'assessment work only' has comprised the year's gold mining record.

COPPER.

The Shasta copper belt, extending in a semicircle nearly thirty miles long, north of, and within 25 miles of Redding, contains the most important copper ore deposits so far developed on the Pacific Coast. To these is due the fact that for a decade or more Shasta County has ranked first in the state in the value of metallic wealth produced. Due to the closing of the Mammoth Smelter, the production of copper from the Shasta County mines fell from 25,294,590 pounds valued at $6,247,764 in 1918 to 8,673,342 pounds valued at $1,613,242 in 1919. Figures for 1920 are not available but the low figures of 1919 will be still further reduced by the closing down of the reverberatory furnace of the Afterthought Copper Company, in February and practical cessation of all copper mining in the county. It is difficult to see where there will be any appreciable output beyond that recovered from the leaching of the pyrite cinder, at the plant of the Mountain Copper Company in Martinez, obtained from pyrite ore mined for its sulphur content and containing on an average only about .7% copper.

Other important copper districts are being developed in Siskiyou and Trinity counties and there are excellent prospects in Humboldt, Del Norte and Lassen. Both the Gray Eagle and Blue Ledge mines in Siskiyou County are developing large ore reserves and the latter is shipping to the Tacoma Smelter.

In Shasta County the Mammoth Smelter of the United States Smelting, Refining and Mining Company has been shut down during the entire year. Development has been carried on, however, at the Mammoth and Keystone mines of the company by both surface and underground diamond drilling and large ore bodies have been proven. At the Keystone mine 25 to 30 men have been employed. Some of the ore developed here is said to run very high in gold. During the year the company closed an option on the Crystal Group of 24 claims, lying north of the Balaklala. They have also acquired the entire holdings of Holt and Gregg, consisting of limestone quarry, limeworks, and electric railway. No date has been set for the resumption of smelter operations. This will depend on conditions governing operating costs and the copper market.

The Balaklala Consolidated Mining Company's ores are sent to the Mammoth plant for smelting. Since the shut-down of the smelter the Balaklala mine has been closed. The company has large ore-reserves blocked out and is in a position to produce ore whenever the smelter is ready to receive it.

The Iron Mountain Mine of the Mountain Copper Company has been closed down during the year. Production of copper will not be resumed until there is a more stable market. The company, however, has continued to produce from 400 to 500 tons of pyrite ore daily from the Hornet mine, the only one of the group being worked. The ore is marketed, chiefly for its sulphur content, which averages from 45% to 48% with copper less than 1%. A new plant with a capacity of 600 tons per day, designed for the fine crushing of pyrites was completed and put in operation in October. Additional cottages for employees are being built.

The Afterthought Copper Company closed down its oil flotation plant and reverberatory furnace in February and laid off its large force of men for an indefinite period. Production had not been resumed up to the end of the year.

One of the most important deals in the history of the copper belt was consummated this year when Daniel C. Jackling and associates took over a half interest in the famous Bully Hill group of mines. Development work at Bully Hill has been carried on for the past three years at their Rising Star mine, where some 300,000 tons of ore are blocked out. A new company, known as the Shasta Zinc and Copper Company has been organized, of which D. C. Jackling is managing director.

The Shasta Zinc and Copper Company is erecting a new plant at Bully Hill for the production of copper matte and zinc-oxide from their copper-zinc ores. With 125 men employed on construction, rapid progress is being made and it is expected that the new plant will be ready for operation in March, 1921. For the present the oil flotation mill will remain shut down.

The above five companies produce practically all of the copper and zinc ores of the Shasta belt. Although actual production for 1920 will be almost negligible, due to the development work carried on, the mines will be in a stronger position than before, whenever conditions warrant resumption of mining.

Drilling for exploration and development purposes is being carried on at the Shasta May Blossom property near Bully Hill. P. J. Healy of New York has the contract for drilling. Work was commenced in September, a Calyx chilled-shot core drill being used.

On the West belt, the Pittsburg and Mount Shasta Gold Mining and Milling Company is making the transition from gold to copper mining. The property adjoins the Mountain Copper Company and was long operated as the Little Nellie gold mine. In a crosscut running northwest for over 3000 feet, alaskite porphyry was encountered carrying chalcopyrite. Diamond drilling demonstrated the chalcopyrite at points 500′ to 700′ below the adit level. A new vertical 500′ shaft was then sunk at the end of the adit. It was completed during the summer and a crosscut started from the bottom of the new shaft. No definite copper ore-body has as yet been reached but copper sulphides are encountered in fracture planes and joints and the geological conditions are considered extremely favorable. This is the deepest working on Iron Mountain.

The famous Uncle Sam gold mine in the Squaw Creek district, the Alice, Snyder, Croesus and Clipper claims, adjoining, and the Colma

copper group, have been bonded to the American Zinc, Lead and Smelting Company of St. Louis. They are being developed for copper and zinc.

The Greenhorn mine of the Atascadero Copper Company has been idle during the year.

In Lassen County the Cooper Hill Mining Company let a contract for a 1000-foot crosscut tunnel to prospect their copper deposits near Westwood. The occurrence is similar to that at the Engels mine.

PLATINUM.

The production of platinum which is obtained from the dredges, hydraulic and placer mines in conjunction with gold, will probably show a slight falling off following the decline in gold mining. The high price obtained for the platinum group metals, however, is an inducement to prospectors and a good many are making a specialty of searching for platinum deposits. This activity and the closer saving practiced by the dredging companies may offset any decline due to fewer hydraulic and placer operators.

A recent shipment of 32 dwt. obtained by a man working alone with a pan on upper Beegum Creek, Shasta County in less than thirty days, assayed 25 dwt. osmiridium, 1 dwt. gold, 6 dwt. platinum. The high percentage of osmiridium in the metal from Beegum Creek adds considerable to the value of the product. At the present writing iridum is quoted at $400-450 per oz., osmium $75 per oz. and platinum $105 per oz.

SILVER.

A market price of $1 per oz. for domestic silver is now guaranteed by the government. Purchase of silver up to a total of 207,000,000 oz. at the above figure is provided for by the Pittman Act. Up to October, 1920, 16,000,000 oz. had been purchased. Figured at the average yearly rate of 50,000,000 oz., this price will hold for from three to five years, and there is some likelihood of its being extended at the end of that period. Without restriction the market was for a time considerably above $1 and later below that figure. At $1, the price shows an increase of 73% over the pre-war price in 1913 and it is considered fair.

The normal output of silver in the northern counties is considerable, but it is largely obtained as a by-product from silver-bearing gold, copper, lead and zinc ores. The closing down of the Mammoth Smelter will greatly curtail silver production for 1920. Besides cutting off the by-product silver, it leaves no market nearer than the Selby Works on San Francisco Bay, for ores that could be produced primarily for their silver content at the prevailing price of that metal.

Renewed interest is manifest in the old silver mining district near Igo, Shasta County, where development work has been carried on at a number of the mines, among them the Big Dyke and Silver Falls. Some production is likely in the near future.

ZINC.

Zinc ores are associated with the copper bearing ore-bodies of the Shasta belt particularly on the east side at Bully Hill and at the Afterthought mine.

The production of zinc for 1920 will be very small, following the decline in copper mining. At both the Shasta Zinc and Copper Company's mines and at the Afterthought mine, selective oil flotation processes have been successfully operated, and a separate zinc and copper concentrate produced. As it is impossible to ship the zinc concentrate to eastern smelters at a profit, due to excessive freight and treatment charges, they have been stored pending the erection of electrolitic zinc plants or zinc-oxide works. The Shasta Zinc and Copper Company has a plant well under way for the production of copper matte and zinc-oxide, which it is believed will solve the metallurgical and market problems involved.

PYRITE.

The **Mountain Copper Company** has continued to produce in the neighborhood of 500 tons of pyrite ore from the Hornet Mine daily throughout the year.

IRON ORE.

The **Noble Electric Steel Company** has shipped an average of 500 tons of iron ore per month from its mines at Heroult, Shasta County, to various Pacific Coast points between Los Angeles and Seattle.

QUICKSILVER.

Ten men have been employed at the **Hutton Quicksilver Lease,** near Gottville, Siskiyou County. A 25-ton rotary furnace is to be installed. This is the only quicksilver mine being developed in this district at the present time.

CHROME AND MANGANESE.

There has been no activity in these metals.

OTHER MINERALS.

The year 1920 will show only a nominal production of the minor metals and non-metallic products, such as asbestos, barytes, clays, limestone, mineral water, natural gas, potash, pumice, salt and miscellaneous stone.

Among the above, mineral water will probably rank first in value. It is an important item, the famous Shasta Springs being in Siskiyou County.

During the year shipments were begun from a deposit of potash bearing rock near Ager, Siskiyou County. It is said that this rock contains 5½% of potash. Samples submitted to the Bureau gave a good potassium test.

GENERAL OUTLOOK FOR COMING YEAR.

Mining in this district is confined principally to the two great basic metals, gold and copper, and activities during the coming year will be governed to a very great extent by general conditions throughout this and other civilized nations.

The only bright spot on the horizon for the gold miner is the McFadden bill. In the hope of its being passed some interest is again being taken in prospecting. Even if it becomes a law there are still many properties that will have difficulty in operating at a profit. Taking the general run of quartz properties in the northern gold producing counties and it is apparent that, under present conditions, ore running less than $50 per ton is practically valueless.

The copper situation presents a different view. Copper producers made extraordinarily large profits during the war, and the present stagnation in production appears to be only a natural aftermath resulting from forced depletion of reserves, abetted by a weak foreign and domestic market. According to a statement issued by the government, some 574,000,000 pounds of copper were recovered during the past year from new and old scrap alone. Under such conditions there is no incentive for other than minimum production.

It will take some time for the disjointed affairs of the world to become straightened out, but with the change in political parties at home, it is the consensus of opinion that our international affairs will become stabilized and that 1921 will see the beginning of a new commercial and industrial cycle. The industries in this country that absorb copper are growing and as new capital becomes available the demand for the red metal is certain to expand; while the hoped-for solution of our international commercial relations will open the way for copper exports on a large scale.

An engineer, identified for the past three years with large copper interests operating in Chile, recently made the statement that operators there expected to see 40¢ to 50¢ copper within three or four years. Although the premises on which this prediction was based, were not stated at the moment, it serves to indicate the pervading undertone of optimism in the copper mining industry.

The quiet development work carried on at the mines, acquisition of new territory, injection of new capital and improved metallurgical plants being erected by the copper producers of this district during the period of curtailed output, will place them in an excellent way to take full advantage of the demands for the metal which it is generally believed will develop in the reconstruction period, after the present slump.

GEOLOGICAL NOTES.

The supervisors of Shasta County are having a series of maps made covering the west belt of copper deposits from the Mammoth on the north to the Mountain Copper Company's holdings on the south. One series shows the ownership of all claims with the topography of the area, and a second corresponding series shows the areal geology and indicates the position of the various formations. The maps are being

prepared by Mr. M. E. Dittmar and are for the purpose of determining an equitable valuation basis for tax assessments.

The plates are in color and to a scale of 1000 feet to one inch. Owing to the large scale used and detail shown, they make a valuable addition to other geological studies of the west belt.

TRANSPORTATION; POWER; WATER; CLIMATE.

State highway construction and county road building have progressed throughout the year. Improved transportation facilities are one of the basic needs of the mineral industry in the northern counties.

The principal copper camps of Shasta County have railroad connection, usually privately owned, with the main line of the Southern Pacific. In Siskiyou County, the copper camps are less fortunate. At the Gray Eagle mine of the Mason Valley Mines Company, at Happy Camp, over 1,000,000 tons of low grade ore have been blocked out and await the construction of a railroad down the Klamath River. The Blue Ledge mine, which is shipping copper ore to the Tacoma Smelter, is compelled to haul 33 miles to Jacksonville, Oregon, to get rail connection. Del Norte, Humboldt, Siskiyou, Trinity, Modoc and Lassen counties are very largely dependent on motor trucks for their supplies. The Redding-Weaverville lateral, Klamath River highway, and Redding-Alturas lateral, when completed will be kept open the year round and materially reduce transportation costs.

Reports from Modoc County state that work is expected to begin in 1921 on the extension of the Fernley-Lassen branch of the Southern Pacific from its present terminus near Westwood, Lassen County, to Klamath Falls, Oregon. The proposed route is through western Lassen and Modoc counties.

Hydro-electric power development now under way in the northern counties will greatly benefit the mining industry, both directly, by furnishing a most flexible and economic motive power, and indirectly by making available electro-metallurgical reduction processes and by building up electro-chemical industries, which, in turn, require a variety of raw mineral products whose production will be stimulated.

The growth of chemical and electro-chemical industries has been rapid in this country during and since the war. Engineers have pointed out that these industries could be established by the power companies themselves, or by subsidiary, or independent companies and adapted to use electric power only at the time of high water or daily during periods of minimum loading on the line, so that a very cheap power rate could be obtained. Compared to the East but a small proportion of the electric power on the Pacific Coast has been developed for industrial purposes. These industries would be of advantage to the power companies. At the same time they would create a market for various mineral products, many of which are abundant and in close proximity to the generating plants, and be the means of building up manufacturing communities.

Both the California-Oregon Power Company, whose transmission lines are mainly in Siskiyou County, and the Shasta Division of the Pacific Gas and Electric Company, are engaged on construction programs. The ultimate plans of the Pacific Gas and Electric Company

call for an expenditure in the neighborhood of ten million dollars for power projects on Pit River, Fall River and Hat Creek. Construction of Plant No. 1 on Pit River at Sheep Rocks is under way. Here 60,000 h.p. will be generated and a like amount at Plant No. 2 farther up. The Big Bend project calls for an initial installation of 100,000 h.p. with an ultimate development of 375,000 h.p.

Water and timber are perhaps nowhere more abundant than in the Northern California field division. The drainage systems of western Siskiyou and Trinity counties are tributary to the Klamath and Trinity rivers which flow direct to the Pacific Ocean. In this area hydraulic mining may be carried on without restriction, on account of the silt question not affecting any navigable stream. Climatic conditions are excellent and below elevations of 2500 feet mining may be prosecuted in winter as well as summer without inconvenience. Above 2500′ in altitude snow is liable to interfere, to some extent, with work in winter.

Very heavy rains in November and December, general throughout this section, indicate a break in the abnormal dry seasons experienced for several years and promise abundant water for mining and power use during 1921.

LABOR.

Labor conditions changed materially for the better toward the latter part of 1920. One operator reported that he had had more applications for jobs during the two months of October and November than during the previous two years. A disposition to hold on to a job once obtained and to deliver a fair day's work is also becoming general. There is nothing, however, to indicate any immediate reduction in miner's wages and it is possible that employers will be satisfied with increased efficiency, at least until the cost of living has been unmistakably reduced.

OUTFITTING AND SUPPLY CENTERS.

Eureka and Crescent City are the outfitting and supply centers of Humboldt and Del Norte Counties. Yreka is the central distributing point in Siskiyou County, but camps near the northern boundary are more conveniently reached from Jacksonville, Oregon. Points in Tehama County are supplied most conveniently from Red Bluff. In Lassen County, Susanville and Westwood are the principal outfitting points. Alturas in Modoc County is the center for that section.

Redding, on the main line of the Southern Pacific Railroad and near the geographical center of the entire northern division, is the principal mining center. Large stocks of various supplies are carried by the local merchants. The main highway north and south, and the east and west laterals meet here. Unloading derricks for handling heavy dredge parts and mining machinery are available. There is a foundry and machine shops and an engineering and assay office. It is the outfitting point for Shasta County; and Trinity County, through Weaverville.

The office of the Northern California Field Division of the State Mining Bureau is located in Redding.

Part II.

Redding District: By Counties.

DEL NORTE COUNTY.

Del Norte County has an area of 1024 square miles and occupies the extreme northwest corner of the state.

It presents a wide field for development along mining lines, but is handicapped by lack of railroads and the inaccessibility of many of the deposits.

The county is traversed by the Coast ranges and is extremely rugged and covered with heavy forest.

Deep-seated granitic rocks form the core of the mountain ranges. These are blanketed by crystalline limestones, slates, quartzite and other metamorphics. The western portion is composed largely of sedimentary rocks. A belt of intrusive serpentine and associated rocks extends in a northerly direction through the county at a distance of from eight to ten miles from the coast. Farther east near the Del Norte-Siskiyou county line is another belt. These belts contain the most promising chrome and copper deposits. Quartz occurs in small veins and seams, the slates carrying many thin seams, sometimes rich in gold. Erosion of these formations is responsible for the concentration of gold in the streams.

Crescent City is the county seat and principal outfitting point. Freight service is furnished by small coastwise steamers, without regular schedules, that call at the port principally for the lumber trade.

From Eureka, on the Northwestern Pacific Railroad, in Humboldt County, the coast highway extends 99 miles north to Crescent City, thence to Grants Pass, Oregon, via South Fork, Gasquet and Patrick Creek, a distance of 95 miles. Road construction is expensive and many points can only be reached by trail.

During the war, chrome mining became an important industry and many deposits were opened up in the serpentine areas.

A table showing the mineral production of the county for 1917-1918-1919 follows:

Commercial production for 1917 was:

Substance	Amount	Value
Chromite	3275 tons	$97,255
Gold		1,373
Platinum	10 oz.	853
Silver		8
Stone, miscellaneous		2,700
Other minerals		2,151
Total value		$104,340

Commercial production for 1918 was:

Substance	Amount	Value
Chromite	7143 tons	$360,485
Gold		565
Platinum	1 oz.	97
Silver		4
Stone, miscellaneous		8,000
Other minerals		2,524
Total value		$371,675

Commercial production for 1919 was:

Substance	Value
Gold	$500
Silver	4
Stone, miscellaneous	6,300
Other minerals	67
Total value	$6,871

The chief mineral resources of the county are chromite, clays, copper, gems, gold, graphite, iron, platinum, quicksilver, silver and miscellaneous stone.

A description of the mines and prospects in Del Norte County is contained in the Fourteenth Report of the State Mineralogist. Under later date, Bulletin No. 76 describes the chrome properties and Bulletins No. 78 and No. 85 the quicksilver and platinum deposits, respectively. The possible occurrence of petroleum is discussed in Bulletin No. 89.

During the year 1920 there was very little mining activity in Del Norte County beyond doing assessment work, which is again required after three years' suspension.

With the exception of the field work done in connection with Bulletin No. 89 the county was not visited during the past season.

HUMBOLDT COUNTY.

Humboldt is one of the north coast counties. It has an area of 3634 square miles and lies between Mendocino on the south and Del Norte on the north. Its length, parallel to the coast, is about three times its width from east to west.

The county is mountainous, being more rugged in the northern part, where crystalline and metamorphic rocks predominate, than in the southwestern section, where sandstones and shales are prominent. The serpentine belt noted in Del Norte County passes southeasterly through Humboldt.

The general trend of the Coast ranges is northwest-southeast and the streams which enter the Pacific all flow in a northwest direction, parallel to the strike of the sedimentary formations which form a large portion of the mountain masses.

The Northwestern Pacific Railroad, which terminates at Eureka, gives direct rail connection to San Francisco. Eureka, the county seat and largest city, is also a port for coastwise shipping. The county still lacks much in transportation facilities. It is noted as a lumbering, dairying and agricultural territory, but it also contains a notable variety of mineral deposits and though not of large size as a rule, and but partially developed, the county has ranked as an important producer for many years.

Commercial production for 1917 was as follows:

Substance	Amount	Value
Gold		$23,086
Platinum	6 oz.	351
Silver		95
Stone, miscellaneous		27,014
Other minerals*		9,312
Total value		$59,858

*Includes brick, clay, mineral water, natural gas, and volcanic ash.

Commercial production for 1918 was as follows:

Substance	Amount	Value
Chromite	370 tons	$21,744
Clay (pottery)	210 tons	420
Gold		8,028
Granite		116
Manganese	1520 tons	57,751
Natural gas	640 M cu. ft.	85
Platinum	2 oz.	140
Silver		72
Stone, miscellaneous		51,082
Other minerals*		2,516
Total value		$141,954

*Includes brick, mineral water, and pumice.

Commercial production for 1919 was as follows:

Substance	Value
Brick and clay	$9,271
Gold	8,000
Silver	50
Stone, miscellaneous	25,198
Other minerals*	1,148
Total value	$43,667

*Includes mineral water and natural gas.

Its resources include brick-clay, chromite, coal, copper, gold, granite, iron, mineral water, natural gas, petroleum, platinum, pottery-clay, pumice, silver, volcanic ash, and miscellaneous stone.

The Fifteenth Report of the State Mineralogist describes in detail the mines and mineral deposits of the county. In addition to the above report, and of later date, Bulletin No. 78 describes the occurrence of quicksilver; Bulletin No. 85 and Preliminary Report No. 7 cover the platinum occurrences and clay deposits, respectively, and Bulletin No. 76 discusses the manganese and chromite deposits.

Attention throughout the country during the past year has been drawn to the petroleum possibilities in new fields. The commercial production of natural gas and known occurrence of petroleum in Humboldt County has aroused special interest in this section and all field work in the county during the past season was directed to the investigation of the oil field. The results of this work are published in Bulletin No. 89.

Mining, in general, has been quiescent. A small amount of development work has been done and with few exceptions the annual assessment work, which is again required, has not been neglected.

The following notes on properties not mentioned in previous reports have been obtained through correspondence.

GOLD MINES—LODE.

Golden Eagle. Owner, Frank Schweichler, Orleans, California. This prospect was discovered in 1915. It is in the Red Cap mining district and is reached by a good road from Trinidad, the nearest railroad point. Elevation about 1000 feet, with abundant timber and water. The ledge is said to be sixteen feet wide, free milling, and to carry gold, silver and copper.

Prospect Hill Mine. Owners, C. S. Little and Prospect Hill Mining Company, L. I. Rowland, president; C. S. Daniels, secretary; home office, Orleans, California. Property consists of nine claims, the Doney, Ten Eyck, Wildwood, Martha, Martha Ex., Lucky Queen, El Portal and Norelle Merle, with a total area of 200 acres. The mine is located in the Orleans district in section 5, T. 11 N., R. 6 E., on the forest reserve, and it is plentifully supplied with red fir, sugar and yellow pine. The surface is composed of steep ridges and deep gulches, the workings being located at an elevation of 3000 feet. The water supply is limited.

The deposit consists of quartz veins, twelve in number. Diorite is the prevailing country rock. The principal vein averaged about two

feet in width with a maximum breadth of eleven feet. The foot and hanging walls appear to be a metamorphic shale. The vein filling is talcose in character and the quartz carries some iron and a small percentage of chalcopyrite. It is, however, largely free milling. The vein being developed has a strike of north 20°-25° east and a dip of about 50°. It is proven on the surface for 150 feet. There are several tunnels aggregating 700 feet in length. The greatest depth on the vein so far developed is 150 feet, this point being 100 feet vertically below the outcrop. One man is employed on top and three in the mine. The total production to date has been about $7,000.

PLACER—HYDRAULIC.

Cañon Bar Mine. Owner, Willie Norton Sr., Hoopa Valley, California. Nearest town, Weitchpec. Property is on the Indian Reservation and thirty-nine miles east of the nearest railroad point. It was discovered about forty years ago and has been piped off and on at different times. Has not been worked for the past eight years. The area is forty acres and the claims extend along the river channel, which here courses north-south, for about one-fourth of a mile. The pay gravel, which contains some boulders, has an average depth of four feet and a width of fifty feet. About one acre has been worked.

Elkhorn Mine. Owner, G. F. Willhite, Orleans, California. Property consists of 200 acres, containing bench gravels. The mine is located in the Orleans district at an elevation of 500 feet and is reached by trail having a 6% grade. The county is reconstructing this into a wagon road. Trinidad, the nearest railroad point, is 75 miles southwest. The deposit was discovered in 1915. Red Cap Creek furnishes the water supply. The ground is level and covered with timber, the mine being on the forest reserve. It is equipped with a ditch 4000 feet long, supplying water, under 110-foot head, to pipe and giant. Tailings are run into the river. There is a four-room house.

Livingston and Eveston Pocket Mine. This property was sold in 1918 to T. E. Ahlstrom, Ashland, Oregon, or Gottville, California.

SILVER.

Gettysburg Silver Mining Company. This company, with home office in Reno, Nevada, is reported to have three claims in the Sawtooth Range, four miles from Sulphur, on which a twenty-foot shaft has cut a four-foot ore body. The shaft is on the Litharge claim and the ore is said to average $35 per ton, the values being mostly in silver, with a little gold. The vein has been prospected for 1500 feet in length. The width is said to vary from four feet to ten feet and assays from $10 to $45 per ton.

LASSEN COUNTY.

Lassen County lies wholly east of the crest of the Sierra Nevadas. The western portion is elevated and rugged, being composed of a succession of short mountain ranges, heavily wooded and interspersed with valleys. The latter are frequently occupied by lakes. Toward the east, the elevation is lower and the country more barren. The valleys take on the character of alkali flats and the mountains change to straggling hills and isolated buttes.

As shown on the geological map of the state, by far the greater portion of the county is made up of volcanic flows, chiefly andesitic lavas and tuffs, with some basalt and rhyolite, mostly of Tertiary age. There are some small exposures of heavily bedded sandstones and shales, and gravels of lake origin. Quaternary deposits of unconsolidated clays, sands, gravel and desert wash comprise the balance.

The eruptive flows have practically covered all evidence of mineralization, and although there has been some prospecting in this section, from the early days, when Peter Lassen lost his life while searching for silver-bearing lodes, to the present day, only two districts have been developed to the producing stage.

The mineral resources of the county include copper, gems, gypsum, gold, mineral water, potash, silver, sulphur, volcanic ash and the stone industry. Gold has been the principal product and most of it has come from the Hayden Hill mining district.

The following table gives the commercial mineral production for 1917, 1918 and 1919.

Commercial production for 1917 was as follows:

Substance	Value
Stone, miscellaneous	$376

Commercial production for 1918 was as follows:

Substance	Value
Stone, miscellaneous	$800

Commercial production for 1919 was as follows:

Substance	Value
Stone, miscellaneous	$1,100

A description of the mines and mineral resources of Lassen County is contained in the Fifteenth Report of the State Mineralogist (1915-1916). The following notes on current development and new discoveries obtained during the 1920 season of field work, are intended to supplement the data contained in the earlier publications and bring them up to date.

COPPER.

Copper prospects have been developed in the district south of Coppervale, in T. 28 N., R. 10 E.

Cooper Hill Group. This group, comprising seventeen unpatented claims, having an area of 350 acres, was located in 1917. In January, 1920, the claims were taken over and development started by the

Cooper Hill Mining Company (Union Construction Company, of Oakland); home office, 717 Walker avenue, Oakland, California; E. Z. Humphrey, president; F. E. Smith, superintendent. The property is situated in the Mountain Meadows mining district in section 28, T. 28 N., R. 10 E., 9 miles southeast of Westwood, the nearest railroad point. A good auto road has been built from the Southern Pacific Railroad, at Westwood, to the property, which has an elevation of 5400 feet at the tunnel site. The claims are within the forest reserve and are timbered with yellow and sugar pine. Cottonwood Creek supplies a small flow of water throughout the year. The surrounding country is mountainous and rough.

Country rock is diorite and the deposit consists of metallic oxides, sulphides and some native copper, disseminated through fresh diorite in a mineralized zone, 500 feet to 600 feet wide and at least 3000 feet long. The copper ores, accompanied by silica, occur in fractures in the diorite mass. The mineralized zone strikes N. 80° W. and practically all the croppings show copper stains, with specks of native copper occurring in many places.

The most prominent outcrops are near the summit of the ridge, about 350 feet above the proposed tunnel site near the creek level. A gas engine, compressor and two machine drills have been purchased and a contract let for driving a 1000-foot tunnel south across the strike of the ore-body. This is expected to cut the ore at a distance of 300 feet from the portal.

The deposit is thought to be a continuation of the Engles copper belt, as it lies along the strike of the latter and about five miles distant. Surface indications are excellent and the deposit is expected to develop into a large low-grade copper mine.

GOLD MINES.

Blue Bell Mine. The Blue Bell mine, owned by H. P. Anderson, of Hayden Hill, was leased during 1920 to J. I. Dorsey, Hayden Hill. The mine was discovered in 1880 and worked spasmodically until 1910, after which it remained idle until the present lessee began work this season.

The old workings, consisting essentially of a glory-hole about 35 feet deep and 50 to 60 feet in diameter and shaft below it, are caved and inaccessible. It is stated that $60,000 was produced from a pocket in the glory hole and that there were several veins in the old workings. Property consists of one claim on the rugged southwest slope of Hayden Hill. The deposit is a filling of soft unconsolidated fault breccia of adjacent wall rock, in fractures penetrating the rhyolite tuffs composing the hill. Finely divided gold, much of it oxidized, occurs in the veins. A new 50-foot vertical shaft is being sunk south of the glory-hole, from which it is expected to crosscut the veins beneath the old hole.

All mining is done by hand drilling and hoisting by windlass and bucket, two men being employed. There is no reduction equipment at the mine.

Coyote Mine. Owner, H. P. Anderson, Hayden Hill, California. There is a fair road to the property from the railroad station at Likely,

32 miles easterly. The mine is located in section 36, T. 37 N., R. 9 E., at an elevation of 6776 feet, and there is some timber on the claim. Water is pumped from Williams Creek, 3½ miles distant. The claim covers 1500 feet of the lode and has a total area of 22 acres. The ore-body consists of a decomposed quartz vein in rhyolite country rock. A shaft has been sunk 65 feet and 110 feet drifted on the vein.

Eckart and Allen Group. Owners, Harn, Eckart and Company; F. Allen of Westwood, California. This group comprises ten claims, the June, June No. 1, No. 2, No. 3, and No. 4 (west group), and the Beatrice, Beatrice No. 1, No. 2, No. 3 and No. 4 (east group), having a total area of 200 acres. The property is situated in the Mountain Meadows district, in sections 19 and 20, T. 29 N., R. 10 E., at an elevation of 5725 feet. It is nine miles northeast of Westwood, at the foot of Fredonia Pass, and one mile from the highway between Westwood and Susanville. A good auto road connects the highway with the mine. The locality is marked by rugged hills and ravines, the average elevation being about 5700 feet. Yellow and sugar pine cover the claims and spring water is available.

The country rock is meta-andesite and the deposits so far prospected consist of a large gossan outcrop, exposed in the ravine and on the mountain about 300 feet above the valley. This gossan is said to carry a little over $2 per ton in gold.

A number of trenches and a 40-foot shaft have been sunk in the meta-andesite, following up the cañon and above the gossan outcrop. A few kidneys or irregular small pockets of talc and quartz were encountered, all of which gave low values in gold.

The owners are planning on sinking a shaft below the gossan in an endeavor to locate a ledge. There appears to be a fracture in the andesite on this property, which shows a well-defined hanging wall, with a filling of silicified brecciated wall rock. Equipment consists of a windlass and a few tools, all work having been done by hand drilling. Idle at time of visit.

Eclipse Mine. This mine was first opened over twenty years ago, but little work has been done. It is situated on the south slope of Hayden Hill, at an elevation of 5700 feet and has a total area of ten acres. Geo. McFarling, of Hayden Hill, owner; post office, Merrillville. Likely, on the Nevada-California-Oregon Railroad, thirty miles northeasterly, is the nearest railroad point. Susanville, on the Southern Pacific Railroad, is sixty miles to the south. The country rock is rhyolite tuff and the ore deposit is a soft, unconsolidated fault breccia, of adjacent wall rock, filling the fracture. The veins are composed of fine-grained quartz and breccia with soft, clay-like gouge carrying very finely divided oxidized gold.

The Eclipse vein is two to four feet in width. It strikes north-south and has a vertical dip. The total length on the property is 700 feet.

Development consists of two shafts. No. 1, sunk many years ago, is now caved. It is said to have been 100 feet in depth. Shaft No. 2 is located 150 feet south of No. 1. At a depth of 40 feet, a drift has been started northward on the vein, to connect with the old workings. This drift is in 125 feet and it is said that some fairly good pockets

have been struck, the vein, as a whole, averaging $10 per ton. The owner is developing the property alone, by hand mining, a windlass being the only equipment.

Gold Leaf Mine. A. H. Hartman is reported to have discovered and located the Gold Leaf Mine, a short distance east of Wendal on the Nevada-California-Oregon Railway. Silver occurs with the gold.

Gray Goose Mine. The Gray Goose, formerly known as the Hayseed, comprises two claims, the Gray Goose and Sunrise, with a total area of thirty acres. The property is located at an elevation of 6000 feet, near the summit of Hayden Hill, in section 36, T. 37 N., R. 9 E. It was discovered in 1873 and worked intermittently up to 1912. New development work was started in the winter of 1919-20. It is owned by J. S. Owens ($\frac{2}{3}$) and J. M. Arnatte ($\frac{1}{3}$), Hayden Hill, or Bieber; post office, Merrillville. There is no water at the mine, and the mill is located three miles below on Willow Creek. The deposit consists of fine-grained quartz and breccia veins with clay-like gouge filling fractures in the rhyolite tuff, composing the country rock. There are three well-defined veins on the property, the Brush Hill, Gray Goose and Sunrise. The ore is free milling, but the gold is very fine and often oxidized. New development work has been confined to the Gray Goose vein, on which there is a 250 shaft. At the 215′ level, a drift has been run N. 50° W., on the vein a distance of 80 feet, showing it to be 6 to 8 feet wide. It is stated that this will average $10 per ton.

The shaft is filled with water below this level. There is said to be virgin ground above. Mining is done by hand drilling and the ore is hoisted with a whim.

The mill on Willow Creek, three miles by wagon road below the mine, consists of ten 850-lb. stamps and cyanide leaching plant, in fairly good condition. Power was obtained from two Pelton water-wheels. The mine was idle at the time of visit, the owners wishing to dispose of it.

Juniper Mine. Owners, Juniper Mining Company, Hayden Hill; post office, Bieber; M. A. Maher, president; W. H. Paulk, secretary.

The property consists of one claim, the Juniper Quartz claim, containing 20 acres. The mine has an elevation of 5600′ and is on the gentle southwest slope of Hayden Hill, in section 36, T. 37 N., R. 10 E.

This property is an old one and the most famous one on Hayden Hill. It was taken over by the present company in January, 1919, and has been in continuous operation since. The deposit consists of decomposed quartz and soft unconsolidated fault breccia of adjacent wall rock, filling fractures in the country rhyolite tuff. The decomposed quartz and breccia veins have a clay-like gouge and carry very finely divided gold, occasionally oxidized. There are no sulphides present.

On the Juniper, the hanging wall is well defined, but the footwall is less clearly distinguished. Both are of rhyolite tuff.

The vein is from two to twelve feet in thickness, having an average width of four feet on the 100-foot level. It strikes N. 70° W. and dips northeast at an angle of 60 to 80°, with a proven length on the surface of 1500 feet.

The present pay-shoot follows the hanging wall. A streak twelve inches wide is reported to run $350 per ton. Across the four-foot width, the ore probably runs less than $30.00 per ton. This shoot was struck on the 200′ level of the new shaft. It has been drifted on 48′ westerly and is said to maintain its high-grade character throughout. The shaft is now being sunk to the 250′ level, where a drift will be run to block out the ore-shoot. The old workings are caved and abandoned.

The mine is equipped with an Atlas gas engine and Rix 2-drill compressor, jackhammers being used in shaft sinking. There is also a 25-h.p. Fairbanks-Morse gas engine hoist, good for 500′ depth.

A mill, consisting of 10″ x 12″ jaw crusher, ten 1050-lb. stamps and two amalgamating tables, was completed in April, 1920. Water for the plant is leased from the Lassen Mining Company. It is pumped from Willow Creek, a distance of three miles, water power being used to operate the pumps. The entire plant is said to have cost $40,000. It was shut down after a six weeks run, on account of not saving the values and tests are now being made to determine what treatment to use. A ton of ore shipped to the Selby Smelting and Lead Company, in June, netted $300.00. This property has produced to date about $1,200,000. Four men are employed sinking the shaft, working one shift per day. The Blue Bell Mine adjoins.

PETROLEUM.

The possible occurrence of petroleum in Lassen County was investigated during the year. The results of the field work and conclusions to be drawn therefrom are published in Bulletin No. 89.

POTASH.

Desert Products Company. This company is developing potash deposits on the shore of Honey Lake. A small production of potash has been made. C. A. Jacobson, president, care Mackey School of Mines, Reno, Nevada.

VOLCANIC ASH.

Anderson Ranch Deposit. A deposit of volcanic ash outcrops over an area of 20 acres or more on the Anderson Ranch, in section 24, T. 37 N., R. 9 E., about 15 miles southeast of Beiber. H. P. Anderson of Hayden Hill, owner; post office, Beiber.

The deposit consists of a heavy bed of white volcanic ash at least twenty feet thick, with an overburden of soil, except where it outcrops. A fifteen foot tunnel, driven along side of the Adin-Hayden Hill road is entirely in the ash. There is no other development work. It is thirty miles from Hayden Hill to Likely, the nearest railroad point on the Nevada-California-Oregon Railway, or sixty miles to Susanville, on the Southern Pacific. There has been no production. The ash is reported by the owner to contain less than 1% Fe.

A sizing test gave—

90.4%—100.
9.6% +100.

Moisture test—

	Percent.
Dry slime, Sp. Gr. 2.3	100.0
Calcined	87.5
Water	12.5

MODOC COUNTY.

Modoc County has never been a large producer of mineral products. Heavy lava flows cover most of the county and only two mining districts have been developed. The area, as a whole, is an elevated plateau, marked by a succession of valleys separated by volcanic ridges. The Warner Range, which separates the Goose Lake country from the Surprise Valley section, contains the highest peaks, some of which exceed 8000 feet.

The Nevada-California-Oregon Railway, commencing at Reno, Nevada, and extending to Lakeview, Oregon, passes through the county near its eastern side. Fairly good roads from the principal towns along the railroad reach the more remote parts. Stockraising and agriculture are the principal industries.

Comparatively little attention has been given to mining and only a small amount of prospecting, mostly by range riders, has been done.

The knowledge of this fact and the occurrence of some outcrops of diatomaceous shale and sandstone, which many regarded as oil producing formations, has drawn attention to the possible importance of the undeveloped mineral resources of the county and increasing interest in their development was plainly manifest during the past year.

The known resources of the county include clay, coal, copper, gold, iron, mineral water, quicksilver, salt, silver and miscellaneous stone. The writer was recently shown a fine specimen of galena, the size of a walnut, said to have been picked up by a cattle man. Indians are reported to frequently come in with chunks of it, but its origin is unknown. The galena is practically pure and carries no silver.

The following table gives the commercial mineral production of the county for 1917, 1918, and 1919:

Commercial production for 1917 was as follows:

Substance	Value
Stone, miscellaneous	$200

Commercial production for 1918 was as follows:

Substance	Value
Stone, miscellaneous	$200
Other minerals*	8,020
Total value	$8,220

*Includes gold, salt, and silver.

Commercial production for 1919 was as follows:

Substance	Value
Stone, miscellaneous	$550
Other minerals*	8,120
Total value	$8,670

*Includes gold, salt, and silver.

The Fourteenth Report of the State Mineralogist contains a general description of the mines and mineral deposits of Modoc County. Quicksilver prospects are referred to in Bulletin No. 78, of later date,

and a discussion of the oil possibilities in this section will be found in Bulletin No. 89.

The following notes record the little activity that has survived the general decline in mining during the past year.

GOLD MINES.

Hess Mine. A new shaft is being sunk about 500 feet east of the old shaft to cut the main vein at the 300-foot level. The old workings are caved and abandoned.

Goose Lake Gold Mining Company. The above company is being organized by Geo. S. Freeborn of San Francisco, to develop property near Willow Ranch in the New Pine Creek district. A 200-foot tunnel was run by local prospectors and farmers several years ago. The new company expects to sink a shaft and develop the prospect into a mine. The geological conditions are said to be similar to those at Oatman, Arizona.

SHASTA COUNTY.

Copper has been the predominant metal produced in Shasta County since 1896. Prior to that year the greatest value was in its gold output. During the period from 1896 to 1919, inclusive, the total production of copper has been 619,430,220 pounds, valued at $100,688,269. During the same period, gold to the value of $22,105,879 was produced. Silver to the amount of $10,167,103, and 29,190,409 pounds of zinc, valued at $3,431,758, were added to the county's production record at the same time. The total value of the four metals, copper, gold, silver and zinc, produced during the above period was $143,509,074. The value of other metals and structural and industrial minerals, if added, would increase this total by several millions.

Production statistics of all classes of mineral products for the years 1917, 1918 and 1919 are given in the following tables:

Commercial production for 1917 was as follows:

Substance	Amount	Value
Chromite	3,116 tons	$68,479
Copper	28,009,990 lbs.	7,646,727
Gold		775,125
Lead	8,725 lbs.	750
Lime and limestone		78,101
Platinum	14 oz.	1,100
Silver		520,703
Stone, miscellaneous		800
Zinc	8,281,516 lbs.	844,715
Other minerals*		308,369
Total value		$10,244,869

*Includes cadmium, brick, iron ore, mineral water, molybdenum, pyrite, and silica.

Commercial production for 1918 was as follows:

Substance	Amount	Value
Chromite	1,423 tons	$70,214
Copper	25,294,590 lbs.	6,247,767
Gold		543,509
Lead	492,565 lbs.	34,972
Limestone	45,671 tons	72,410
Platinum	35 oz.	2,709
Silver		420,410
Stone, miscellaneous		7,000
Zinc	3,045,692 lbs.	277,158
Other minerals*		422,525
Total value		$8,098,671

*Includes cadmium, brick, iron ore, lime, mineral water, molybdenum, and pyrite.

Commercial production for 1919 was as follows:

Substance	Amount	Value
Copper	8,673,342 lbs.	$1,613,242
Gold		525,000
Lime and limestone		29,100
Platinum	121 oz.	21,075
Pyrite	138,046 tons	497,398
Silver		[1]155,000
Stone, miscellaneous		31,750
Other minerals*		40,153
Total value		$2,912,718

*Includes barytes, brick, iron ore, lead, mineral water, and zinc.
[1]Estimated.

The mines and mineral resources of the county are described in the Fourteenth Report of the State Mineralogist (1913-1914), Bulletin No. 50, 'Copper Resources of California,' a revised and enlarged edition of Bulletin No. 23, the first report devoted exclusively to the copper deposits of the state, describes in detail the Shasta copper belt.

No general report on the county has been published since the Fourteenth, but the occurrences of quicksilver are noted in Bulletin No. 78, platinum deposits are described in Bulletin No. 85, manganese and chrome in Bulletin No. 76, and the clay resources in Preliminary Report No. 7, all issued since the Fourteenth Report.

Nearly all field work in the Northern California division during the season of 1920 was devoted to the investigation of petroleum possibilities in this field. Bulletin No. 89 gives the results of this work.

The following notes on the mineral industry, largely obtained through correspondence, are intended to supplement previous reports and bring them up to date by listing properties hitherto not mentioned, noting changes in ownerships and general development during the year.

BARYTES.

Loftus Barytes Mine. Owners, Loftus and Sons, Castella, California. Property is located on Tom Neal Creek, four miles southwest of the railroad station by good trail. Elevation 5000 feet. It is on the forest reserve and plenty of timber and water are available. Assessment work only is being done. D. O. Deuffel, 503 Market street, San Francisco, has an option on the mine.

COAL.

Beegum Creek Deposit. Owners, Don Noble and D. F. Weed, post office, Ono, California. Property is located in sections 31 and 32, T. 29 N., R. 9 W., at an elevation of 2100 feet. Cottonwood, the nearest rail shipping point, is 45 miles east by road. The Red Bluff-Eureka highway runs to Noble's Station. From here there is a three-mile chrome haulage road and 1½ miles of trail to the claims. The surface is hilly and rough. A small perennial stream in Coal Gulch, tributary to Beegum Creek, would probably furnish sufficient water for a boiler. The total area is 320 acres, 200 being in section 32 and 120 in section 31.

The deposit consists of a vein of semi-bituminous coal, overlying serpentine and capped with hard silicified slaty shale. At the cropping the vein is 4″ to 6″ thick. A cross-cut tunnel driven about ten feet below the vein, cut it at forty feet and then followed on the dip to 75 feet from the portal. In the face of this tunnel, the seam is three feet thick, with some traces of lime shale.

Twenty-two feet above the lower seam, another parallel seam outcrops. The latter has not been developed.

The seams strike almost due east and west, dipping 18° S. The outcrops can be traced here for over a half mile and across Beegum Creek for a couple of miles. The coal is hard and said to be excellent blacksmith coal. It has been used locally in the forge. Owners can place it at the railroad for $10 per ton. The long haul to the railroad is the principal hindrance to commercial production.

Dakin Coal Mine. Owners, Dakin Estate of San Francisco. Property consists of patented ground, having an area of 951 acres, situated in section 12, T. 33 N., R. 2 W., in the Little Cow Creek mining district. Bella Vista, the nearest railroad point, is about 12 miles southwest. The deposit lies at an elevation of 1900 feet. There is some pine timber on the property and a spring.

The deposit consists of coal seams separated by thin layers of clay, with a combined thickness of at least fourteen feet. The thickest coal seam exposed is 2½ feet at the widest part, grading down to six inches. The coal is a light, blocky lignite. The clay layers, separating the coal seam, are not over a few inches thick at the most, so that the greater part of the total width is coal. The deposit is overlain by a stratum of sandstone, which is capped by basaltic lava. Clay and shale occur below it. The bedding is almost horizontal. Development work consists of an adit, driven in it for 350 feet. Coal is exposed in the drift, over its full height. No work has been done for about twenty years, but an enormous tonnage could be developed.

COPPER.

Afterthought Copper Company. This company shut down its flotation mill and reverberatory furnace at the Afterthought mine in February and laid off its large crew of men for an indefinite period.

Akers Group. Owners, J. W. Akers and Frank Meixner, Kennett, California. Property consists of 280 acres, comprising fourteen claims, ten located on the north side and four on the south side of Squaw Creek, which here runs nearly east-west. They are situated in sections 6 and 7, T. 33 N., R. 5 W., adjoining the Trinity Copper Company's property, and are on a line between the Mammoth and Balaklala mines. The ground rises steeply from the creek on both sides. There is a good road from Kennett, the nearest railroad point, five miles distant. There are six or seven tunnels on the claims, varying from twenty feet to 350 feet in length. The lowest tunnel has an elevation of 1000 feet and the highest an elevation of 1600 feet. Small veins in fracture planes, along which movement has taken place, carrying iron and copper sulphides, are encountered in a number of the workings, but no definite ore-body of size has been developed. All work has been by hand. Equipped with hand tools and cabin.

Balaklala Consolidated Copper Company. The Balaklala mine has been closed down, during the year. Large ore reserves are blocked out and the company is in a position to produce whenever the Mammoth Smelter resumes operation.

Bully Hill Mines, Incorporated. (See Shasta Zinc and Copper Company.)

Clover Creek Copper Lease. Owners, G. Cleveland Taylor et al., Redding, California; (bond and lease from Central Pacific Railroad Company). Property consists of 240 acres comprising 160 acres of patented railroad land and four claims, located by Taylor in section 32, all in the Clover Creek mining district. There is an auto road to within one mile of the claims. They are situated fifteen miles east of Palo Cedro, a station on the branch railroad from Anderson to Bella

Vista. The elevation is 1500 feet. There is no timber on the property, but it can be obtained, cut, at a saw mill three miles away. Clover Creek contains sufficient water the year round for all purposes.

Country rock is rhyolite (alaskite porphyry). The ore bodies occur in irregular fissures that show extensive shearing. The shear zone is of undetermined width, but is at least several hundred feet wide. It strikes N. 65° W. and dips almost vertical. The alaskite is capped with basalt and is only exposed where the creek has cut a deep channel through the basalt. The cañon is evidently due to a fault as a diorite dike, which is exposed on the west side of the creek, lies, about 300 feet upstream, on the east side. The width of the dike is forty feet. Some small gossan croppings are exposed along the creek bed. Above the water level where cuts have been made, oxides of copper are found, below the water level chalcopyrite occurs. Some iron is associated with it, but no zinc.

Development work consists of a main tunnel driven south 30° west, for 80 feet. At thirty feet from the portal, a drift was run southeast along the ore zone. About 20 feet in the drift, a winze, sunk 9 feet, cut an ore body 7 feet wide, carrying chalcopyrite, the ore averaging 4.37% copper across the face. Beyond the winze, the drift is not in ore. A series of parallel cross slips striking N. 30° W. were encountered in this working and in each case they cut off the ore body. Beyond the drift to the face of the tunnel very little ore is seen. Besides the tunnel, numerous small open cuts have been made along each side of the stream, for ¼ mile in both directions. In all cases where ore is exposed, there is a prominent cropping of alaskite. A cropping heavily stained with copper oxides occurs one-fourth of a mile east of the tunnel. It lies in contact with the diorite dike. The ore-zone here is from 20 to 30 feet wide. The Afterthought Mine is four miles northwest, the power line to the Afterthought passing within one and one-half miles of the property. No work has been done for some time, but the surface indications are good.

Dozier Copper Prospect. Owners, Dr. E. Dozier, J. W. Sandholt and Geo. O'Grady, Redding, California. Property consists of 320 acres of patented land, being the west one half of section 13, T. 33 N., R. 5 W. Kennett, the nearest railroad station, is about one and one-half miles in an air line or four miles by road, that passes within one and one-fourth miles of the croppings. Elevation is from 1500 feet to 1900 feet. There is some pine timber and Moody Creek, which flows all year, contains sufficient water for prospecting purposes. The ground is hilly, the deposit being near the summit of a spur ridge from Bass Mountain. The prospect was discovered several years ago and a few tunnels and cuts were driven. It was acquired by the present owners in 1918.

The deposit is marked by large gossan croppings near the summit of the ridge in black shales and cherts of the Kennett formation near a contact with rhyolite. The extent of the rhyolite has not been determined, but it appears to be a dike striking almost due south with the trend of the ridge.

There is a tunnel driven 120 feet vertically below the most prominent cropping, into the Kennett formation, a few feet from the dike. The face of the tunnel at about 170 feet from the portal is in rhyolite,

with which is associated masses of gossan and large cubes of iron pyrite. For the first 30 feet in the Kennett formation, exudations of copper sulphate are seen on the walls and the water is stained with it. The gossan appears to be dipping about 40° southwest. On the surface it covers an area approximately 200 feet by thirty feet. No copper indications are found in the other small cuts or tunnels. The surface indications warrant prospecting with a diamond drill.

Greenhorn Mine (formerly **Warren Brothers Mine**). Owners, Atascadero Mining Company, 1014 Hobart Building, San Francisco, California; C. E. Gilman, secretary; Albert Hanford, superintendent of mine, post office, Tower House. Property is located in the French Gulch mining district in section 6, T. 32 N., R. 7 W. Redding, the nearest railroad point, is 22 miles southeast. The Redding-Weaverville lateral of the state highway passes the mine. The camp is on Willow Creek, at an elevation of 2000 feet and has an excellent water supply. There are fifteen unpatented claims and 120 acres of patented land in the holdings which have a total area of 420 acres. The country rock is quartz porphyry (altered ryholite). The deposit consists of lenticular ore-bodies in a sheer zone in the altered rhyolite. These lenses dip 20° to 30° westward, raking to the north. The ore is mainly chalcopyrite or pyrrhotite with some cuprite in the upper workings, as well as malachite and azurite. The largest ore-bodies are, however, mostly chalcopyrite in a gangue of pyrrhotite and pyrite. As the rhyolite is very much fractured, timbering is necessary throughout the workings. The ore-bodies vary from thin seams to ten feet in thickness. They are usually cut off by fault planes in the rhyolite.

Development work consists of six tunnels and several thousand feet of drifts, raises, etc. No. 1 tunnel, the lowest working, is at an elevation of 1833 feet, the portal being 100 feet above Willow Creek. It is driven due east 450 feet where it cut black slate. A raise of 90 feet from the north drift cut a face of high grade ore six feet thick. Several thousand feet of drifts, from No. 2 tunnel, 90 feet above No. 1, expose numerous ore bodies. This tunnel cuts the slate at 550 feet. No. 3 tunnel was driven due east 350 feet from which point a drift was run south for 350 feet. From this level considerable ore was shipped by former lessees. A new tunnel, No. 4, at an elevation of 2095 feet, is in an iron gossan for 100 feet. No. 5 tunnel, at an elevation of 2207 feet, is an original working from which considerable ore was shipped. Tunnel No. 6, at an elevation of 1867 feet, was driven 1000 feet eastward below No. 5, but failed to cut an ore body.

The mine is equipped with a compressor plant at No. 2 tunnel, containing an Ingersoll-Rand 10″ x 12″ compressor, operated by electric power. There are also air drills and blacksmith shop, boarding house, bunk house, etc. The erection of an acid-leaching plant is contemplated. The mine was discovered in 1901 and worked from 1910 to 1916, ore being shipped to the Mammoth Smelter. The present company took over the property in January, 1919. The management estimates that there is 260,000 tons of 3.2% copper ore blocked out and 450,000 tons of probable ore. Idle during the past year.

Shasta Zinc and Copper Company (formerly **Bully Hill Mines, Inc.**) The famous group of mines at Bully Hill, known as the Bully Hill Mines, Incorporated, were sold during the year to the Shasta Zinc and Copper Company, home office, Hobart Building, San Francisco, California; W. Arnstein, president; D. C. Jackling, managing director; R. L. Beals, superintendent; post office, Winthrop, California. The new company is capitalized at 200,000 shares of no stated par value. Of this amount, D. C. Jackling, in conjunction with Hayden Stone and Company have taken one-half and one-half has been retained by W. Arnstein et al. The new company also acquires the Sacramento Valley and Eastern Railroad, a broad gauge line connecting the mines at Bully Hill with the main line of the Southern Pacific at Pitt, a station three miles north of Kennett.

Development work has been carried on at their Rising Star Mine for the past two years and approximately 300,000 tons of ore are now blocked out. Thirty to forty men are employed in the mine. The erection of a new treatment plan for the production of copper matte and zinc-oxide is progressing rapidly. Much of the structural steel used is being obtained from the old Balaklala smelter at Coram, which is being torn down and the material shipped to Bully Hill, so that rapid progress is being made. One hundred and twenty-five men are employed on construction and the new plant is expected to be ready for operation by March, 1921. The general layout includes mechanical roasters, storage bins, cooling system, reverberatory furnaces and baghouse. For the present the 150-ton flotation plant will not be used.

GOLD—QUARTZ MINES.

Alice Mines (formerly **Alice Consolidated Mine**). Owners, J. E. Baker, Mrs. E. Bui and L. Neivi; incorporated as the Crescent Copper Company; J. E. Baker, president, 222 Market street, San Francisco, or Redding, California.

Property is located in the Shasta mining district in section 19, T. 32 N., R. 5 W., about 1½ miles west of Keswick, the nearest railroad point. The holdings include the Alice Consolidated group and the Zeb, Monarch, October and Peacock claims, the total area being about 170 acres. The mine has an elevation of 600 feet. Water is obtained from Rock Creek. The deposit was discovered about thirty years ago but was relocated and incorporated in 1918.

Deposit consists of several veins, some small and some of fair size. The ore is base. Development work consists of three tunnels, 300, 80 and 25 feet long, the greatest depth reached on the veins being 60 feet. A power line crosses the property. It was a small producer at one time.

Arndt-Haschke Mine. Owners, Geo. C. Arndt and E. W. Haschke, post office, Ingot, California. Property consists of four claims, having an area of 80 acres, situated in sections 33 and 34, T. 34 N., R. 2 W., in the North Cow Creek district. Ingot is the nearest town and Redding, 24 miles southwesterly the nearest railroad point. The elevation is 1200 feet and there is some timber on the claims. Country rock consists of porphyry, phonolite and slate. There is a gossan carrying some gold. The owners are driving a tunnel for development purposes.

Black Bear. Owners, Strayer Brothers, Oak Run, California. Property located in T. 33 N., R. 2 W., in the Cow Creek mining district.

Black Cloud and Red Top (formerly **Reservoir and Offset Mine**). Owner, James Duffy, care S. A. Meek, Quartz Hill, or Redding, California. Property consists of one claim and a fraction, with a total area of about thirty acres. The claims are in section 15, T. 32 N., R. 5 W., 4½ miles north of Redding and 2½ miles from Keswick in the Quartz Hill mining district. There is no water except in the winter. Quartz veins outcrop on the surface and two of these are cut in the main shaft. The principal vein is four to six feet wide. The shaft is down 165 feet and there is a 60 foot drift and forty-five foot crosscut on the 100-foot level. The ore is said to be of good milling grade and amenable to cyanide treatment. A shipment to the former smelter at Coram, of 100 tons obtained in shaft sinking, gave returns of $3.00 per ton. There is no equipment.

Evening Star Claim. Owner, C. C. McCray, French Gulch, California. Property consists of one full claim adjoining the Washington and Milkmaid mines in the French Gulch district. Located over twenty years ago and assessment work kept up. The owner states that total values received from milling ore would about pay for assessment work. Under lease and bond until July 1, 1921.

Florida Group. Owner, T. E. Graff, Redding, California. Property consists of the West Point, Golden Jubilee, Florida, Daylight, Miner's Dream, Irma B., Big Gem, Last Chance, Lost Hope, White Elk, Northern Light and Keith claims, having a total area of 240 acres. The holding is located in the Middletown mining district, in sections 7, 12 and 18, T. 31 N., R. 5 W., 7 miles west of Redding. There is a good auto road to the property. Elevation 1000 feet. Olney Creek furnishes water during eight or nine months of the year and water has been encountered in sinking shafts. The surface ranges from low rolling hills on the southeast to mountainous on the northwest. This is one of the early placer mining districts and the claims were located years ago, but very little work has been done on the main ledges. The country rock is meta-andesite and the deposit consists of quartz veins on the contact of the meta-andesite and slate, or more commonly in the meta-andesite. There are two principal quartz ledges and a series of smaller ones. They are very regular with well defined walls. The quartz filling is considerably shattered and iron stained in the fractures. Oxide of copper was found in one place. The gold occurs both free and in sulphides.

The Miner's Dream ledge located about midway of the group is very strong and can be traced by its extensive outcrops almost the entire length of the claim. The strike is N. 80° E., with dip to the north. Several shafts have been sunk to a depth of from 40 to 50 feet. From a tunnel driven about 100 feet a winze was sunk 50 feet and here the vein was 12 feet wide. Croppings are from three to ten feet wide. In one cut a sample of ore ran 24.65% copper. Assays along this ledge are said to have run $16.60, $25.40, $12 and $8.10. The Big Gem ledge, apparently the strongest and most persistent of the group, lies south of the Miner's Dream. It strikes N. 30° W., the outcrop varying from five feet to fifteen feet in width and extending the length

of the claim and beyond its southeasterly limit. It has been developed only by means of shallow shafts, the deepest being seventy feet. None of the workings are sufficient to determine its value and it is worthy of further development.

The Irma B. lies south of the Miner's Dream and strikes north-south. The principal working here is a forty foot shaft. This was sunk on a stringer that was expected to yield a pocket. At the bottom of the shaft a strong vein is exposed which pans free gold. An 1148 lb. shipment to the Mountain Copper Company, of an assay value of $49 per ton, gave returns of $26.98 and another of 2561 lbs., to the Selby Smelting and Lead Company, assay value $38.60, returned $48.43.

Besides the above described claims, the others all have well defined quartz ledges of like appearance, the most notable being the Last Chance. A ton of ore taken from the surface here a few years ago and shipped to the Keswick smelter yielded $43. There is very little equipment on the property and no maps or notes. The latter, and all reports having been destroyed in the San Francisco fire. A small amount of development work is being done.

Gladys Mine. Owners, E. E. Hart and Donald McPhail, Shasta, California. Property consists of the Gladys and Jay Bird claims and the Monzel group of four claims, having a total area of 120 acres. The mine is located in section 34, T. 32 N., R. 6 W., in the Shasta mining district and is ten miles northwest of Redding, the nearest railroad point. It is four miles from the highway by wagon road, with some heavy grades, but it is possible to drive within one-fourth of a mile of the camp. The elevation at the tunnel is 1500 feet. There is some yellow pine on the property and two springs, good for camp use. The claims were located in 1899 and have been worked only by the owners.

The country rock is quartz porphyry and the deposit consists of parallel quartz veins, cutting it, the two principal veins being about 75 feet apart. The veins are hard white quartz, well defined with a gouge on the footwall side. The vein matter is heavily stained with iron and manganese and the ore is base, the gold occurring mostly in sulphides. The walls are hard and no timbering is necessary. The main vein averages four feet in width, with a maximum width of six feet. It strikes N. 55° E., and dips 85° northwest.

A crosscut tunnel driven N. 70° W. cut the main vein at 300 feet. Here it is split and broken by a fault striking N. 65° E. Drifts run to the south cut a vein at 75 feet and to the north at about 50 feet, but they are caved. A shaft sunk on an outcrop caught this drift at 130 feet depth. It is caved near the bottom. The second vein is not cut by the tunnel. A shaft sunk 75 feet on the second vein shows it to be two to three feet wide. At 150 feet in, the tunnel cut a two foot vein reported to assay $6 per ton. All work is by hand drilling, the only equipment being a blacksmith shop and cabin. Owners would like to lease or sell.

Gold Leaf (formerly **Crown Deep**). Owners, Ira Judson Coe, et al., Mills Building, San Francisco. Property consists of four claims, the Gold Leaf, Gold Bronz, Summit and North End, located in section 5, T. 31 N., R. 5 W., in Lower Springs mining district. Redding, the

nearest railroad point, is four miles east, one mile by county road and three miles by highway. Elevation 500 feet; water is obtained from springs. The country rock is andesite and black slate and the deposit consists of quartz veins carrying gold in sulphides. Maximum width of the four veins is twelve feet, averaging six feet on the East Gold Leaf and two feet on West Gold Leaf. The strike is northeast and dip 65°. The length of the pay shoot is 110 feet and its average width six feet. The shaft is down 400 feet, cutting the vein 430 feet below the outcrop. A drift has been run 175 feet on the vein from the bottom of the shaft and 150 feet drifted on each of the five levels. Equipped with electric hoist. Power is obtained from the Pacific Gas and Electric Company. Idle since 1916.

Happy Jack and **Mountain Monarch Group**. Owner, Charles L. Paige, box 195, Santa Barbara, or Redding, California. The Happy Jack Group consists of the Happy Jack, Nonpareil, Langtry, Mountain Belle, Mountain View and Knickerbocker patented locations and the unpatented Illinois, Peoria and Greenstone locations. The Mountain Monarch Group comprises the Great Slide, Boulder and Nos. 1 to 17 locations, the total area being about 560 acres. The property is in the Whiskeytown (Stella) mining district in sections 28, 32 and 33, T. 31 and 32 N., R. 6 W. Shasta is the nearest town. Redding, the nearest railroad point, is ten miles east. From the state highway, which passes within three or four miles, a fair wagon road extends to the property. The elevation ranges from 3000 to 5000 feet and timber is plentiful. Water can be obtained from Clear Creek, Brandy and Boulder creeks. The surface is steep, with deep ravines and gulches.

Country rock is a schistose diabase, with granite to the west. White quartz veins occur, carrying both free and base gold ores. The Happy Jack is the principal gold vein. Numerous cross and secondary veins also occur. The Happy Jack varies from three feet to eight feet in width, averaging about four feet, and strikes northwest-southeast, with dip nearly vertical. There are no deep workings and many of the shallow shafts are caved. They are chiefly on the smaller cross veins and near the surface, where pocket and free milling deposits were worked by bucket and windlass.

On the Mountain Monarch group, located for copper, there is an 850-foot tunnel, which should tap the main vein about 650 feet below its outcrop, if extended some 75 feet.

Good water power is available within one mile, but it was never used except to run an arrastra and old cannon-ball mill. All buildings, etc., have been destroyed by fire. The property is favorably situated and easily accessible from the highway.

Jumbo Prospect. Owners, W. W. Felt and J. Smith, Redding, California. Property consists of 40 acres of patented land in section 18, T. 31 N., R. 5 W., near Centerville and 6 miles southwest of Redding, the nearest railroad point. Elevation 900 feet. Water can be obtained from Olney Creek during seven to nine months of the year.

The country rock is meta-andesite and the deposit a quartz porphyry dike carrying auriferous quartz veins. It was worked years ago as a placer. A series of parallel shoots strike east-west and dip 30° to 40° south. They are bunchy, but appear to be persistent. All work has

been entirely superficial. The deepest working is a shaft sunk fifty feet on a quartz vein in which there is said to be a 75-foot drift at the bottom. It is caved and full of water. Numerous pits and trenches expose quartz veins from one to one and one-half feet wide. The rock is soft and decomposed on the surface. Gold can be panned from any of the dumps.

Minneshasta Mine (formerly **Brackett Mine**). Owners, Wm. Miller, G. B. Crabtree, T. R. Thompson and Isadore Krauss. Incorporated as the Minneshasta Mining Company, 512 Lumber Exchange, Minneapolis, Minnesota; Wm. Miller, president; Isadore Krauss, superintendent, Shasta, California. Property consists of four claims, the Mt. Pleasant, Center Slope, Rough and Ready and Brackett Fraction, situated in section 33, T. 32 N., R. 5 W., in the Shasta mining district. It contains eighty acres and is located four miles west of Redding on good road. Water is obtained from the mine. The mine was discovered in 1890. It was closed during the war, but work was resumed late in 1920. The deposit consists of a quartz vein averaging six to seven feet in width, carrying base gold ore. The strike is north-south and the vein stands nearly vertical. It has been proven on the surface for 3000 feet. The greatest depth developed is 300 feet. There are two tunnel levels. The lower tunnel is in 1800 feet and the upper tunnel 700 feet. There is still another tunnel, fifty feet higher, 110 feet in length. The vein has been drifted on for 250 feet. All work has been by hand, the only equipment being track, cars, tools and blacksmith shop. Ore produced has been shipped to smelter.

North Star. Owner, Geo. W. Garwood, French Gulch, California. Property consists of the North Star and Virginia claims, a total area of forty acres, located in section 9, T. 33 N., R. 7 W., in the French Gulch mining district. Originally located in the early sixties, they were relocated by the present owner in 1902. Deposits consist of one main quartz vein, with feeders from the footwall. The country rock is porphyry and slate. The average width of the vein is eight inches and the values are spotted. It strikes north-south and dips 80° east. Development work consists of a 300-foot tunnel, 300-foot drift and 60 feet of crosscuts, winzes, etc. The vein is an extension of that in the Milkmaid, an adjoining mine. Equipment consists of shop and tools.

North Star. Owner, C. P. Baker, Schilling post office, California. Prospect located in Whiskeytown mining district, in section 6, T. 32 N., R. 6 W.

Rawhide Mine. Owner, A. C. Renfrew, Shasta, California. Property consists of one claim of 20 acres in section 19, T. 32 N., R. 5 W. It is on old road two and one-half miles from Keswick, the nearest railroad point. The country is rugged and broken. Water can be obtained from Rock Creek. The deposit consists of a quartz ledge about two and one-half feet wide, which pans free gold. Discovered in 1920. No development.

W. and W. Prospect. Owners, H. D. Willard and J. J. Williams, Shasta, California. Property consists of two claims, the East Half and West Half, a total area of forty acres, located in the northwest quarter of section 19, T. 32 N., R. 5 W., about 1 mile west of Keswick,

the nearest railroad point. There is a rough mountain road to the mine. The claims have an elevation of 1500 feet and the ground is hilly and rugged. There are three springs, said to flow all the year. The country rock is meta-andesite. Auriferous quartz veins form the deposit. There is one principal vein and several smaller parallel veins. They are well defined. Quartz highly oxidized on the surface. The ore is said to be free milling, but it contains sulphides. Chalcopyrite shows in the shaft. At the outcrop, the principal vein is from six inches to one foot in width, widening to three or four feet in the bottom of the shaft.

The strike is N. 70° E. and dip 65° N. It has been proven on the surface for 150 feet. A shaft, down fifteen feet, is being deepened and there is a fifty-foot open cut along the vein. No equipment except a few tools. Located in 1919.

Yankee John Mine. Owners, Yankee John Development Company, W. L. Clark, president; home office, Pittsburg, Pennsylvania; R. T. Peirce, superintendent, Redding, California. The mine is 6 miles southwest of Redding, the main county road from Redding to Ono passing within one-half mile. The country consists of low rolling hills; elevation at the mine 930 feet. Water is obtained from Olney Creek during the winter and stored in a reservoir covering eighteen acres. It is ample for milling purposes throughout the year. The holding consists of five mineral claims and 305 acres of patented lands on which the reservoir is located, a total area of 400 acres. The mine was worked about thirty years ago by an old company. The present company began operations in 1915.

Country rock is meta-andesite and the deposit consists of a series of parallel quartz veins in the meta-andesite and slate. They are well defined and hard. The quartz carries some free gold, but gold also occurs in the pyrite, necessitating concentration.

The general trend of the veins is east-west, the dip being almost vertical. The vein under development is from one to four feet in width, averaging about two and one-half feet. It is faulted and bunchy. The largest ore-shoot encountered was 175 feet. There is a vertical shaft, 300 feet in depth, with levels at 70, 100, 200 and 300 feet, but all workings below the 100-foot level are now inaccessible. There is a stope in a high grade ore-shoot between the 70-foot level and the surface. The vein here is one to four feet wide and is rich in sulphides, there being some galena. The old workings are said to be extensive.

Mining is done with machine drills, including stopers and jackhammers. Equipment consists of 25-h.p., 2-cycle, 2-cylinder Victor gas engine, for new 1000-foot hoist. Fairbanks-Morse engine. Small compressor, pumps, etc. Distillate is used for fuel. Reduction equipment consists of a 12-stamp mill, containing jaw crusher, ten 1000-lb. and two 800-lb. stamps, three amalgamating plates, and one Deister concentrator. It is operated by a 40-h.p., 2-cycle, 2-cylinder gas engine. Tailings are stored for future treatment. Five men were employed in the mine and mill until it was shut down indefinitely in September, 1920, on account of excessive costs. When last operating, the mill was only running one shift and treated about twelve tons per eight hours. Concentrates run about $160 per ton. They were shipped to the Selby Smelter.

GOLD—PLACER.

Grubstake Placer Mine. Owners, Nelson Brothers, La Moine, California. Property is in section 22, T. 36 N., R. 5 W., in the Slate Creek mining district, 1 mile south from La Moine. It is in the Shasta National Forest and contains a small amount of oak, pine and fir. Elevation 1260 feet. The claim was located in 1917 and contains eighty acres. Country rock is slate. Deposit consists of sloping gravel bars. The gravel channel being worked courses north-south, the gravel varying from one to forty-six feet in depth. There is no cement, but boulders up to four tons are encountered. The slate bed-rock is full of holes and crevices. Width of pay gravel about 40 feet and depth 30 inches. The portion of the claims being worked is located on a high bluff about forty feet above the present river level. Here the gravel is about nine feet deep. The top dirt is moved to one side and the pay dirt moved out and dumped into a chute and run down to the river level, where it is washed in sluice boxes. Only worked in the winter on account of scarcity of labor and high wages.

Rainbow Mine. Owner, G. A. Lintow, La Moine, California. Property comprises 28 acres, lying at an elevation of 1250 feet in section 15, T. 36 N., R. 5 W. It is in the Slate Creek District, one mile north of the railroad station and between the railroad and state highway. It was worked in 1861 by J. Keeting and in 1880 by L. Curber. Deposit consists of placer gravel.

Hornet Mine. Owners, Mountain Copper Company, home office, London, England; Sir Chas. Fielding, president; Wm. F. Kett, general manager, and M. J. Murphy, general superintendent, Keswick, California.

The Hornet mine is one of the properties of the Mountain Copper Company. It is located in the Iron Mountain district in section 35, T. 33 N., R. 6 W., and is connected by the Iron Mountain Railroad, owned by the company, with the Southern Pacific main line at Keswick. It lies at an elevation of 2400 feet on the hilly northwest slope above Boulder Creek. The country rock is rhyolite, and the deposit fills a large fissure, due to shearing and crushing of the rhyolite. The lenticular ore bodies are several hundred feet long and of undetermined width and depth. The filling is nearly pure iron pyrite, with not over 1% to 2% of silica and averages 0.7% copper. The strike of the ore zone is N. 30° E., dip almost vertical, with a rake at a high angle to the northeast.

A main adit, 3000 feet in length, has been driven 180 feet vertically below the old adit, formerly used as a haulage way, to cut the ore body. A stope has been opened between the two levels and the ore is mined by combination shrinkage and caving. There is no timbering in the mine. Pillars are left in the stope and later recovered. It is worked in sections of 150 feet along the ore body, grizzlies being placed every 25 feet, to which the ore is broken. These grizzlies are on the mill floor, 25 feet above the adit and 25 feet below the stoping floor. Blasting is done by electricity and from 50,000 to 150,000 tons are broken at one time. The stopes are 150 feet long, 80 to 100 feet wide and five feet high. The broken ore averages 45% sulphur and 0.7% copper.

Electric power is used throughout. No muckers are required. Mine equipment consists of Ingersoll-Rand compressor, machine drills and drill sharpeners, machine shop, etc. Electric haulage is used, ten 7-ton cars being sent to the mill at one time.

The mill consists of 1000-ton crushing and sizing plant, equipped with No. 6 gyratory crusher, conveyor belts, trommels and four Hartz jigs. Three sizes are produced, $1\frac{1}{2}''$ to $4''$, sold to the Standard Oil Company $\frac{3}{8}''$ to $1\frac{1}{2}''$, and tailings from the $\frac{3}{8}''$ sold to the General Chemical Company. About 90% of the pyrite averages 45% sulphur or better. Second-class ore is sent to the Hartz jigs, and the waste is discarded.

The Standard Oil Company returns the pyrite cinder to the Martinez plant of the company, where it is leached and the copper extracted. With the exception of that obtained by the precipitation of mine water and recovered by leaching the pyrite cinder, no copper is being produced by the Mountain Copper Company. Operations at the Iron Mountain mine will not be resumed until market conditions improve. About 150 men are employed at the Hornet mine and mill.

SILVER.

Big Dyke Mine. Owners, Bill Dyke, John and Frank Richter, of Igo, California. The Igo Consolidated Mining Company, Geo. T. Ruddock, president, 729 Mills Building, San Francisco, California, is developing it under bond and lease.

This property, consisting of a group of seven claims, with a total area of 140 acres, is located in sections 17 and 18, T. 31 N., R. 6 W., in the South Fork mining district. It is eighteen miles southwest of Redding, the nearest railroad point. The road is good from Redding to Igo, but the three or four miles from Igo to the mine is rough and has heavy grades. It could be improved at little cost. The mine is located on the rather steep slopes near the top of the ridge, above the Silver Falls mine tunnel, the elevation at the shaft being 2000 feet. There is considerable pine on the property. Water is obtained in a tunnel for camp purposes.

The deposit was discovered years ago. Dyke and Richter Brothers acquired it in 1906, and a little work was done in 1917 and 1918. The present company took it up in December, 1919. Practically all work is confined to the Big Dyke claim.

The country rock is a granodiorite in which the deposit occurs as a quartz fissure vein. The principal vein, the Big Dyke, strikes N. 60° E., and dips almost vertically. It is well defined with strong wall and little timbering is required. The vein matter is from two feet to five feet in width, the best ore being found along both walls in streaks from 4″ to 7 feet in width. The ore contains argentite, native silver, some freibergite, a variety of tetrahedrite, or gray copper ore, containing from 3% to 30% of silver, sphalerite, galena and arsenopyrite. Some gold is associated with the pyrite.

A shaft sunk on the vein has reached a depth of 153 feet. A crosscut has also been driven to the vein, cutting it about 100 feet below the collar of the shaft. Some stoping was done here a couple of years ago and a resulting shipment to the Kennett smelter averaged 300 ounces of silver per ton. It was only stoped about 20 feet above the

main level and for a short distance. The mine is equipped with a gas engine for hoist and compressor, and two air drills. The machinery was used by former operators. The hoist is good for about 400 feet and the compressor is 25-h.p. All ore and waste has been taken out through the shaft. Six men are employed. In March the shaft had been sunk to the 200-foot level and drifting east and west had commenced. Considerable native silver occurs with the sulphides in the ore, giving it a very high grade appearance.

Silver Falls and Chicago Consolidated Silver Mine. Owner, F. M. Archer, Redding, California. This property includes the Pillchuck, Union, Cold Springs, Richmond, Madison and Chicago, patented claims, ten unpatented claims and adjoining patented ground, the total area of the holdings being 340 acres. It is located in sections 17, 18, 19 and 20, T. 31 N., R. 6 W., in the South Fork mining district, and is 2½ miles northwest of Igo. Girvan is 12 miles and Redding about 15 miles distant by good roads. Both are railroad shipping points. The elevation ranges from 1400 feet to 2300 feet. There is some pine and oak on the property. Water is obtained from Andrews Creek. The ledge on the Chicago claim was discovered in 1865 and worked at intervals until the late 90s. The greatest depth attained was 210 feet. It is said to have been rich, and during the early operations ore was shipped to Swansea, Wales, for reduction. The total production of the Chicago is reported to have been approximately $1,000,000. All the old workings are now caved and abandoned.

Country rock is a granodiorite or granite and the deposit consists of a series of fissure veins and seams, carrying tetrahedrite, running high in silver, pyrite and some galena, sphalerite and chalcopyrite. Very little timbering is required.

In 1900 a long cross-cut drainage tunnel was started and run in 3000 feet, cross-cutting the vein system and reaching a maximum depth of 600 feet at the face. Some 36 separate veins and fissures have been cut, but it is believed that the main Chicago lode has not as yet been reached in the tunnel.

The best showing is in the vicinity of veins Nos. 27 and 28, which are presumed to represent the Madison lode on the tunnel level. In vein No. 28 two shoots are exposed containing high grade galena ore. From a short drift at this point 40 tons were shipped to Kennett that assayed $.83 gold and 17.7 oz. silver per ton. According to a report by Geo. J. Bancroft of Denver, assays on vein No. 28 were as follows:

	Au.	Ag.
East breast, one foot wide	trace	6.02 oz.
12 feet west of breast, one foot wide	3.08	12.00 oz.
30 feet west of breast, 8 inches wide	3.75	27.00 oz.
106 feet west of breast, 9 inches wide	4.56	75.00 oz.
Solid galena from stope, 9 inches wide	17.00	270.00 oz.
Ore bin sample	2.00	37.00 oz.

Cyaniding and concentration tests made on the ore by Smith, Emery and Company indicate that a total recovery of 90% of the gold and 66% of the silver is possible without roasting. Preliminary flotation tests are said to indicate a recovery of 95% of the silver content.

The mine equipment used at the time the long tunnel was driven was destroyed by fire in 1912. The present owner has installed track and

cars and 3000 feet of ten-inch air-pipe and blower driven by gasoline engine to ventilate the mine. There is an electric power line within two miles. Three men are employed advancing the tunnel face. Equipped with blacksmith shop and camp buildings.

Silver King Mine. Owners: Under lease to L. C. Parker, et al., Redding, California. Property is located in the Middletown mining district in section 8, T. 31 N., R. 5 W. Redding, the nearest railroad point, is four miles east by good road. There is one claim, the Silver King, located about thirty years ago. The surface is rolling hills, having an elevation of 800 feet at the shaft. There is some digger pine and oak on the claim. Water is obtained from the mine, and for domestic purposes from a spring.

Country rock is meta-andesite, which is cut here by an intrusive alaskite-porphyry dike. The deposit consists of a more or less brecciated quartz vein, carrying copper and silver, which follows the contact of the alaskite and meta-andesite on the footwall side of the intrusive. The dike is about sixty-five feet wide and the vein averages two feet in width with a maximum thickness of eight feet. The ore-body strikes north-south and dips 82° east. It has been proven on the surface for the full length of the claim. The vein is well defined with hard walls and little timbering is required. The ore is a siliceous copper sulphide, carrying high silver values, the principal minerals being chalcopyrite, chalcocite, and argentite. The pay-shoot was 150 feet long and fourteen inches wide.

Development work consists of a 325-foot vertical shaft with four levels. No. 1 at 90 feet, No. 2 at 150 feet, No. 3 at 200 feet and No. 4 at 300 feet. Level No. 1 is drifted on for 80 feet; No. 2 for 320 feet; No. 3 for 160 feet, and No. 4 for 410 feet. At the 300-foot level a cross-cut was run 90 feet west, to and through the hanging wall of the dike. There are three raises above the 150-foot level and the vein has been stoped approximately 40′ x 2′ x 80′ and about 1000 tons of good grade ore shipped to the smelter. Ore reserves are estimated at 500 tons partly developed. Hand and machine drills are used.

The mine is equipped with a good shaft house, 40-h.p. steam boiler and 15-h.p. Vulcan hoist with 500 feet of ¾″ cable; also a 40-h.p. Deisel hot-head engine, a 9″ x 8″ Sullivan compressor, and pumps, cars, blacksmith shop and all necessary tools for mining. When operated from twelve to eighteen men were employed. A good boarding house, foreman's house, and bunk house provide accommodations. It was shut down in 1918 and has been idle the past two years.

SISKIYOU COUNTY.

The inaccessibility of the mineral-bearing sections of Siskiyou County has hindered the development and equipment of its lode mines and many of the hydraulic and placer properties have a comparatively short season's run, even in years of average precipitation, on account of the necessity of bringing water long distances, if an adequate supply is to be obtained.

Due to high production costs and the unusual dry season, there has been very little activity in precious metal mining in 1920.

The Davis Consolidated Mine at Happy Camp has been kept in operation despite adverse conditions. This property has become, since the closing down of the La Grange Mine in Trinity County, the largest hydraulic mine in the state. Two important copper districts have been developed, one near Happy Camp, where the Gray Eagle Mine is located, and one at Copper in the western part, near the Oregon line, where the Blue Ledge mine is producing.

The mines and mineral deposits of the county are described in the Fourteenth Report of the State Mineralogist. Manganese and chrome mines have since been reported on in Bulletin No. 76, quicksilver properties in Bulletin No. 78 and the clay deposits in Preliminary Report No. 7.

The mineral resources of the county include baryte, chromite, clay, coal, copper, gems, gold, graphite, lead, limestone, manganese, marble, mineral water, potash, pumice, quicksilver, sandstone, silver and miscellaneous stone. Siskiyou is the fifth county in California in size and offers splendid opportunity for future development of its mineral resources.

Commercial production for 1917 was as follows:

Substance	Amount	Value
Chromite	2,046 tons	$49,797
Copper	888,043 lbs.	242,436
Gold		325,550
Granite		500
Lead	192 lbs.	17
Mineral water	503,000 gals.	50,600
Platinum	15 oz.	709
Silver		16,883
Stone, miscellaneous		134,382
Other minerals[1]		8,535
Total value		$829,409

[1]Includes lime, sandstone, and soda.

Commercial production for 1918 was as follows:

Substance	Amount	Value
Chromite	6,612 tons	$336,588
Copper	573,593 lbs.	141,677
Gold		294,227
Mineral water	501,750 gals.	50,175
Platinum	1 oz.	58
Silver		14,501
Stone, miscellaneous		24,588
Other minerals[1]		15,473
Total value		$877,287

[1]Includes lead and pumice.

Commercial production for 1919 was as follows:

Substance	Amount	Value
Chromite	510 tons	$13,379
Gold		350,000
Mineral water	451,500 gals.	90,375
Platinum	7 oz.	1,015
Silver		[2]16,000
Stone, miscellaneous		26,405
Other minerals[3]		111,294
Total value		$608,468

[2]Estimated.
[3]Includes copper, limestone, pumice, and quicksilver.

Field work during the year was limited to that done in connection with Bulletin No. 89, and the following notes on the metal mines, which are intended to supplement previous reports, have been obtained principally through correspondence. They cover, as far as possible, properties not previously of record and such changes and developments as have taken place at the mines heretofore reported on.

CHROME.

Mountain Chrome No. 1 and No. 2.—Owner, W. D. Dale, Sacramento, California. This property was discovered in 1918. It is located in section 24, T. 41 N., R. 6 W., in Edgewood Mining district, the railroad station of Edgewood being seven miles northeasterly. The prospect is situated at an elevation of 2500 feet along the North Fork of Shasta River. An open cut fifteen feet wide has crosscut eighty feet of chrome ore. One man only has been working.

Blue Ledge Mine. Owners, Mexican Smelting and Refining Company, 82 Beaver street, New York City; Geo. Foster Peabody, president; R. E. Safford, secretary; D. C. Brown, general manager, 82 Beaver street, New York; Jerome A. Hilbert, superintendent, post office, Copper, California. Jacksonville, Oregon, 33 miles northeast is the nearest town. The mine is in township 48 N., R. 11 W., and on the Crater Lake National Forest. There is a good wagon road from Jacksonville to the property. The country is precipitous and covered with abundant pine and fir. The elevation is 5000 feet. Water is obtained from tributaries of Applegate River.

The Blue Ledge mine was discovered in 1898. From June, 1909, to October, 1916, it was closed down.

The property consists of 26 patented mining claims, having a total area of 486.9 acres. The country rock is schist and the deposit consists of lenticular veins, carrying primary copper sulphides, gold and silver. The ore is base, as is shown by the following analysis of a composite sample:

Ag.	2.68 oz. per ton	SiO_2	10.0 %
Au	.08 oz. per ton	Al	14.18%
Cu	4.85%	Ni	0.0 %
Fe	32.399%	Co	0.0 %
Mn	18.64%	S	35.00%
CaO	0.0 %		

A dark schist forms the footwall of the main Blue Ledge vein and the hanging wall is a lighter colored schist. The vein strikes north-south and dips 60° west. It has a maximum width of 35 feet, but averages about 5 feet. It has been proven on the surface for 23,000 feet. The length and average width of the pay-shoot developed is 1500 feet by 5 feet. Greatest depth reached below outcrop 600 feet; length driven on the vein 1800 feet. There are four main tunnel adits, the total length of tunnels and drifts approximating 9000 feet. Crosscuts, raises and winzes total 6000 feet. There are various small stopes, their maximum height being 75 feet. length 150 feet and maximum width 35 feet.

It was estimated by the management that there are 240,000 tons of ore blocked out, having an average content of 4.8% Cu., Au. .035 oz., Ag. 1.5 oz., per ton. Over hand stoping methods with open and cribbed chutes are used.

Steam is used for power. Wood for fuel is cut on the claims and costs $7 per cord. The mine is equipped with a 500-cu. ft. 2-stage Sullivan air compressor, jackhammer stopers, underground hoist and a 1500 foot aerial tram. There is no reduction equipment. Twenty-five men are employed, thirteen on top and twelve in the mine. Development costs are given as $5.85 per ton; mining $11.95 per ton; general, $7.55 per ton. Total operating cost $37.43 per ton. Power costs $2.57 per ton, labor $12.06, timber 10c per ton and transportation $10.50. Production to date, 8460 dry tons. Ore was shipped to Tacoma Smelter and gave an average assay of Cu. 13.7%, Ag. 5.5 oz., Au. .1 oz., Fe 30%, S. 30%.

Gray Eagle Mines (formerly **Dakin Mine**). Owner, Mason Valley Mines Company of Nevada; operating company, Gray Eagle Mines Company, Wm. Kermer, superintendent, Happy Camp, California.

This property is in section 4, T. 17 N., R. 6 E., 80 miles by road west of Hornbrook, the nearest railroad point. There is an auto road to within three miles, from which an uphill wagon road, that could be made passable for trucks at little cost, extends to the mine. The country is hilly and the elevation at tunnel No. 7 is 2539 feet. There is timber and a sawmill on the property. Tributaries of Indian Creek supply sufficient water all year for the compressor and plant.

The holdings comprise 32 claims, most of which are now patented. The deposit was located in 1892 and some work was done up to 1908, after which it changed hands. The present company began operations in 1916.

The country rock is gray schist and the deposits consist of mineralization along lines of fracture normal to the schist. The ore-zone trends southeastward and dips at an angle of 20° to 30°. It varies from 10′ to 80′ in width, chalcopyrite being the principal mineral. Very little oxide ore is encountered and that only in the upper workings. There is a strong gossan cropping on the surface. The ore varies from 2% to 18% copper and is said to average 6%. Over 1,000,000 tons of low-grade ore have been blocked out.

Since taken over by the present company, work has been confined to No. 7 tunnel, on the north side of the hill above the camp. It is the lowest working on the deposit and has been driven 3000 feet southeasterly. There are approximately 10,000 feet of crosscuts and drifts from this tunnel. Ore exposed on this level appears to be mostly pyrite and low in copper. Where raises have been put up good ore is exposed. A raise is now being driven to connect with tunnel No. 1, 150 feet vertically above No. 7. The raise is in ore. No. 1 tunnel was driven to cut the ore body underneath the gossan, from the north slope. At about 50 feet, a good vein was cut. Some oxidization is shown here and copper sulphate has been precipitated along the walls in several places. Tunnels Nos. 2 and 3 are short crosscuts, 20 feet and 40 feet vertically below No. 1 and are on the dip of the vein. Good ore is exposed in both.

The mine is equipped with steam plant to operate compressor and small electric light plant. The compressor is capable of carrying a dozen or more drills, and 8-inch air line running to the main tunnel. The mine plant is complete, with blacksmith shop, etc. Sixty men were employed up to 1918, but only two men on a contract were working during the past year.

Isabella Copper Mine. Owner, Isabella Copper Mining Company, Gazelle, California; Mrs. F. Moreland, president; R. E. Rader, secretary; home office, 3228 Adeline street, South Berkeley, California; controlled by R. E. Rader and Sons. Property consists of 120 acres in the East Fork mining district in section 34, T. 41 N., R. 7 W. It is reached by road up Rail Creek from Gregg's Ranch. Nearest railroad station is Gazelle, eighteen miles northeast. There is one large and one small vein or ledge. The width of the main one is about 50 feet. The vein filling consists of quartz and quartzite with sulphides and talc gouge. The ore is base, carrying gray copper and silver, with some gold.

The vein strikes northeast-southwest and dips 80°. It has been proven on the surface for over 4000 feet. Development work consists of a 45′ shaft, 95′ tunnel and 75′ drift on the vein. There are also two crosscut tunnels; No. 1 is in 235 feet and No. 2 is in 175 feet.

The mine is equipped with steam engine, 6″ x 8″ air compressor and Sullivan drill.

GOLD MINES—LODE.

Boulder Mine (formerly **Pumpkin Roller**). Owner, J. M. Campbell, Dunsmuir, California. This prospect is located in the Soda Creek mining district in section 30, T. 39 N., R. 3 W. Dunsmuir is the nearest town. Deposit consists of a free-milling quartz vein, averaging six feet in width, with porphyry footwall and heavy black slate hanging wall. Its strike is east-west and dip north. A 350-foot tunnel driven on the

vein reaches a maximum depth of 75 feet below the outcrop. There are four crosscuts. Preparations are being made to sink a shaft.

Cassadoga Mine. Owner, J. L. Corbett, Hilt, California. Property is situated in section 2, in the Cottonwood mining district, 10 miles west of Hilt, the nearest railroad point. The deposit is a quartz vein in granite country rock. The footwall is granite and hanging wall mica-schist and porphyry. The vein strikes east-west and dips at an angle of 70°. It has been proven on the surface for 3000 feet. A tunnel cuts the vein, which averages three feet in width, at a depth of 125 feet, and 450 feet of drift has been run. The owner estimates ore reserves of 8000 tons, valued at $10 per ton. The mine is equipped with a 2-stamp mill, run by steam power. Idle at present, only assessment work being done.

Champion Mine. Owners, W. F. and J. A. Hunter, Orleans, California. Property consists of nine claims in the Cottage Grove district in section 33, T. 12 N., R. 6 E. Reached by good trail of 11 miles from Orleans, the nearest town. Korbel, the nearest railroad point, is 60 miles southwest. Ten Eyck Creek furnishes plenty of water for power and the claims are timbered. The ore is free milling, but bunchy.

Development work consists of two tunnel levels, the lower one in 335 feet and the upper one 100 feet, with a raise between. The vein has been drifted on for 435 feet. All work has been done by hand, using car and wheelbarrow. Water ditches are complete and in use.

The mine is equipped with 1000-lb. single stamp in good condition for sampling and working rich bunches, also a 2-ton cyanide plant. It was worked from 1909 to 1917. All supplies have to be carried in by pack train.

Crawfish Gulch Quartz Mine. Owner, Sam Bratt, Oak Bar, California. Property consists of 40 acres located in the Oak Bar district in section 18, T. 45 N., R. 10 W., 39 miles west of Hornbrook, the nearest railroad point. There is a running stream and sufficient timber for working. The ore contains gold, silver and copper and is partly free and partly base. The vein strikes east-west, dips south and has an average width of two feet. The mine has been opened to a depth of 50 feet and 70 feet has been driven on the vein, and a 20 foot crosscut run. Total production to date $4,000.

Easter Mine. Owner, Frank Zollihofer, Yreka, California. Property is located in section 34, in the Humbug mining district. Rider Gulch supplies water and there is pine, fir and cedar on the claim. The country rock is granite and the deposit consists of a vein varying from 4″ to 12″ in width, proven on the surface for 600 feet.

Development consists of a 40 foot shaft and 300 foot tunnel. There are two levels opened with drifts of 80 feet and 300 feet respectively. The mine is equipped with arrastra and overshot wheel, water power being used. The owner works it alone.

Eureka and W. J. O. D. Owners, Wm. J. Durch, Rollins, California, and Dunphy Estate. Prospect in Liberty mining district. Nearest town Sawyers Bar. There is a 2-foot vein developed by one 230-foot and one 160-foot crosscut. Idle.

Little Bonsa Mine. Owner, C. N. Gordon, Yreka, California. Burks Blanket, a cross-claim, was located in 1920. The Little Bonsa is a pocket mine. The longest tunnel is 120 feet and the greatest depth reached below the outcrop is 50 feet. The largest pocket contained $1,200. Production to date about $8,000. Owner works it alone.

Mountain King 1-2-3. Owner, D. C. Weaver, Orleans, California. Property is in Prospect Hill mining district, 12 miles by trail from Orleans. Discovered in 1918. Only assessment work has been done.

Mountain Lilly Mine. Owner, G. A. Conzetti, Cecilville, California. Property consists of seven claims in the Salmon River district. Water is obtained from Salmon River and there is plenty of timber on the claims.

The deposit consists of four veins, striking east-west, of which two dip south and two north. The veins vary from four feet to twenty feet in width and have schist hanging wall, the country rock being schist and porphyry. The principal vein has been opened up to a depth of 150 feet and proven on the surface for 6000 feet. Water costs $120 per year.

The mine is equipped with 6-stamp mill, arrastra, two cars, tools and two blacksmith shops. The owner has been unable to save the values with present equipment, claiming a 75% loss in tailings. Idle.

Mount Vernon Consolidated Mine. Owners, James S. Dobyns and Cora N. Jacobs, Yreka, California. This mine has been operated at various times by different companies. James S. Dobyns expects to start operations again soon. The ore is free milling and the mine is equipped with a 5-stamp mill.

Oro Grande Mine (formerly **McKeen** or **Shasta**). Owners, Oro Grande Mining Company, J. R. McKinnie, president; Hugh McKinnie, secretary; home office, 637 Citizens National Bank Building, Los Angeles, California. Property is located in the Callahan mining district in section 36, T. 40 N., R. 9 W. Gazelle, the nearest railroad point, is 39 miles northeast. The holding includes 478 acres of patented land and 200 acres held by location. The country rock is granite and the deposit consists of quartz veins. The ore is base, but is amenable to cyanidation. There are five veins varying in width from eighteen inches to four feet. The principal vein strikes northeast-southwest and dips 85°. It has been proven on the surface for 4600 feet. About 8000 feet have been driven on the vein in five tunnels.

The owners estimate reserves of 50,000 tons valued at $8 per ton. Work is now confined to the two lower tunnels.

The property is equipped with mill, blacksmith shop, compressor building, warehouse, sawmill, and bunkhouse and boarding house capable of accommodating fifty men. The compressor will carry four drills and there is a good equipment of Sullivans and Waughs, steel track and cars.

Reduction plant includes Blake crusher, automatic feeder from ore bin to ball mill of 100 tons capacity, Senn amalgamator, K. and K. flotation machine, tanks, zinc-boxes, etc. The present owners have not operated the mill except in an experimental way, devoting efforts to

developing ore reserves. From mill tests the ore is thought to average $7 to $8 per ton. The property is reported to have produced $500,000, but old reports from the present mill only show about half that amount. There are no returns available of the several arrastras and 3-stamp mill at one time operated. The present tailing pile samples about $3 per ton. High costs prevent operation at present.

Pilot Knob and **Kearsarge** (formerly **Midwinter** and **Modoc**). Owner, R. G. Reeder, Yreka, California. Property consists of two claims in the Fool's Paradise district, in section 30, T. 46 No., R. 6 W. Yreka, 10 miles south, or Hornbrook, 9 miles east, are the nearest railroad points. The state highway passes within one-half mile of the property.

The deposit consists of quartz veins with porphyry and slate walls. The Midwinter vein strikes north-south and the Modoc east-west. They vary in width from a few inches to three feet. There are two shafts on the Midwinter, one thirty feet and one thirty-five feet deep and four tunnels, sixty-five feet, forty-five feet, thirty feet and seventy feet in length. The Modoc is developed by two tunnels, one thirty feet and one ninety-seven feet long. The ore is partly base and partly free, but mortars well when good. Several thousand dollars in gold have been taken from the claims.

Snowflake and **Little Gem**. Owner, Theo. H. Behuke, Rollin, California. Property consists of forty acres in Liberty mining district. Nearest town, Sawyers Bar. Deposit consists of a small vein striking northeast-southwest and dipping 31°. It is proven on the surface for 1000 feet. Porphyry, slate and quartzite constitute the country rock.

S. R. Crary Mine. Owner, S. R. Crary, Walker, California. Property consists of eighty acres, worked as a quartz and placer. The vein has been drifted on for 400 feet. Ore is free milling. Water for operating is scarce.

Victoria Quartz Mine. Owner, L. H. Brown, Dunsmuir, California. Property consists of forty acres in the Soda Creek district, in section 6, T. 39 N., R. 3 W. The nearest railroad station is Mott, one and one-half miles west. There are thirteen veins on the property varying in width from one to twelve feet. The vein filling is quartz carrying chalcopyrite, with some gold and silver. Country rock is diabase.

Development work consists of a 390 foot crosscut, a drift running north seventy feet and a forty foot raise and eighty foot winze.

GOLD MINES—PLACER AND HYDRAULIC.

Creosus Mine (formerly **Hickey Mine**). Owner, John Lenkert, Sawyers Bar, California. Placer on North Fork of Salmon River.

Gold Bank Mine. Owners, M. R. Ramsey and Jos. Frazier, Sawyers Bar, California.

Property consists of bench gravel in Liberty mining district. Discovered 1917. Water is obtained from Eddy's Gulch and mine is equipped with pipe, giant, derrick and water wheel. Production to date $2,400.

Gold Leaf Placer Mine (formerly **Joe King Mine**). Owner, Chas. Dillsham, Yreka, California. Property is in section 8, T. 45 N., R. 8 W., in the Hawkinsville mining district. Montague, eight miles east, is the nearest railroad point. Located in 1918. Both coarse and fine gold occur, but water is very scarce.

James Frazier Mine. Owner, James Frazier, Sawyers Bar, California. Placer mine idle for past four years.

Multo in Parvo Mine. Owners, Wm. Wike and Sam Mathias, Sawyers Bar. Placer mine in Liberty mining district. Idle at present.

Only Hope Placer Mine. Owners, W. L. McClunghry and Fred Martin. Located in Humbug mining district. Idle and probably abandoned.

Pennsylvania Placer. Owner, Frank Edwards, Copper, California. Nearest town, Jacksonville, Oregon. Property consists of six claims in the Elliott Creek district. Only assessment work is being done.

Pond Water Mine. Owner, H. H. Albard, Blue Nose, California. Property consists of one claim located in the Dillon mining district in section 20, T. 13 N., R. 6 E. Somes Bar is the nearest town. Trinidad, the nearest railroad point, is about fifty miles south. The deposit consists of gravel carrying fine and coarse gold. Ditch water rights are owned and the mine is equipped with pipe and giant. Assessment work only is being done.

Rocky Point Mine. Owners, Hicks and McCarthy, Scotts Bar. Property is situated in section 32, T. 45 N., R. 10 W., 3½ miles south of Scotts Bar. The deposit is old channel gravel, which is hydraulicked.

QUICKSILVER.

Hutton Quicksilver Lease (formerly **Herzog** and **Morgan** Mines). Ten men have been employed on development work at this mine near Gottville. A 25-ton rotary furnace is to be installed during the summer.

TEHAMA COUNTY.

Tehama County is situated at the northern end of the Sacramento Valley, and reaches from the summit of the Sierras on the east to the crest of the Coast Range Mountains on the west. The eastern portion is covered with lava flows. The central part through which the Sacramento River flows, is composed largely of unconsolidated gravels, sands and clays. In the western part where most of the mineral deposits occur, sandstones, shales and the metamorphic rocks and serpentines of the Coast Range are found.

The county has never been a large producer of mineral products, the most important one, prior to the period of the war having been mineral water. During the war chrome mining was active, but for the past year there has been no production.

The possibility of finding commercial quantities of petroleum in this section has attracted more attention than the development, under present conditions, of known occurrences of other minerals, and for this reason field work in Tehama County during 1920 was devoted to the investigation of formations and structural features of economic importance to oil operators. The results of this work will be found in Bulletin No. 89.

The Fifteenth Report of the State Mineralogist (1915-1916) contains a general description of the mines and mineral resources of the county. Under later date Bulletin No. 76 covers the manganese and chromite deposits exclusively and Preliminary Report No. 7, the clay industry.

The mineral resources of the county include brick-clay, chromite, copper, gold, manganese, marble, mineral water, salt, silver and miscellaneous stone. Borax was first discovered in California in the waters of Tuscan Springs, Tehama County, in 1856.

The total value of Tehama's mineral products for the year 1914 was $300. In the table following the values for 1917, 1918 and 1919 are given for comparative purposes.

Commercial production for 1917 was as follows:

Substance	Amount	Value
Chromite	2053 tons	$41,646
Stone, miscellaneous		2,373
Total value		$44,019

Commercial production for 1918 was as follows:

Substance	Amount	Value
Chromite	3261 tons	$152,291
Stone, miscellaneous		2,500
Other minerals		2,800
Total value		$157,591

Commercial production for 1919 was as follows:

Stone, miscellaneous	$7,500
Other minerals	1,500
Total value	$9,000

TRINITY COUNTY.

The principal mineral product of Trinity County is native gold. The four dredges within its borders have continued to operate despite the adverse conditions under which all gold producers are laboring. The county is well watered and most of the small placer mines are so situated that they have felt the effects of the past dry season to a less degree than the mines in the other counties of this district.

There was little loss of time due to power restrictive measures as the power companies serving most of the operators in Trinity County were able to supply all demands for power throughout the year. The occasional finding of rich pockets in the Weaverville district, which is famous as a pocket country, has helped to sustain production and it is probable that Trinity County will show a smaller proportional decrease in the value of its 1920 mineral production than any other county of the northern California division. It was one of the few counties that showed an increase in gold production in 1917 when, as a rule, a marked falling off in gold output was reported throughout the state.

Its mineral resources include asbestos, barytes, chromite, copper, gold, mineral water, platinum, quicksilver, silver and miscellaneous stone. Trinity County is without railroads and increased transportation facilities are needed to further develop its varied resources.

The following table gives its commercial production for the years 1917, 1918 and 1919.

Commercial output for 1917 was:

Substance	Amount	Value
Chromite	242 tons	$6,325
Gold		602,048
Platinum	50 oz.	3,283
Silver		10,021
Stone, miscellaneous		7,718
Other minerals*		358,447
Total value		$987,842

*Includes copper, manganese, mineral water, quicksilver.

Commercial output for 1918 was:

Substance	Amount	Value
Chromite	1814 tons	$75,660
Gold		444,729
Platinum	41 oz.	3,136
Silver		6,912
Stone, miscellaneous		1,513
Other minerals*		175,574
Total value		$707,524

*Includes copper, mineral water, and quicksilver.

Commercial output for 1919 was:

Substance	Value
Gold	$500,000
Silver	[1]7,500
Stone, miscellaneous	11,839
Other minerals*	17,444
Total value	$536,783

[1]Estimated.
*Includes copper, mineral water, platinum, and quicksilver.

A general report on the mines and mineral resources of the county is contained in the Fourteenth Report of the State Mineralogist. Special reports of later date include Bulletin No. 76 (1918), which describes the manganese and chrome deposits; Bulletin No. 85, "Platinum and Allied Metals in California" (1918), which contains a detailed description of the platinum deposits in the county, and Bulletin No. 78 (1918), covering the occurrences of quicksilver.

Field work during the season of 1920 was mainly devoted to investigation of the petroleum possibilities of the northern counties. With the exception of the dredges which were visited, the following notes on the mining developments of the past year have been obtained principally through correspondence. They are offered as a supplement to former publications, giving changes of ownership and data on properties not formerly of record.

GOLD MINES—LODE.

Blue Jay (formerly **Knabe**). Owner J. F. Gifford, Lewiston, California. Property consists of three claims, the Blue Jay, Confidence and Mountain Echo, a total area of sixty acres, located in the Eastern mining district. Elevation 3500 feet. Country rock porphyry and slate. Ore is free milling with some sulphides.

Bonanza King Mine (formerly **Trinity Bonanza King**). Owners, Foster Gold Mining Company, C. G. Foster, president; E. W. Harmon, secretary; home office, 112 Steuart street, San Francisco, California; David E. Cavagnero, superintendent, post office, Carrville, California. The mine is in section 14, T. 37 N., R. 7 W., in the Trinity Center mining district. Delta, the nearest railroad point, is 33 miles east. There is an old wagon road about nine miles long with heavy grades, from Trinity Center but supplies are packed five miles over a trail from Carrville. The mine has an elevation of 6500 feet. There is sufficient pine on the property for mine timbers. The country is rugged and the property being near the top of a ridge 7200 feet high, considerable trouble is experienced in winter, due to heavy snowslides.

The mine was originally located in 1886 and was formerly worked by Treadwell and associates. It was recently reopened and a new mill was constructed in 1915. The property embraces 28 claims mostly unpatented, also section 36 on Clear Creek, 640 acres known as Bugle Hill placer. The latter is undeveloped and not being worked. The total holding is about 2500 acres.

Country rock is gabbro and schist. The deposit consists of a quartz vein in chloritic schist. A serpentine dike 50 feet wide cuts across the schist, striking N. 20° W. The strike of the vein is with the schist N. 60° W. The serpentine dike, or intrusion, is evidently responsible for the pay-shoots as the shoot appears to follow the serpentine contact and extends for about 400 feet to either side of the intersection with the schist. The quartz is hard and white and the gold free milling. It is often coarse enough to be detected with the naked eye. The best values are found in talcose quartz along the contact. There is a gouge along both walls from six inches to one foot thick.

The main tunnel, No. 4, is the working adit. It is driven north 1472 feet to cut the vein. There is a 960 foot drift northwest on the

vein at this level. The serpentine dike cuts the schist 700 feet from the portal of No. 4.

No. 2 tunnel is 110 feet on the dip of the vein (about 70°), above No. 4. No. 1 raise from the main tunnel is 350 feet northwest of the intersection of crosscut and drift and No. 2 raise is 400 feet northwest of No. 1 raise.

At 110 feet on level of No. 2 tunnel drifts are being run from both raises, on ore, to connect them. A drift being run northwest 250 feet above No. 2 tunnel, shows ten feet of quartz in the face. Assays here are reported to run up to $500 per ton. An intermediate drift was run from the raise on a vein varying from four feet to six feet in width.

Air drills are used in mining. The company owns a power line six miles long, water power from East Fork of Trinity River being used for generating electricity. There is an air compressor for five drills, blacksmith and machine shop, and electric tram in the main adit, which hauls a train of one-ton cars.

The reduction equipment consists of Blake jaw crusher, twenty 1000-pound stamps, dropping 105 times per minute, and four amalgamation plates. Tailings are run to waste. The old 40-stamp mill has been dismantled and the tramway to it is out of commission, but still in place. The new mill is at the portal of the main adit. Shortage of water has caused partial or complete suspension of operations in the summer for the past two years. In October, 1920, operations were again commenced after a three months shutdown. Labor has also been difficult to obtain.

Globe Mine. The Globe Mines at Dedrick have been operated on a small scale during the greater part of the year, by Buckley Wells, Hobart Building, San Francisco. The mill and cyanide plant were in operation for three months prior to December 1, when it was closed down. It is reported that the Globe and adjoining Chloride-Baily mine have been sold to J. N. Kilner, of New York, and Chas. Farmer, of Hayfork. The mill and cyanide plant were retained by Wells and will be torn down and transferred to one of his properties in Nevada.

Golden Jubilee Mine. Owners, McCormick-Saeltzer Company, Redding, California. This property has been idle for the past four years.

Jennings Gulch Mine. W. C. Dohrman, president of company. Idle past two years.

Little Buster Mine (formerly **West Point**). Owner, Frank Gallagher, West Point; post office, Lewiston, California. Property is in the Deadwood mining district. Redding, the nearest railroad point, is twenty miles easterly by good road. There is plenty of good timber and water is obtained from Little South Fork of Deadwood Creek. Country rock, porphyry and black slate. The deposit consists of a 5-foot vein proven on the surface for 1500 feet. The greatest depth opened on the vein is fifty feet. It has been drifted on for 200 feet.

May Blossom Mine. Owners, Joseph and George Kapusta, Lewiston, California. Property consists of forty acres, located in the Minersville district, in section 16, T. 34 N., R. 8 W. Elevation 2500 feet. The claims are timbered with pine and fir, but the water supply is

small. The deposit consists of a small vein averaging six inches in width carrying free gold. It strikes northwest-southeast and dips 80° and has been proven on the surface for 100 feet. A tunnel cuts the vein at a depth of 55 feet at which point there is a ten foot drift.

New Blue Jay Mining Company (formerly **Blue Jay Mine**). Owners, J. B. Batz and Company, Bakersfield, California: J. B. Batz, president; Jud Jordan, secretary. The mine is located in the Coffee Creek district, in section 13, T. 37 N., R. 8 W., about 2 miles from Carrville. It is thirty miles easterly over toll road to Delta, the nearest railroad point. The property lies at an elevation of 3000 feet and is well timbered with pine, fir, cedar, oak and ash. Water is obtained from Morrison Gulch and by ditches from Little Boulder Creek, both tributaries of Coffee Creek.

Slate and porphyry occur on the east side of the section and serpentine on the west. The dike rock, carrying the gold, is a fine grained gray porphyry classed as a vogesite porphyry. Manganese and copper occur wherever the gold is found. Ore is free milling. The vein is narrow and irregular, varying from one-half inch to one foot in width and probably averaging about six inches. It strikes a little east of north and dips about 20° east. Proven on the surface for 100 feet.

There are three levels, the lower level or working tunnel is 990 feet in length and the upper tunnels are about 130 feet each. There are two crosscuts of 50 feet each, one 30 foot winze and raises from each level through to the surface. The ore has been practically all stoped from the working level to the surface for the entire length of the shoot or 50 feet in length by 130 feet in height, and there is no ore in sight in the present workings.

The mine is equipped with a Graupner mill, manufactured by the Joshua Hendy Company of San Francisco.

The Blue Jay mine was discovered by Graves Brothers of Carrville, who found a rich vein leading to a pocket containing about $60,000. The find was the cause of the rush to Coffee Creek in 1897. Several other pockets have been extracted by the present owners and later by lessees of the property but it has been practically idle for the past four years.

Phillips Group Quartz Claims (formerly **Phillips and Hensley Group**). Owner, J. W. Phillips, Lewiston, California. Property consists of three claims, the Florence, Laurel and McWilliam, located in the Indian Creek district, in Sec. 14, T. 32 N., R. 9 W. Redding, the nearest railroad point, is 45 miles easterly, over two miles of trail and forty-three miles of good road. The area of the claims is sixty acres and there is an abundance of fir, pine and oak. Spring Gulch furnishes sufficient water for milling purposes. This mine was discovered about 1886. It was closed down in 1894 due to litigation, but was reopened in 1916. Country rock is mica schist, cut in places by limestone dikes. The claims cover the lode for 4500 feet. Two veins, the Florence and Laurel, have been developed. The filling is quartz, containing both free and base ore.

The maximum width of the principal vein is three feet with an average of about eighteen inches. It strikes northwest-southeast, with

vertical dip, and has been proven on the surface for 500 feet. The pay-shoot is 200 feet in length by eighteen inches wide. The ore has been opened up on three levels. No. 1 tunnel is in 150 feet, No. 2 tunnel, 290 feet, and No. 3 tunnel 200 feet. The greatest depth attained below the outcrop is 300 feet. The owner estimates there is 1600 tons of ore, valued at $45 per ton, blocked out.

San Miguel, Snowshoe and Montezuma. Owner, Paul Potillo, Weaverville, California. Prospect discovered in 1898 and reached by trail only. Located in the West Weaver Mountains. Bally district. Deposit consists of a quartz vein four inches to eighteen inches in width, in granite. Development work consists of a 200 foot tunnel.

Sherwood Group Quartz Mine. Owners, James W. and John H. Bartlett, Denny, California. Property consists of four claims, having a total area of eighty acres, situated in the New River mining district. Helena is the nearest town. Eureka, the nearest railroad point is 100 miles westerly. A wagon road extends from Eureka to Burnt Ranch and a trail from the latter point to the mine. The claims have an elevation of 4500 feet and are partly timbered and partly open. Water is obtained from Battle Creek.

There is one well defined quartz vein of fairly uniform width averaging about nine inches. It strikes northwest-southeast and dips at an angle of about 23°. It has been proven on the surface for 700 feet. Practically but one tunnel level has been worked, from which two winzes have been put down, 90 feet and 50 feet respectively.

The greatest length driven on the vein is 500 feet and the greatest depth reached is 150 feet. The pay-shoot was about 200 feet long. All ore was milled at the mine. Power was furnished by a Pelton wheel run by water from Battle Creek. The mine is said to have produced $100,000 to date. Idle for past three years.

Smith-Cromwell Mine. Property was sold to S. H. Parkhurst, the present owner. Idle.

Sunny Slope Mine. Owner, Sunny Slope Mines Company, O. K. Paup, president, F. A. Washberg, secretary, French Gulch. Property consists of five unpatented claims in the Minersville district on unsurveyed land in township 34 N., R. 8 W. The mine is 35 miles northwest of Redding, the nearest railroad point, and six miles north of French Gulch, on the Deadwood road. The grades to the mine are heavy and the road narrow. The claims have an elevation of 4300 feet, and are in the Shasta National Forest and covered with pine and fir. A spring supplies enough water for camp purposes. Country rock is meta-andesite and slate, the deposit being a fault vein lying along the contact. The andesite outcrops prominently and forms the hanging wall of the vein. The latter is a well defined quartz vein highly oxidized on the surface and from three feet to six feet wide, where exposed. No sulphides are visible and the ore is said to be free milling. The foot wall is black slate. The vein strikes N. 70° W. and dips 35° toward the north. It has been exposed on the surface for 300 feet by open cuts, 100 feet being run along the vein. A shaft was sunk from the open cut. A crosscut 56 feet vertically below the outcrop

and 100 feet south of it, now in 200 feet in the slate formation, is being run to cut the vein at depth. Work is done with hand tools, wheelbarrow and shovel. One man employed.

GOLD MINES—PLACER AND HYDRAULIC.

Battle Peak Mine. Owner N. L. Hildrick, Copper, California. Property is located in the Copper Creek district. It is 40 miles from Delta, the nearest railroad point, 36 by good road and 4 miles by fair trail. Battle Creek furnishes the water supply which is good in early spring. Claims have an elevation of 7000 feet. The mine was reopened in 1917.

Champion Placer Mine. Owners, C. Bradbury and John Hagelmann, Junction City, California. Property is situated in the Weaverville mining district, East Weaver Creek furnishing the water supply. Equipped with pipe and giant. Idle.

Democrat Gulch Mine. Owners Armentrout Brothers, Weaverville, California. Property consists of the Effie Bull, Lucky Strike, Just in Time, Hitchens and McKinzey and Hoag placer mine claims, a total area of 640 acres. It has been worked since 1900 by hydraulicking. Water is used under 175 foot pressure, but the supply is limited and the length of run is dependent on the winter rains and snowfall.

Gold Ridge No. 1. Owner, unknown. The surface of this property in the Minersville district in township 25 N., R. 8 W., was piped off in 1912. Prospecting only since that time. Nearest town is Lewiston.

Linda Marie Placer Mine. Owner, C. H. Mathews, Forest Glen, California. Property consists of 100 acres patented in 1915, and situated in sections 32, 33, T. 1 S., R. 8 E., in the South Fork mining district. Eureka and Red Bluff, railroad points, are 86 miles distant, west and east respectively.

The property has an elevation of 2770 feet, the deposit consisting of bench gravel about 50 feet above the present level of Marie Creek, a tributary of South Fork Trinity River. Country rock is schist and slate.

McDonald Placer Mine. This property has been acquired by the Estabrook Gold Dredging Company, Trinity Center, California.

Stevens Gulch Placer Mine. Owner, George Zinn, Coffee, California. Property is in the Coffee Creek district on unsurveyed land in township 38 N., R. 9 W. The nearest town is Carrville. It is in the Shasta National Forest and lies at an elevation of close to 3000 feet. Local water supply.

Tom Bell Placer Mine. Owner, W. W. Young, Weaverville, California. Property is in the Weaverville district in sections 5, 6, T. 33 N., R. 9 W. The claims were patented in 1874. It was last worked in 1863 at which time water was rented from the Howe ditch. Deposit consists of clay and gravel.

VOLCANIC ASH.

Liberty Bell Mine. Owners, Frank Sarcletti, Joe Merciari, Louis Sarcletti and Joe Dallatorre, French Gulch, California; home office, Redding. Property is located in section 13, T. 34 N., R. 8 W., in the Minersville district and is 35 miles northwest of Redding, the nearest railroad point. The claims have an elevation of 4000 feet. There is ample pine and fir for mining and spring water in Little Papoose Creek below the mine. There are five claims located on a steep hillside about 500 feet below the summit of the ridge. The deposit consists of a bed of volcanic ash (andesitic), lying between a slate footwall and andesite hanging wall. The strike is west with a flat dip to the south. A tunnel driven 100 feet in the slate-andesite contact cuts the volcanic ash at about forty feet and it is exposed in the tunnel for sixty feet, gradually widening out to four feet at the face. The owners are building a three mile trail to connect with the auto road. No shipments have been made as yet. There is a quartz outcrop on the ridge 150 feet above the tunnel from which a sample is reported to have assayed $15 in gold per ton. It is expected to cut this vein by driving the tunnel ahead.

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JANUARY, 1922

REPORT XVIII OF THE STATE MINERALOGIST

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INTRODUCTION.

Many years ago the fact was recognized that it would be a good investment for the government to spend time and money as a means of aiding in the development of the nation's natural resources.

Work of this character is done both by federal and state agencies.

The California State Mining Bureau is charged with the duty of giving all possible assistance to those who are engaged in any and all branches of mining in this State.

This assistance is manifested in various ways, advantage of which is not taken by the general public to the extent that might be.

It is also a fact that some of the Bureau's work may have fallen short of its full purpose because it has sometimes been impossible to make the results available to the mining public in usable form or in a timely manner.

With reference to this latter situation, it is a common criticism of many government bureaus that the results of their investigations are so long in preparation that when they appear in print they often represent 'ancient history' and have lost much of their usefulness.

There are valid explanations of this situation, but even so, the fact is acknowledged, and the matter of correcting it has received a great deal of thought by the State Mineralogist and the members of the State Mining Bureau.

In 1919 a progressive change was made by the State Mining Bureau when the State Oil and Gas Supervisor's annual report to the State Mineralogist was issued in monthly chapters. This practice has been followed long enough to prove that the idea behind it was sound.

The Bureau, therefore, is taking an additional step in what is believed to be the right direction by starting with this issue (January, 1922) the monthly chapters of the Annual Report of the State Mineralogist.

The result will be that instead of beginning to correlate material for an annual report after the close of a year, and getting it out in the course of several months, all possible data resulting from any of the Bureau's endeavors will be assembled every thirty days and will be placed in the hands of interested parties in a few *days*. Facts and statements relating to the mining and allied industries will be as of two or three weeks ago instead of 'as of last year or the year before.'

Furthermore, while this new departure is primarily for the purpose of correcting a fault that was inherent in the prescribed system of carrying on work such as that in which the Bureau is engaged, it is hoped that it will also succeed in reaching people who have not been reached in the past, and that the number of persons taking advantage of the service the Bureau offers will be increased and will continue to grow as time goes on.

Henceforth the results of the work of the mining department will be made available to the public in the following ways:

1. Through the medium of this monthly publication attempt will be made to record current field work of the technical staff, current figures relative to mineral production in California, and 'progress reports' of all Bureau activities which have formerly been summed up and compiled at the end of an annual or biennial period.

2. The second type of work mentioned will comprise a continuation of investigations of special subjects, followed by special reports, as has been done in the past, and which necessarily must mean a rounded out field campaign followed by a detailed technical report, whether it take three months or two years to complete. This character of work is represented by such Bureau bulletins as those on 'Methods of Mine Timbering'; 'California Gold Mill Practice'; 'Mine Drainage'; 'Quicksilver Mining and Metallurgy'; 'Petroleum Resources of California,' and many others.

Work done under No. 1 will be largely along economic rather than technical lines, and will give, as far as practicable, an accounting of all mining activities.

The State Mining Bureau is maintained primarily to assist in the development of our mineral resources. The people of California spend part of their money through the Mining Bureau because they believe it will result in added prosperity to the State. The law under which the Bureau functions does not provide for a research department unless research is deemed necessary to bring out facts of purely economic importance.

It is therefore construed to be as much of a duty of this office to assist a man in finding a market for his product, or a manufacturing concern in locating supplies of raw materials, as it is to offer information or advice, when called upon, as to all phases of the mineral industry.

Returns to the State for the money spent in maintaining the Mining Bureau is received many times over as a result of placing simple facts in the hands of parties who require that particular information.

Many inquirers call on the Bureau for data and consequent results of their efforts are not recorded. Others, however, have kept in touch with the Bureau, and many instances are known where this office served as a starting point in the building up of a business or an industry which subsequently gave employment to large numbers, added to the wealth of the State, and assumed its share of the tax burden that must be borne by all, thereby lessening that burden both by the production of *new* taxable wealth, and by increasing the numbers who bear the total load.

The monthly chapters will be subject to revision, correction and improvement. They will be made up of data furnished by all the technical staff. Suggestions from the mining public will be gladly received and are invited. The motto of the State Mining Bureau is 'Service,' and the object of all its endeavors is to increase the quality and quantity of service offered in order that such service may bring about an increase in actual development of the wonderful latent mineral resources in the State of California.

It is the desire of the State Mining Bureau to have the monthly chapter reach the hands of all interested parties, and those who wish to receive it regularly will have their names placed on the mailing list upon request.

FLETCHER HAMILTON,
State Mineralogist.

DISTRICT REPORTS OF MINING ENGINEERS.

The Seventeenth Report of the State Mineralogist, 1920, was the first to be issued following the organization of the Mining Department into four main geographical divisions, with the field work delegated to a district engineer in each division, working out from a local branch office.

Although handicapped by changes in the personnel of the staff and other unfavorable conditions incident to the establishment of branch offices, the new measures adopted brought the Bureau into closer touch with the industry, and enabled it to present facts and conditions as of sometime during 1920, in the Seventeenth Report, and to have the volume ready for distribution a comparatively short time after the close of the year.

As a further step toward keeping the public advised of current activities affecting the industry, a monthly report prepared by the district engineer of each division will form a regular feature of the contents of the monthly chapter of the State Mineralogist's Report for 1922, thus making each issue an up-to-date compendium of California's mining progress.

The counties included within each field division and the location of the respective local offices are shown on the accompanying outline map of the State. (Frontispiece.)

Although the petroleum industry is clearly distinguished from other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the State's 'oil fields' will be included under the same heading as the district engineers' reports.

REDDING FIELD DIVISION.

Preliminary Report No. 8, entitled 'Mining in California During 1921,' contains a review of the mining activities in the Redding district, as noted by the district engineer while in the field, up to December 15, and is the latest report available.

Unfortunately plans of the present monthly chapter necessitated a change in the allocation of some members of the staff, and Mr. C. McK. Laizure, former district engineer at Redding, was transferred to the San Francisco office on December 15. It was presumed at the time that a successor would be assigned to the Redding field within two weeks, but it was later found impossible to consummate the change before February 1, 1922.

As a consequence, the Redding office was without an engineer during the period covered by the present monthly report, although the office was kept open for the convenience of the public, and mail and routine matters were taken care of by the stenographer, Miss Ione Russell.

The following notes regarding operations during the past thirty days in the Northern field have come to the attention of the Bureau from various sources, and are here given, although lacking confirmation by a Bureau representative for the reason stated.

John Lorenz of Weaverville, one of the owners of the Lorenz Hydraulic mine, is reported to have leased the Nash mine near the head of Coffee Creek in Secs. 6, 7, 8, 28, 29, 30, 31, T. 37, 38 N., R. 9 W., about fifteen miles west of Carrville. The Nash was formerly operated as a hydraulic mine by the Trinity Hydraulic Gold Mining Company, Ltd., an English company. It is described in detail in the Tenth, Thirteenth and Fourteenth Reports. The Nash was a good producer, but the ground is so nearly level that it was difficult to work by hydraulicking. Lorenz expects to work the gravel with a dredge.

The Shasta Dredging Company, operating a dredge on Cottonwood Creek near Gas Point, has bonded one thousand acres of auriferous gravels including the claims of J. E. McLean in the Minersville district, and will prospect them by drilling.

The Valdor Dredging Company, at present operating below Junction City, has also been prospecting ground in this vicinity.

The American Gold Dredging Company, whose dredge on the Sacramento River opposite Redding has been shut down for a year, will resume operations in January. Three shifts will be put on.

Machinery for constructing a ditch to replace nine miles of flume at Farnsworth Bros. mine on the South Fork of Salmon River is being taken in via the Black Bear road.

Persistent rumors are in circulation that a coal, iron and steel corporation with a capital of $25,000,000 is being organized by Utah and California capitalists and that they purpose to acquire the property and plant of Noble Electric Steel Company at Heroult, Shasta County.

Completion of the wire rope tramway from the Hornet mine of the Mountain Copper Company to Mathewson on the Southern Pacific Railway has been delayed for two weeks on account of bad weather and is it not expected to have it ready before February 1. Shipments of pyritic ore have been increased again to approximately five hundred tons per day. A large warehouse is being constructed at the lower end of the tram. Men employed 125 to 150.

According to press reports, Manager Egleston of the Mammoth plant of the U. S. Smelting, Refining and Mining Company is quoted in regard to the copper situation as saying "The price of copper has picked up a good deal lately but the advance is not enough to warrant resumption of mining and smelting at Kennett. It is possible that something may be done during the year, but as yet there is no sign. The situation is still unsettled, though hopeful."

AUBURN FIELD DIVISION.

C. A. Logan, Mining Engineer.

Winter storms that set in late in December put an end to prospecting and new outside work in the mountains. At the same time there has been a good fall of snow which will assure a water supply for placer mining and power purposes for the coming season.

M. J. Calnan is planning considerable work on the Calnan Group of copper claims near Genessee in Plumas County. It is reported that an air compressor and machine drills will be installed and a crosscut will be run from the adit on the Keystone claim to prospect large quartz veins on the other claims.

A. L. Wartman is reported to have produced considerable platinum this fall from placer claims near Pilot Peak in the Onion Valley district in Plumas County.

Possible activity at the Banner claims east of Nevada City is indicated by the transfer of the claims to the Banner Consolidated Mines Company. The same company is supposed to be interested in the Norambagua mine south of Grass Valley.

The Glenn drift mine in eastern Placer County is showing a wider and richer body of gravel as work continues in the lower adit. Clean-ups at a rate equal to $1,000 to $1,200 a week have been reported lately from this adit from gravel taken out in driving upstream and there is said to be considerable good gravel left for future extraction on both sides of the drift. The stock in the owning company has recently paid a small dividend.

The Rising Sun mine near Colfax has been shut down for the time being.

Dan Russell and partners of Colfax have lately been putting up a small mill on a claim between the Forest Hill road and Colfax, just west of the North Fork of American River.

Haines Gridley, superintendent and secretary of the Oro Fina Mining Company, and for seven years past the moving spirit in the operation of that mine, died early in January at his home in Auburn. Mr. Gridley made the Oro Fina mine a paying property by his careful and conscientious work, and during his superintendency it has been the only producer in the Ophir district, and practically the only producing quartz mine in Placer County. Development and prospecting has been kept up for several months past because of Gridley's faith in the property, but the future policy of the company is not yet known.

Columbus mine. According to advice received January 15 from West Point, Calaveras County, the Columbus mine near there is producing sensationally rich ore from a shoot encountered in November last. A crew of eight men and a small Gibson mill are busy.

The Hagerman mine, similar geologically to the Columbus, but lying across the river from it in Amador County, is also said to have a shoot of rich ore three feet wide.

Old Elephant gravel mine. Hydraulic mining began the first of January at the old Elephant Gravel mine near Volcano in Amador County, but was halted in a few days by cold weather which froze up the water supply.

Improvements of existing dirt roads which at present extend from Auburn to Sonora via Placerville, Sutter Creek, Jackson and other towns on the Mother Lode, was contemplated in a bill passed by the last legislature. The resulting road is to be called the Mother Lode Highway. Work began late in 1921 on this road between Auburn and Cool. Early in January a meeting of delegates from the various counties concerned was held in Jackson to further the work. This highway will be of great benefit to all mines along its course. The route is open all winter at present for automobiles, but much can be done to improve its condition and to reduce costs of hauling over it. It will connect at Auburn, Placerville, Jackson and Sonora with state highways and railroads.

A bill of interest to miners was introduced in the Senate this month by Senator King of Utah. It authorizes the Secretary of the Interior to permit prospecting, development and use of any mineral resources found within the boundaries of national parks. If passed, the Secretary of the Interior would have power to establish regulations under which such work might be done.

A State Supreme Court decision that is of some importance to mining interests was recently made in regard to the powers of the late Water Commission, now a part of the Department of Public Works. This decision holds that the above body must approve applications made for appropriating unalienated water supplies, if the applications are in proper form. This seems to settle the question as to what powers the Water Commission had in regard to applications for water from streams where applications were for amounts in excess of all free water in the streams.

SAN FRANCISCO FIELD DIVISION.

C. McK. Laizure, Mining Engineer.

There is little to add at this time to the facts contained in the review of mining in the San Francisco district which was published in Preliminary Report No. 8, and which outlined conditions relative to the mineral industry covering the calendar year 1921. Weather conditions have not been favorable for visiting properties in the hills, and pressure of other duties has kept the writer at his desk since the completion of the annual review mentioned.

A point of rather widespread interest, which has been focused in the San Francisco office, is the matter of reopening of hearings by the Department of the Interior as regards claimants for reimbursement under the amended War Minerals Relief Act. Much of the local engineer's time during recent weeks has been taken up in attempting to assist miners of chrome and manganese in obtaining proper advice relative to procedure required by the federal government. On another page will be found a statement in which are correlated all the facts in the case known to the Bureau.

This has been given out by the State Mineralogist in answer to direct inquiries and is printed here in the hope that, even at the last moment, it may benefit some who have not been able to run to earth any definite facts concerning the publications of official statements urging the production of the 'war minerals.'

During the past thirty days reports from various sources have been received of developments in the mineral industry in various counties of the San Francisco field division. It is planned to review here only such activities as have been personally investigated by the Bureau representative, but in the present instance,where it was not possible to do any field work, the following notes are given until such time as they can be checked up and described authoritatively and in detail.

California Pottery Company is said to have started operations in first unit of their new plant at Merced. Building tile is reported to be the principal product.

Sierra Magnesite Company is reported to be constructing a calcining plant at Porterville which will handle the crude magnesite from the

company's mines near the town of Success. In the future it is said that all crushing and calcining operations will be carried on at the new plant instead of at the mine, as was formerly done.

Louise K. Knapp and Fanny H. Beck recently located two placer claims on the beach near the mouth of Tunitas Creek, San Mateo County. Black sands containing small amounts of gold and sometimes a trace of platinum have been noted in the past at various points along the beach from San Francisco to the shores of Santa Cruz County.

Messrs. Van Hook and McMillan are reported to have leased a limestone deposit at Jenkins Hill in the Merced River Canyon above Bagby. It is understood that they plan to establish a distributing plant at Merced and sell crushed limestone for fertilizing purposes.

Sulphur Bank quicksilver mine, near Lower Lake, Lake County, is reported sold to Messrs. Mocine and Martin. This famous property was a large producer in the past.

The Patriquin quicksilver mine, north of Parkfield, Monterey County, is reported sold to Albert Mayhall of San Luis Obispo.

Tin ore is said to have been discovered on the F. B. Bailey ranch above Springville, Tulare County, The authenticity of the report is seriously questioned, but inasmuch as tin has been one of the few metals of which the United States has lacked domestic supplies, it will be interesting to look into this matter carefully at the earliest opportunity.

George Janoko, box 253, R. F. D. 1, Porterville, California, reports the discovery of a coal prospect in Southern Tulare County. He expects to do some development work in the near future.

H. V. Underwood, Sunny Slope road, Hollister, has discovered lignite outcroppings near that town in San Benito County.

LOS ANGELES FIELD DIVISION.

M. A. Newman, Mining Engineer.

The Kelly, Coyote, and other properties at Randsburg continue to draw investors to that region. It is now reported that the Elkins and Flynn Syndicate will sink a shaft 1200 feet deep to open up their holdings, which comprise the Silver Reef and other claims. Canadian capital has interested itself in this property.

It seems impossible for a new camp not to be cursed with mining litigation and the rumored lawsuit between the Kelly and Coyote properties is almost a certainty. Both sides have engaged legal talent and the usual array of mining engineers and geologists have been retained by both factions.

A plant which is being watched with much interest is that of the Refiners Clay Company, at Vernon, Los Angeles. This was designed by a local firm of engineers for the refining of bentonite. It is claimed that bentonite is likely to replace fullers earth as a filtering medium.

It is reported that the mines owned by the Green Campbell Estate after being closed down over 20 years are to be unwatered and opened up by modern methods. These are located in the old Vanderbilt district in San Bernardino County, near the Nevada line.

Mining for oil, instead of drilling, sounds rather startling; yet that is exactly what is to be done four miles south of San Luis Obispo on the R. M. Smith tract. A company organized in the east and under the direction of J. D. Fields is to mine by steam shovel methods the oil sands on this tract. These sands contain oil and asphalt and their extraction is to be accomplished by using K. and K. flotation machines. The success of this venture will be closely watched by oil operators.

OIL AND GAS DEVELOPMENT.

R. E. Collom, State Oil and Gas Supervisor.

In the resume of development and production conditions in the oil business during the year 1921, which appeared in Preliminary Report No. 8, 'Review of Mining in California During 1921,' some estimates were made as to California's production record for the year 1921.

According to data now made available by the statistical department of Standard Oil Company, California produced 114,849,924 barrels of crude oil during 1921. This exceeded the production of 1920 by 9,128,000 barrels.

Oilfield operations reported to the State Oil and Gas Supervisor during the year 1921 show 1287 notices to drill new wells as compared with 893 notices received during 1920. The successful results of prospecting during 1920 were in a great measure responsible for the increased drilling activity of 1921. About one-fourth of the new wells reported were drilled at Huntington Beach, Elk Hills and Long Beach. In addition, about 175 wells were reported from shallow drilling at Devils Den in King and Kern counties and Conejo in Fresno County.

The production of these latter wells has no material bearing however on the State's production as a whole.

It is a reflection however of the general sympathetic reaction and response to the increased demands of petroleum in 1920.

As is generally the case, more drilling has been done and more production obtained than was actually necessary to establish an exact balance between supply and demand. The year 1922 opened therefore with an overproduction of crude and a tendency to curtail drilling and producing operations in San Joaquin Valley fields and to concentrate upon the more desirable production of new areas such as the Santa Fe Springs oil field.

One of the most noticeable features of oilfield operations in 1921 is revealed by the records of redrilling work. In 1921 671 notices were filed to redrill or deepen, as compared to 878 notices for 1920. This indicates that operators were giving more attention to the development of new fields in 1921 and less to the repair and upkeep of the older wells. In times of flush production and successful wild-catting the tendency is to neglect the older producing wells.

SPECIAL ARTICLES.

As heretofore, detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins.

Shorter and less elaborate technical papers and articles by members of the staff, possibly augmented by contributions from sources outside the Bureau, not of sufficient length to be issued separately, but containing much information that will add to the permanent value of the monthly chapter, will be included in each number.

It is anticipated that these special articles will cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations; as well as articles intended to supply practical and timely information on the problems of the prospector and miner.

Press bulletins and mimeographed letters giving the text of new laws and other official regulations and notices, affecting the mineral industry, have formerly been used to disseminate information of the latter character.

PLACER GOLD RESOURCES.

By Chas. S. Haley.

Investors outside the State of California, no less than residents of the State, have little conception of the possibilities still dormant in the tremendous bodies of tertiary and quaternary gravels which are as yet unworked in its borders. Conservative estimates of the amount of gold which can still be obtained vary from one to three billions of dollars. In view of the fact that the State's total production of gold since 1848, from both quartz and placer mining operations, is about one and one-half billions, these figures are very significant as indicative of the potentialities of the situation.

The Sawyer decision, in 1884, wiped out at one blow the value of upwards of $100,000,000 in investments in hydraulic mining operations in this State. The Caminetti Act, designed originally to relieve the situation, has failed to do so.

An investigation is now being undertaken by the Bureau with the object of determining the available placer resources of California and of indicating the best and most feasible means of working them. A plan is being worked out which will be not only of benefit to the mining industry, but, so far from being detrimental to the agricultural interests of the community, will be of positive and definite benefit to them.

In order to take advantage to the fullest extent of the present revival of interest in gold mining, it is extremely desirable that this report shall be available by the spring of 1923.

Owing to the limited funds at the disposal of the Bureau for the work, it is possible to retain only one investigator in the field, who must cover the entire State by the end of 1922. For this reason, the utmost cooperation is desired from the citizens of the mining counties of the State, and from all who are interested, directly or indirectly, in the revival of the industry.

This bulletin is designed to be of assistance not only to the large investor and capitalist who wishes to know the most likely fields for careful investigation; but also to be of interest to the smaller investors and the prospectors who are seeking places for the man of limited means not only to make a living, but to secure a return on what capital he may have at his disposal. This in itself will be of great direct benefit to the quartz mining industry by increasing the number of prospectors.

Despite popular opinion to the contrary, there are still many localities in this State where the '49ers did not gather all the money. And for the larger investor, under a feasible scheme of adjustment to the needs of the agricultural industry, there are possibilities of reasonably safe and sound investment with a speculative chance of exceedingly high returns.

Already in covering the Feather River, Klamath River and Northern Sacramento River areas several large deposits of virgin gravel have been encountered of which little or no information has ever been published, and on which scarcely any prospecting has been done.

The report will be devoted more to the economic side of the gravels than to the geological one, although the work of more able geologists than the present investigator will be freely drawn upon wherever it has a direct bearing upon the profitable operation of the gravels.

It is hoped that the cooperation of the mining public will be given in order that the report may be published in time to be of the greatest assistance and use to the proper development of the resources of the commonwealth of the State of California.

NON-METALLIC MINERALS OF SOUTHERN CALIFORNIA.

By M. A. Newman.

INTRODUCTION.

This is the first article of a series dealing with the mineral resources of Southern California, giving particular attention to the non-metallic wealth of the vast desert region, which lies partly in the southern section of the State. Its aim is to simply touch on the salient controlling factors regarding the exploitation of the immense resources in these desert regions. The other articles will treat in detail such important members of this non-metallic group as borax, kaolin, diatomaceous earth, gypsum, graphite, marble, potash, soda, and others for which there is an increasing demand.

There is probably no equal area on the face of the globe which is as rich in natural resources as California. It possesses within its borders nearly every element necessary to our modern civilization and if the State were suddenly isolated from the rest of the universe, it could maintain itself from the resources within its borders and on a standard equal to our present enlightened period.

Brought to the attention of the world by Marshall's discovery of gold, its production of this precious metal from 1848 to the end of 1920 has amounted to the immense sum of $1,679,022,820. Its glorious gold epoch has now been eclipsed by another mineral, petroleum, which at present is on the ascendant, and will in a few years surpass our gold yield.

Petroleum may not be classed as a 'noble' mineral, yet production in California from 1875 to the end of 1920 yielded its producers $1,004,839,489. Of this immense sum 80 per cent has come from Southern California.

If Southern California possesses a vast undeveloped wealth in its non-metallic resources, what are the necessary conditions for their profitable exploitation? The answer to this, I believe, lies in transportation facilities and the marketing of the non-metallic products.

The population of California in general, and Southern California in particular, is growing by leaps and bounds. There is nothing visible on the horizon that suggests any decrease. In fact, everything indicates that the growth in the next ten years will surpass by several times the increase between 1910 and 1920.

The advent of the automobile has resulted in the building of a magnificent system of highways all over the State. These highways are tied by laterals which reach into the mountainous regions and traverse our deserts. As a result, deposits which were inaccessible a few years ago by railways can now be reached by auto trucks. The harbor which the South possesses at San Pedro will enable our non-metallic products, through cheap water transportation, not only to enter into competition for business in the densely populated regions of the eastern seaboard of the United States, but also for the markets of Mexico, South America and the Orient.

Due to the tremendous development of hydro-electric power a great surplus will soon become available and a cheap power rate will result.

There is also another source of power now going to waste to a great extent. I refer to natural gas which is not being utilized to its fullest extent. No more ideal fuel can be obtained for the ceramic industries than natural gas. Capital is beginning to grasp the possibilities, and with an increasing demand for the products of our non-metallics, it will find a field for its investment.

There is nothing that can now stop the gradual development of our non-metallic deposits, because

1. Modern transportation facilities have made them accessible.

2. The rapid growth of population has created sufficient local market for manufactured products of our non-metallics.

3. The establishment of direct steamship lines from Los Angeles Harbor to South America and the Orient, as well as our eastern seaboard, will allow the direct exportation of any surplus product manufactured.

NOTES ON THE WEST POINT DISTRICT, CALAVERAS COUNTY.

By C. A. Logan.

Foreword.

The following pages contain some of the writer's notes on properties visited. Previous published and unpublished reports of a fragmentary nature have also been drawn upon when considered to be reliable. Not all of the properties mentioned have been examined by the writer, as circumstances have not permitted nor has the relative importance of the district seemed to call for a full report. At the same time it is hoped these notes will serve to give an inquirer a better general idea of the district than can be had from a perusal of the different short reports previously printed.

Geography.

The mines of this district surround the town of West Point, which lies near the north boundary of the county at an elevation of 2800 feet, on a plateau between the North and Middle Forks of Mokelumne River. West Point is 19 miles by road from the terminus of the Amador Central Railroad at Martel, and 28 miles from the Southern Pacific at Valley Spring. The road from Martel to West Point is preferable, though quite steep where it enters and leaves the river canyon. The climate is fine with little snow in winter, and natural advantages for mining are good. The steep canyon sides of the river's three forks have made good tunnel sites available and there is a good supply of timber and water.

Geology.

Most of the mines of the district lie in the area of granodiorite which has a width of nearly five miles from north to south and extends west nearly five miles from the town in the form of a peninsula from the main mass of the Sierras. The granodiorite penetrated the older metamorphic rocks which were for the most part originally sedimentary, but have been folded and tilted and altered to black micaceous schists, hard slate and quartzite. These rocks generally strike a little west of north and dip steeply east. Little study has been made of them, but they are supposed to be of Carboniferous age. The eastern portion of the granodiorite is partly covered by andesite flows. The granodiorite shows local variations especially along its borders and has been variously termed quartz-mica diorite, hornblende granite, and diorite. Dikes of dark colored intrusives, usually diabase or similar rocks, occur in the schists at times parallel to the veins. Two systems of greenish diorite dikes are noticed in the granodiorite. The system striking north has been considered important in connection with ore occurrence in some of the mines. Jointing is common in the granodiorite probably as an effect of weathering, and distinct from the ore bearing fissures. Sometimes these joints are occupied by small quartz bodies, and are misleading to the miner, who in following a fissure may easily get off on the wrong track.

History of mining development.

West Point has been known as a pocket mining camp since the early fifties, and the art had reached a high stage of precision there fifty years ago. In those days, the local miners' regulations limited the length of a claim to 200 feet. The veins are numerous and easily traced. They have been worked in many cases to only about 150 feet in depth by shallow shafts and adits, though a few of the larger producers have been opened much deeper. Ore that paid less than $20 a ton in the early days was classed as low grade and scarcely worth bothering with, except in the rare case where the mine was equipped with a mill. Ore not rich enough to mortar was crushed in small custom mills and arrastras at a cost of from $5 to $7 a ton. Usually no attention was paid to the sulphides.

In 1867 there were eleven small mills, mostly doing custom work, running in the district. The custom mills drew their ores from the properties being worked by pocket miners, of whom there were about 100 working there at the time. The Skull Flat Company was running ten stamps and was mining ore said to have been worth $30 to $35 a ton. A roasting furnace was in operation at Morris' mill, treating ore worth $50 a ton. The Woodhouse mine, between the Middle and South forks of Mokelumne River and four miles from West Point, had a 15-stamp mill and up to the end of 1867 had produced 14,000 tons of ore that yielded $140,000 in free gold. The owners recognized that they were losing much of the gold in the sulphides and had contracted for a roasting furnace to handle concentrate. The Holmes mine, just south of the Woodhouse, was opened and equipped with a 10-stamp mill in 1866 and was producing. The sulphides were said to be worth $300 to $1,300 a ton. The 15-stamp mill at the Mosquito mine, five miles west of West Point, was idle at the time, pending the opening of the vein at depth through a new adit. Eighteen stamps at the Vance and Mina Rice were idle, and four small mills and several arrastras were working entirely on custom ores.

But the progress since then has not been such as might reasonably have been expected. A few mines were worked during the next 25 years, but none very extensively. The Lockwood mine, three miles southeast of West Point, was opened to a depth of 430 feet. Concentrate was saved and treated in a chlorination plant that did custom work for $20 a ton. The Blazing Star mine, a mile and a half east of West Point, was worked from 1877 to 1895 to a depth of 400 feet. The Lone Star and Reed and Hillary parallel veins in the canyon of the North Fork of the river, four miles west of the town, were worked in a small way from 1854 to 1890, and then on a larger scale than any other mine in the district up to 1905. The Champion mine paid well to a depth of 740 feet. In the past 16 years little has been heard from the district, but since 1919 there has been some improvement and there is promise of greater interest and activity next spring.

Character of the ore deposits.

The veins are of the fissure type and with a few exceptions noted later, are all found in the granodiorite. A notable feature is their persistence on the strike, especially when the narrowness of most of

them is considered. The Woodhouse vein, covered by the mine of the same name for a distance of 4500 feet, contained two ore shoots 150 and 400 feet long, respectively, in a distance of 3000 feet, then split up into branches carrying pay for 1000 feet farther. It is said to be traceable over two and a half miles. The Sawyer vein, ranging in width from eight inches to five feet, is said to be easily traceable for a mile. The Lone Star and Reed and Hillary and other long veins could be cited. There is a marked uniformity in the strike and dip of the veins. The strike is usually north to north 25 degrees west and the dip commonly west or southwest from 45 degrees to 80 degrees, being as a rule steep. Narrow dikes are common, but as far as can be learned from the history of past operations and from observation, these have had little effect in faulting the veins and usually none in influencing the location of pay shoots. Most of them are probably so small that they could not in any case have exerted any important chemical or physical effect on the firm rock into which they were injected. Those that cross the prevailing strike of the vein system have been considered younger than the veins, but there is a group of dikes that run parallel to the veins and may be about the same age as the veins. Series of diorite dikes cut across the vein in the Lockwood mine. The Sawyer vein is followed by a parallel dike for 140 feet. In the old workings of the Carlton mine a series of younger dikes cut the vein, without, it is said, having had any effect on the ore, which was found on both sides of them. In the Black Wonder mine a dike was observed in the shaft parallel to the vein, and the ore from this shaft was heavily charged with sulphides and of very good grade. The Champion ore body was in a dike, and here, contrary to the rule, a dike cut off the ore body in depth.

In most of the mines there is little evidence of post-mineral faulting or mineralization of the walls adjacent to the veins. The Lone Star vein, probably the widest seen, has been described as a replacement of the granite, crushed between a series of fault planes. It has a maximum width of 17 feet near the shaft and carries there a good gouge. Many of the smaller veins are quite tight with little gouge, or even frozen to the walls, with the hard granodiorite close up to them.

The ore makes in shoots 25 feet to 400 feet long and is composed of solid quartz with a minor amount of mineralized granodiorite. Below the zone of surface oxidation the valuable quartz is typically greasy looking and bluish in color. The operations of the pioneer miners were confined for the most part to the oxidized upper portions of the veins where the gold was free. Ore rich in sulphides is found at about 130 feet in depth. Pyrite, pyrrhotite, galena, zincblende, marcasite, arsenopyrite, and chalcopyrite have been reported. The iron sulphides are by far most plentiful, and arsenic, zinc and copper are subordinate and not always noted. The presence of galena is held to be especially favorable. The percentage of sulphides goes as high as 20 per cent and in some cases exceeds that. They range from $50 to several hundreds of dollars a ton in value, and much pay was wasted in the early days by not saving them.

Details on some of the mines.

Black Wonder mine. This is in the Calaveras series of hard slates and schists, southeast of West Point. It was last worked from 1918 to late in 1920. There is a shaft 130 feet deep on the vein, which there shows a width of five feet; 1360 feet south of the shaft the vein is two feet wide. In 1919, a lower adit, designed to give a depth of 210 feet on the vein at the shaft, was in 800 feet and was 500 feet south of the shaft. It was later driven about 100 feet farther. A carload of sorted ore shipped from the shaft in 1919 was reported to carry 42 per cent iron sulphides, 9 per cent galena and 2 per cent zincblende, with no copper or antimony. It returned 3 ounces gold and 17 ounces silver a ton. A Gibson mill was put up in 1920 and a few tons of ore were crushed from a shoot 30 feet long which was encountered in driving the lower adit. The mine has been closed since August, 1920.

Blazing Star mine was a producer of high grade ore at intervals for 20 years following 1875. It has a shaft 400 feet deep and levels at 210, 260 and 360 feet which were run about 500 feet to work an ore shoot 450 feet long. In 1893, 210 tons of ore shipped for smelting returned $15,546 gross. In 1894, 143 tons shipped gave a gross yield of $11,056. Ore milled at the mine during these two years is said to have yielded $21.50 to $28 a ton. Some experiments in cyaniding the concentrates were made in 1895, but little has been done since.

Carlton mine is opened in the present workings to a depth of 130 feet by two adits 352 feet and 250 feet long, 86 feet apart and connected by a raise in the vein. An old shaft worked years ago was 160 feet deep. There is also an old shaft 40 feet deep. For a length of 50 feet adjacent to the raise the vein has been stoped part way up between striking northwest and dipping southwest 70 degrees. This ore shoot yielded 12 tons of ore worth $110 a ton. The mine is active at present.

Champion mine. The ore body in this mine lays in a diorite dike the adits. It has a maximum width of two and one-half feet and is said to horn $20 to $30 a ton free gold. The 40-foot shaft is said to have was 90 feet long and was bounded on both ends by parallel fissures striking northeast. The ore was stoped the entire distance between these fissures to a depth of 700 feet. Near the west end of the shoot on the 700 level a winze was sunk 40 feet and is reported to have yielded $10,000. In the bottom of this winze the ore is said to be cut off by a dike. The main ore shoot was a lens-shaped quartz body 10 inches to four feet wide. The shaft was continued to 900 feet and on the 900 level about 300 feet of drifting and crosscutting was done without definite results. On the 400 level a drift 100 feet long was run and 100 tons stoped from the west parallel fissure. This is said to have been six to 16 inches wide and heavily mineralized with galena. According to an old report, it was also rich in free gold. This was the only work done on the parallel veins.

The Champion is thought to have yielded about $500,000. This was all in free gold, and the loss in the sulphides must have been great. The quartz was crushed in arrastras, and it is said that nothing worth less than $60 a ton was crushed, but this is probably an exaggeration. The mine has been idle since 1881.

Columbus mine adjoins the Lone Star on the south. It is being operated by W. W. Gibson, and a little ore is being crushed in a Gibson mill. A shoot of ore had been followed sixty feet when the mine was visited in November last, and was still showing in the face of the drift, which is 130 feet below the outcrop. The vein is four and one-half to five feet wide in this shoot. It strikes north and varies in dip from 70 west to 70 east. At a point 300 feet south of the present face, and 50 feet higher, the vein is six feet wide and is said to assay $8 a ton. Two hundred feet north of the face the vein is said to have been 10 inches wide and to have yielded at the rate of $100 a ton from the Mackenzie shaft, 80 feet deep. In the Moore shaft, 40 feet deep and 200 feet north of Mackenzie shaft, it was of similar width and specimen grade. The quartz in the present shoot is bluish and greasy looking, and is said to carry an average of 6 per cent sulphides, but some bunches of ore were seen which would probably run 20 per cent to 25 per cent sulphides. Pyrrhotite is predominant and copper is present. These sulphides are reported to run up to as much as $500 a ton gold and silver at times.

Keltz mine is being prospected by North Star Mines Company of Grass Valley. There are nine claims in the group, covering a series of veins, but most of the work has been done on the Keltz and Keltz Extension claims. The Owl, Hard Lead, Englishman's and Middle veins have been worked superficially by shallow shafts and short adits. The steep slope of the North Fork canyon allows adit mining. The new adit is 625 feet below the old upper workings and about 100 feet above the river.

In the old upper workings, now mostly caved, the vein is in granodiorite and is paralleled by a fine grained dike. The new adit is a crosscut east 450 feet, with drifts 300 feet south and 145 feet north at time of visit. Short crosscuts were run from each drift. From the north drift just past the fork, a raise was up 141 feet. All this drifting and raising is in hard greenish black fine grained dike rock. This is sprinkled with the sulphides, especially with pyrite and pyrrhotite. In the drifts small bunches and stringers of quartz were observed, frozen tightly to the walls. These are said to be rich at times. One of these was followed 70 feet and had a maximum width of one foot but was cut off by a transverse slip. Some bunches and stringers, the largest eight inches wide and well filled with yellow and brownish sulphides, have been found in the raise. These show no grooving and only one-half inch of gouge in places. The top of the raise was then 110 feet below the deepest old workings. No important amount of ore had been found yet by the present company, and it would appear that the most likely place for the occurrence of a vein is considerably farther ahead.

Lockwood mine was worked off and on from 1850 to 1914 and was quite fully described in a State Mining Bureau report published in 1915, to which reference is made. The vein was opened to 430 feet depth. From the 230 level to the surface and for a length of 500 feet, it was credited with a yield of $400,000. Ore ranged from $12 to $150 a ton in value. The mine has been idle for a number of years.

Lone Star mine is being prospected by North Star Mines Company of Grass Valley. It was worked from 1854 to 1905 at intervals and then closed until 1920. A series of adits called No. 1 to No. 5 were driven from the canyon side. No. 4 is 358 feet below the outcrop and 2500 feet long, and No. 5 is 468 feet below the outcrop and 1500 feet long. A shaft was sunk 300 feet below No. 5 (which is near the river level) and 'minus 200 level' was driven north 181 feet and south 360 feet. This is 185 feet below the river. The Lone Star vein shows a maximum width of 17 feet and a series of ore shoots 100 to 320 feet long and two feet to six feet in average width were worked in a distance of 1200 feet. The parallel Reed and Hillary vein about 90 feet west was worked also nearly to the river level by a series of adits and showed some long ore shoots. These larger veins naturally show more mineralization of the wall rocks than the smaller veins of the district. They carry considerable gouge in places.

The present company has re-equipped the mine and had done about 500 feet of new work on the 'minus 200 level' on the Lone Star lead to the time of visit. On the south they crosscut 65 feet west and had followed a vein 240 feet, south 8 degrees west. This had opened up to about three feet wide. The north face showed a stringer of sulphide ore two inches wide which had been followed 50 feet and was said to be high grade. The south face of the old No. 5 tunnel and also of the 'minus 200 level' as left by the former operators had not been in ore and J. B. Stapler, superintendent, expressed the opinion that the former company had gotten off the vein into another fissure. He believes the vein picked up in the crosscut is the Lone Star vein. Observations made on No. 5 level showed that it would be easy to make such a mistake if no crosscuts are run.

Sixteen miles of ditch supply a minimum of about 200 inches of water to furnish power for the hoist and compressor. A crew of 30 to 35 men are employed. Machine men are paid $4.50 and muckers $4 a shift.

The following table shows in outline some of the details regarding the numerous small mines and prospects in the district. It is not put forth as complete; there are mines that are omitted because of lack of details, and among this number are no doubt some that have never made any production. There are also cases where shafts have been deepened and drifts run since the information was gathered; but the table will probably serve the purpose intended, namely to emphasize the large number of veins that have been worked with some measure of success to uniformly shallow depths, and to point out the features of similarity shared by them.

TABULATED DATA ON SOME WEST POINT MINES.

Name of mine	Location (from West Point)	Width of vein		Depth reached in		Length drifted on vein	Length of ore shoot	Dip in degrees	Strike in degrees
		Maximum	Average	Shaft	Adit				
Alaska	2 miles E.	2 ft.	18 in.	90 ft.		175 ft.		75 W.	N. 15 W.
Black Wonder	9.2 miles E.	5 ft.	2 ft.	130 ft.		800 ft.	30 and 150 ft.	70 W.	N. 18 E.
Billy Williams	3 miles NE.	2 ft.	1 ft.		350 ft.	200 ft.	75 ft. by S in.	65 W.	N. 10 W.
Blazing Star	1½ miles E.	7 ft.	2 ft.	400 ft.		500 ft.	450 by 2 ft.	80 SW.	N. 30 W.
Buena Vista	3 miles W.	2 ft.	1½ ft.		200 ft.	Unknown	Unknown	50 W.	N. 16 W.
Carlton	1.8 miles W.	2½ ft.		160 ft.	130 ft.		50 by 2½ ft.	37 W.	North
Champion	1½ miles W.	4 ft.	10 in.	900 ft.		90 ft.	90 ft.	70 SW.	NW.
Columbus	3 miles W.	5 ft.	2 ft.		150 ft.	60 ft.	60 ft.	70 W.	North
Corn Meal	4 miles S.	2 ft.	1 ft.		150 ft.±	200 ft.	50 by 1 ft.	80 NE.	(2 veins)
Deerfoot	1½ miles N.	3 ft.	1 ft.	195 ft.		150 ft.	50 by 1 ft.	70 NE.	N. 36 W.
Eureka	1½ miles NE.	3 ft.	1½ ft.	135 ft.		Unknown		80 E.	N. 15 W.
Excelsior	3 miles SE.	2 ft.			250 ft.	128 ft.	100 ft.	75 W.	N. 10 W.
Ferguson	3 miles E.	2 ft.	1 ft.	127 ft.		Unknown		75 W.	North
Gilbertson	4 miles NE.	2 ft.	1 ft.	105 ft.		70 ft.	50 ft.	65 W.	North
Good Hope et al.	4½ miles SE.	3 ft.				340 and 120 ft.	Unknown	65 E.	North (3 veins)
Gold-Guiena	2 miles NE.	2 ft.	8 in.	300 ft.		300 ft.	25 ft. by S in.	80 W.	N. 16 W.
Gray	4 miles NE.	3 ft.	1½ ft.	200 ft.	150 ft.	100 ft.	50 and 80 ft.	80 W.	N. 10 W.
Hidden Cave	3½ miles SE.	4 ft.	1½ ft.	100 ft.		196 ft.	100 by 1½ ft.	75 W.	N. 10 W.
Keltz	4.1 miles NE.	2 ft.	1½ ft.	80 ft.	200 ft.	200 ft.	50 and 100 ft.	75 W.	N. 5 W.
Lockwood	3 miles SE.	14 ft.	2 ft.	430 ft.		491 ft.	50 to 200 ft.	80 SW.	N. 23 W.
Lone Point	6 miles SE.		6 in.		40 ft.	225 ft.	25 ft.	50 E.	North
Lone Star et al.	4 miles NW.	17 ft.	2 ft.	778 ft.	468 ft.	2500 ft.; 800 ft.	100 to 320 ft.	75 SW.	NW.
Marino	3 miles E.	2 ft.	1 ft.	112 ft.		50 ft.	Unknown	75 W.	N. 30 W.
Mexican	1½ miles SE.	2 ft.	1 ft.	100 ft.		50 ft.	50 by 1 ft.	75 W.	North
Mina Rica	3 miles SE.	2 ft.	1 ft.	240 ft.		Unknown (3 shafts)		80 W.	N. 20 W.
Monte Cristo	6 miles N.	2 ft.	1 ft.		150 ft.	150 ft.		80 W.	North (4 veins)
Nelson	2 miles S.	3 ft.	1 ft.	101 ft.		300 ft.	100 ft.	80 S.	N. 70 E.
Nixon	1 mile NE.	3 ft.	10 in.	115 ft.		200 ft.	100 ft.	80 W.	N. 30 W.
North Star	2½ miles NE.	2 ft.	1 ft.	340 ft.		200 ft.	50 by 1 ft.	80 W.	North
Novello	2 miles SE.	2 ft.	1 ft.	112 ft.		Unknown		75 W.	North
Price	5 miles E.	2 ft.	1 ft.	116 ft.		60 ft.	Unknown	85 W.	N. 23 W.
Riverside	4½ miles NW.	3 ft.	1½ ft.		200 ft.	400 ft.	50 ft.	70 W.	North
Sawyer	2.2 miles NW.	5 ft.	2 ft.		300 ft.	Indian 120 ft.	140 ft.	90	NE.
Sawyer					125 ft.	Sledge 275 ft.	(Sledgehammer)		
Scorpion	1 mile S.	3 ft.	1 ft.	275 ft.		172 ft.	172 by 1 ft.	80 E.	N. 5 W.
Soap Root	1 mile S.	2 ft.	1 ft.	185 ft.		50 ft.	Unknown	80 W.	N. 10 W.
Spring Gulch	2½ miles NE.	2 ft.	1 ft.	90 ft.		50 ft.	20 ft.	75 W.	N. 15 W.
Standard	6.2 miles SE.		2 ft.		150 ft.	100 ft.	Unknown	65 NE.	N. 20 W.
Star of the West	3 miles NE.	4 ft.	1½ ft.	275 ft.		130 ft.	50 by 1½ ft.	80 W.	N. 15 W.
Steger	3 miles W.	2 ft.	1½ ft.	150 ft.	(Adeline)	450 ft.	Unknown	65 W.	N. 12 W.
				130 ft.	(Steger)				
Water Lily	1½ miles E.	2 ft.	1 ft.	220 ft.		200 ft.	200 by 1½ ft.	80 W.	N. 15 W.
(Matrimony)	1½ miles E.	4 ft.	1½ ft.	125 ft.		400 ft.		80 W.	N. 15 W.
Wide West	2 miles NE.	2 ft.	1 ft.	150 ft.		100 ft.	100 ft.	75 W.	N. 26½ W.
Woodhouse	4 miles SW.	13 ft.	2 ft.	175 ft.	400 ft.	450 ft.	150 to 400 ft.	60 W.	North

MINING LOCATION ON STOCK-RAISING LANDS.

(Numerous inquiries have been received by the State Mining Bureau regarding the rights of a mining claim locator on land taken up under the Act of Congress, entitled "An act to provide for stock-raising homesteads, and for other purposes," commonly called the 640-acre homestead act; where such holdings conflict with mining claims or include mineral-bearing land.

At the request of the State Mineralogist, the following statement setting forth the rights of a mining locator on such lands was prepared by the United States Bureau of Mines, and may be taken as official.)

"RIGHTS OF LOCATOR.

"The rights of a locator of a mining claim on grazing or stock-raising lands, is governed by section 9 of the act of Congress approved December 29, 1916, entitled 'An act to provide for stock-raising homesteads, and for other purposes.' (39 U. S. Stats., 862.)

"The entries and patents issued under the act must contain a reservation to the United States of all coal and other minerals in any such lands, 'together with the right to prospect for, mine, and remove the same.' Any coal or other mineral deposits in any such lands are subject to disposal by the United States according to the coal and mineral land laws in force at the time of any such disposal. All qualified persons are expressly given the right at all times to go upon any such lands entered or patented, for the purpose of prospecting for coal or other mineral therein. Any such prospector, however, is not to injure, damage or destroy any permanent improvements of any such entryman or patentee, and he is required to compensate the entryman or patentee for any damage on such lands.

"A prospector who has thus discovered coal or minerals in or upon any lands that have been entered or patented as grazing or stock-raising lands under the provisions of the act, may, upon acquiring from the United States, the coal or other mineral deposits in such lands, and the right to mine and remove the same, then reenter and occupy so much of the surface of such land as may be reasonably incident to the mining and removal of the coal or other minerals, but upon the following conditions:

"1. Before reentering for mining and removing the minerals, he must secure the written consent or waiver of the homestead entryman or patentee, and

"2. He must pay damages to crops or tangible improvements if and when an agreement is reached as to the amount of such damages.

"In lieu of either of the provisions numbered 1 or 2, he may execute a bond or undertaking to the United States for the use and benefit of the entryman, patentee or owner of the land, to secure the payment of all damages to crops or tangible improvements of the entryman or owner, as such damages may be determined and fixed in an action brought upon the bond or undertaking in any proper court. The bond or undertaking must be in form and in accordance with rules and regulations prescribed by the Secretary of the Interior and is to be approved by and filed with the register and receiver of the land office in the district wherein the land is situated.

"Any patents issued for coal or other mineral deposits under the provisions of the act, must contain notations declaring them to be

subject to the provisions of the act with reference to the disposition, occupancy and use of the land as permitted to an entryman or patentee.

"Under the first section of the act no land can be entered as a stock-raising homestead until the lands shall have been designated by the Secretary of the Interior 'as stock-raising lands.' After the lands have been so designated by the Secretary, then qualified persons may enter and hold the same for the purposes contemplated by the act and may hold and possess the same for such purposes as against all persons except mining prospectors and those who have acquired the right to mine and remove minerals discovered, as provided in section 9.

"An entryman, patentee or owner of any such lands may, without doubt, make a valid mining location upon the lands, the same as any other person, but in making his mining location, he must comply with the law in manner and form as if he were a stranger.

"The entryman, patentee or owner of lands acquired under this act for grazing or stock-raising purposes, has no preference right whatever to locate a mining claim upon the land. In this respect he is on an equality with all other persons and can take no advantage whatever of the fact that he is the owner or in the possession of the land.

"The rights of all persons making mining locations upon any such land used for grazing or stock-raising purposes, must be measured and determined by the rules of priority that govern in relation to the location of mining claims upon public lands generally.

"Such grazing or stock-raising lands, held under the act, are, for the purposes of making mining locations, in effect, public lands.

"The fact that the notice of a mining location was posted in the night time could not affect its validity, if the locator otherwise complied with the law.

"The owner or occupant of any such grazing or stock-raising lands who defaces or destroys a notice posted upon such lands of a mining location, is subject to the same penalty and punishment as a person who destroys any notice of a mining location."

STATEMENT TO WAR MINERALS RELIEF CLAIMANTS.

By Fletcher Hamilton.

Since Congress amended the War Minerals Relief Act, this Bureau has been in receipt of so many inquiries that it is practically impossible to give each one my personal attention. I have therefore attempted to correlate such information as I have on hand in the following paragraphs in the hope that they will meet the requirements of all parties interested, even though it may not serve as a direct reply to each particular inquiry received.

Instructions from Secretary of the Interior.

The Secretary of the Interior, in a notice to war minerals relief claimants, announces that motions for rehearing on claims heretofore passed on or excluded must be submitted in writing to the War Minerals Relief Commission not later than February 15, 1922, plainly designating the claim and specifically stating the grounds upon which rehearing is asked. If the claim or part thereof, for which rehearing is asked has heretofore been rejected on the ground that there was no government request or demand, the written motion must be under oath setting forth:

(1) The exact character of the "personal, written or published request, demand, solicitation or appeal" which stimulated the claimant to produce or prepare to produce the mineral.

(2) The government agency mentioned in the act from which the request, demand, solicitation, or appeal came.

(3) How or by whom the request, demand, solicitation, or appeal was communicated to the claimant.

(4) The time and place of such communication.

The claimant is now called upon to show definitely where he got the word that it was his patriotic duty to produce 'war minerals.' In other words, he presumably will be required to give the name and date of the publication in which he read the statement to that effect emanating from a government official source, such as any of the bureaus of the Interior Department or the War Trades Board, etc.

I am in receipt of various requests asking for 'the text of the official announcement encouraging production of the war minerals' and 'the text of the Government's promise guaranteeing prices thereof.'

As a matter of fact, there was no particular 'official announcement' and no price guarantee. The shortage of and need for the various war minerals was something that had a gradual growth and began to be realized in some quarters long before there appeared to be any possibility that the United States would be drawn into the conflict. After we entered the war and along in 1918 when the speeding-up program was being put into effect all along the line, press bulletins and statements of various kinds relative to the production of war minerals were given out to newspapers and spread broadcast by various agencies, but by that time the general situation was so well understood that there

is no real beginning or 'introductory announcement' which would be exactly what claimants under the War Minerals Relief Act are looking for, and which many think existed.

This office had no more idea of the importance of keeping a record of the published statements that were given out by the Federal Government than any of the claimants who are now seeking relief, and at the present time I am able to offer only the following suggestions, which it is hoped will be of some assistance to those who are forced to make a search for the evidence they require.

Government representatives who had to do with speeding up of war mineral output.

Before proceeding further, it may be helpful to list the following men who were representing the government in the height of the War Minerals Campaign, any of whom would undoubtedly be glad to offer assistance if called upon:

Mr. Albert Burch, Crocker Building, San Francisco, who was Pacific Coast Chromite Representative of United States Bureau of Mines;

Prof. George D. Louderback, University of California, Berkeley, who was Pacific Coast Manganese Representative of the United States Bureau of Mines;

Mr. J. E. Spurr, Editor of the Engineering and Mining Journal, New York, who was at that time in charge of the War Minerals Investigation for the United States Bureau of Mines;

Dr. George Otis Smith, Director of the United States Geological Survey, Washington, D. C.

Dr. H. Foster Bain, Director of the United States Bureau of Mines, Washington, D. C.

One thing which appeared in many of the newspapers on the Pacific Coast, which not only stimulated chrome production, but which led many to believe that there was a price guarantee, was the advertisement of the California Chrome Company, published under the headlines "Your Country Needs Chrome Ore," and containing the statement that the California Chrome Company was the direct purchasing representative of the Ferro Chrome Manufacturers which supplied the entire requirements of all the steel companies manufacturing armor plate, shells, gun forgings, aeroplane motors, trucks, and other war necessities for the United States government. The Company stated further that they would contract for the balance of 1918 for chrome ore at a minimum of $1.25 per unit for 38 per cent chrome oxide and upward and concluded by stating emphatically that every ton of chrome ore the Pacific Coast could furnish would help to release ships for carrying supplies to our fighters in France.

Published statements emanating from official sources.

Among the publications to which mineral producers responded, I have a record of the following:

1. United States Geological Survey Press Bulletin, January 17, 1918, entitled "Chromite on the Firing Line." One of the most significant statements is: "At present we are facing a deficit in the supply of chromite and we should spare no effort to increase the supply of this country as well as that of adjacent countries."

2. United States Geological Survey Press Bulletin, June 20, 1918, entitled "Speeding up the Production of Chromite," as follows: "With patriotism as well as economic considerations loudly calling for an increase in the output of chrome ore, the miners on the Pacific Coast should do their utmost to speed up its production."

3. Report of the National Research Council, Department of Science and Research, Council of National Defense, May 24, 25, 1918: "Need regarded as extremely acute, all material in sight at present has practically been requisitioned for the manufacture of chrome steel and practically none will be available for the manufacture of refractory brick, paint, chemicals, and for use in tanning. The discovery of new deposits is therefore imperative."

4. Committee on Mineral Imports and Exports, United States Shipping Board, May 4, 1918. This statement explains at some length the ship shortage and the necessity for production of local ores including manganese, chromite, pyrites, and graphite, so that it will not be necessary to depend on imports. It goes on to say that the use of local ores will probably require changes in practice, but these changes must be accomplished regardless of cost or difficulties and that Government cooperation will be necessary. One significant paragraph follows: "If private interests wait until every detail is settled before taking steps to meet the situation, there is danger of vital damage to essential war industries. Patriotism requires that the mining and metal industries do everything reasonable to get projects started at once."

5. Bulletin on Chromite, edited by Albert Burch (mentioned above). This publication discusses in detail the necessity of increased production within the United States and in conclusions says: "Reducing this to terms of chrome ore, each thousand tons of such ore produced in California will enable us to face the Kaiser with two thousand more men."

6. In September, 1918, the Hercules Powder Company offered to devote its advertising space in all American magazines to a statement of Franklin K. Lane, Secretary of the Interior, appealing to the producers of minerals. In response Mr. Lane wrote a communication which was published in a full page advertisement in the Mining Congress Journal of October and in many other magazines such as the Saturday Evening Post and Collier's at about that date. A facsimilie of Mr. Lane's signature appeared on the advertisement which was headed, "Wanted—Men to Discover America." He discusses the country's needs, its undeveloped mineral resources, the ones most in demand at that time, mentioning in particular chrome, manganese, and pyrite. One statement which would particularly appeal to the patriotic impulse of the miner was, "Will you save ships for the transporting and

feeding of our armies by discovering and developing our own deposits of these minerals?'' The article then proceeded to point out the various states in which the different minerals might be most advantageously prospected in. The statement concluded by saying: ''We have hardly begun to develop these minor resources—let us get at it in earnest.''

7. In the Mining and Scientific Press, edited by T. A. Rickard and published at 420 Market street, San Francisco, the following editorial statement appeared in the issue of January 7, 1922: ''We have received several letters asking for a specific reference in our pages to the government's call for the production of war minerals. It will be found on page 319 of our issue of March 9, 1918, where we quoted from a circular issued by the late Franklin K. Lane, then Secretary of the Interior. This call was to save the ships needed for war purposes, by producing the needed minerals at home and so decreasing the number of vessels occupied in the transport of minerals from foreign sources. The minerals specified by the Secretary of the Interior were manganese, flake graphite, tin, tungsten, antimony, pyrite, magnesite, potash, and nitrates. In our issue of December 29, 1917, on page 918, we discussed the production of minerals and referred to the urgency of the national demand as indicated by the steps already taken by the Geological Survey and the Bureau of Mines, acting for the government.''

SECRETARY'S OFFICE.

W. W. Thayer, Secretary.

The California State Mining Bureau was created April 16, 1880, by legislative act. In March, 1893, the original act was repealed and an amended act approved and passed by the legislative body. Again on June 16, 1913, a new Mining Bureau Act was approved which became effective August 10, 1913, repealing all former acts, and forming the basic law under which the Bureau now functions.

The political division, California, became known to the world as the Golden State on account of the metallic wealth within its boundaries, and the fitting creation of the State Mining Bureau for the purpose of fostering and promoting the great basic industry of mining in all its branches, speaks well of the foresight and wisdom of its founders.

It is doubtless true that both the mining and lay public have not in the past always recognized the part played by the Bureau in the development of the State's mineral resources. Innumerable inquiries regarding them, originating within and without its borders and in foreign countries, have been answered with ultimate results reflected by a consistent growth in the value of the State's mineral output since the records of production were first compiled by the Bureau in 1887; and which reveal an increase in value of 1000 per cent in the last twenty-five years.

The results attained have attracted the attention of other state and foreign governments and resulted in special investigations of the organization of the Bureau for the purpose of establishing agencies of their own along similar lines.

It is believed that a better understanding of the economic position occupied by the Bureau will be imparted to the public whose funds support it, by embodying in the monthly chapter a review of the executive activities.

The responsibility for the coordination of effort of each department to the end that the utmost efficiency may be maintained with the limited and variable appropriations accorded the Bureau by successive legislatures rests upon the office of secretary.

Activities referable to that office, such as reports of new maps and publications issued, amount of mail handled, changes and enlargements in offices, changes in personnel of the staff, property and equipment, financial statements, etc., will therefore be included in the monthly chapter.

New publications.

During the month the following Bureau publications have been made available for distribution:

Bulletin No. 90—Mineral Production of California in 1920 with County Maps. This is for free distribution and contains information as to production, value, and uses of the various mineral substances arranged according to class of minerals, and alphabetically by counties. These data are compiled from direct returns from operators in answer to inquiries sent out by the Bureau.

Seventeenth Report State Mineralogist.

Summary of Operations, California Oil Fields, September, 1921.

Summary of Operations, California Oil Fields, October, 1921.

Oil Field Map No. 17, Santa Paula-Sespe Oil Fields, revised to November 1, 1921.

Oil Field Map No. 10, Belridge and McKittrick Front Oil Field, revised to November 1, 1921.

Oil Field Map No. 11, Lost Hills and North Belridge Oil Field, revised to November 1, 1921.

Oil Field Map No. 9, Midway-McKittrick Oil Field, revised to September 1, 1921.

Distribution of publications.

The Bureau's publications are constantly in demand, requests for copies coming from all over the United States and foreign countries.

Publications were distributed during the month as follows:

Publications	Number Distributed
Eleventh Report State Mineralogist	3
Fourteenth Report State Mineralogist	6
Mines and Mineral Resources of Colusa, etc.	1
Mines and Mineral Resources of Del Norte, etc.	2
Fifteenth Report State Mineralogist	5
Mines and Mineral Resources of Fresno, etc.	2
Mines and Mineral Resources of Imperial, etc.	2
Mines and Mineral Resources of Alpine, etc.	2
Mines and Mineral Resources of Butte, etc.	4
Sixteenth Report State Mineralogist	1
Mines and Mineral Resources of El Dorado, etc.	3
Mines and Mineral Resources of Los Angeles, etc.	3
Mines and Mineral Resources of San Bernardino, etc.	2
Nevada County Report	5
Plumas County Report	4
Sierra County Report	5
Seventeenth Report State Mineralogist	325
Bulletin No. 6, California Gold Mill Practices	6
Bulletin No. 15, Map of Oil City Oil Fields, Fresno County	2
Bulletin No. 23, The Copper Resources of California	1
Bulletin No. 37, Gems, Jewelers' Materials and Ornamental Stones of California	8
Bulletin No. 46, General Index to Publications of the State Mining Bureau	5
Bulletin No. 50, The Copper Resources of California	5
Bulletin No. 70, Mineral Production for 1914, with Mining Law Appendix	1
Bulletin No. 72, Geologic Formations of California	15
Bulletin No. 74, California Mineral Production for 1916	3
Bulletin No. 75, Mining Laws, United States and California	60
Bulletin No. 76, Manganese and Chromium in California	4
Bulletin No. 77, Catalogue of the Publications of the California State Mining Bureau, 1880-1917	3
Bulletin No. 78, Quicksilver Resources of California	5
Bulletin No. 82, Second Annual Report of the State Oil and Gas Supervisor, 1916-1917	2
Bulletin No. 83, California Mineral Production for 1917	2
Bulletin No. 85, Platinum Resources of California	10
Bulletin No. 86, California Mineral Production for 1918	5
Bulletin No. 87, Commercial Minerals of California	2
Bulletin No. 88, California Mineral Production for 1919	43
Bulletin No. 90, California Mineral Production for 1920	1685
Bulletin, Reconnaissance of Colorado Desert	1
County Maps and Registers of Mines	11
El Dorado Forest Map	2
Madera Forest Map	2
Placer Forest Map	2

Distribution—Continued.

Publications	Number Distributed
Shasta Forest Map	2
Sierra Forest Map	1
Siskiyou Forest Map	2
Tuolumne Forest Map	2
Desert Map	4
Copper Deposits Map	4
Inyo County Geological Map	9
Forest Reserve Map, Unmounted	2
Geological Map of California, Mounted	34
Minaret District; Madera County	1
Tuolumne County Map	1
Oil Field Maps	389

Mails and files.

The Bureau maintains in addition to its correspondence file a mine report file which includes reports on some 7500 mines and mineral properties in California. Also there is available to the public a file of the permits granted to mining and oil corporations issued by the State Commissioner of Corporations.

During the month 1416 letters were received and answered. They are practically all requests for information, and the inquiries cover all phases of prospecting, mining and developing mineral deposits, reduction of crude minerals and marketing of refined products.

Drafting.

The Bureau maintains an up-to-date drafting department, where maps, tracings, oil well logs and similar drawings are prepared.

Changes in personnel.

The secretary is authorized by the State Mineralogist to announce the appointment of W. Burling Tucker as district engineer in charge of the Redding Field Division of the California State Mining Bureau, effective February 1, 1922, succeeding C. McK. Laizure, who has been transferred as district engineer, with headquarters at San Francisco.

Mr. Tucker, whose office will be in Redding opposite the Southern Pacific station, was in charge of the Los Angeles field division for several years previous to January 1, 1921, since which time he has been absent on leave in Mexico. He comes well prepared to carry on the local work which was first inaugurated in July, 1919. He will welcome the opportunity to become personally acquainted with the mining public of Northern California, and extends a cordial invitation to all to make his office their headquarters when in Redding.

The Mining Bureau is anxious to assist in all possible ways in the development of the mineral resources of the State. Its field engineers are authorized to give aid and advice to the extent of their ability, upon request. It is their endeavor to study the problems and difficulties encountered by operators in their district and to prepare for publication reports covering the results of their investigations.

While the northern counties of California have a mining record of which they may be well proud, it is Mr. Hamilton's belief that their possibilities in this regard have been barely indicated to date. With the industrial growth of the Pacific Coast and with increased transportation facilities such as the completion of the State highway laterals already under way, the mineral resources of this region will become even more important factors in the wealth and prosperity of the entire State than they have been in the past.

DEPARTMENT OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Statistician and Curator.

Statistics.

There are some 10,000 individual producers of mineral products in California, and the task of compiling accurate and dependable statistics covering their activities is an extremely difficult one.

The Bureau's data is authoritative, all figures, with the exception of those for gold and silver, which are supplied through the courtesy of the United States Geological Survey, being obtained by direct communication with the producers.

Publication of the annual statistics of mineral production in complete form has been necessarily delayed in the past by slow returns from a few individuals, although the totals for many important products may have been fully compiled for several months, and otherwise available.

Production blanks for the year are sent out during the succeeding January, and followed up by second, third and fourth requests, when necessary, but in spite of every endeavor to advance the date of publication, the usefulness of the statistical report has been impaired by its tardiness.

With the inauguration of the monthly chapter it will be possible to publish the production figures for any mineral within a maximum period of thirty days from the date on which the returns are complete.

It is hoped that the early appearance of the figures for some of the minerals will induce other producers to cooperate, to the end that the complete statistical bulletin may be incorporated in one of the early mid-year issues of the chapter.

An estimate of the mineral production for the year just closed, in the January number, and the dissemination of data on the consumption of mineral products in California, figures for which are rarely obtainable, are features to be forthcoming.

California mineral production in 1921.

The total value of the mineral production of California for the year 1921 is conservatively estimated to have been approximately $244,856,910. This is, in part, detailed in the tabulation below; but, as there are more than fifty mineral substances on California's commercial list, it is impractical at this early date to obtain definite figures on other than the more important items. The report forms are this week being mailed out to the operators in all mineral lines, and the date of publication of the final and complete report will depend upon the promptness of their replies. The State Mining Bureau urges the hearty cooperation of all concerned, to the end that the result may be made known early.

This estimated total of $244,856,910 is an increase of $2,757,243 over the value of the 1920 production, and is due mainly to increases by petroleum, gold and silver. Preliminary reports indicate a record yield by petroleum for the year 1921. The total would have been even greater than here shown but for the strike of employees in the San Joaquin Valley fields during September and October. For the first eight months of 1921 the yield averaged 10,100,000 barrels per month.

The increase in total value for the year was not in the same proportion as the increase in quantity, because the price was somewhat lower ($1.60 per barrel against $1.73) than that for 1920. The figure here used is the average of quotations for 24 degrees gravity oil in the San Joaquin fields during 1921.

Gold mining in California has apparently passed the low point in its career, due to the war-time and post-war economic situation, and is now on the up-grade again. Reports indicate a revival in many gold districts, and the output for the year, based on eleven months' shipments, is estimated at $15,800,000, or an increase of approximately $1,500,000. Silver is estimated at $3,500,000 (at $1 per ounce), the greatest of any year (except one, 1884) in California. This is due to the persistence of high-grade ore shipments from the California Rand mine and adjacent leases near Randsburg. Copper, though decreasing about one-sixth in quantity, shows only a little over one-half the value of the previous year, due to the drop in price from an average of 18.4 cents to 12.6 cents per pound. Lead, zinc and quicksilver all show material decreases, both in quantity and in value per unit. The output of quicksilver was the lowest in the history of that metal in California, and is due directly to the competition of cheaper foreign metal imported from Spain and Italy, against which we have only a negligible tariff protection. Magnesite shows a decrease of about 25 per cent in quantity. The conditions at present confronting the domestic producers of quicksilver, magnesite, tungsten, chromite, manganese and talc (to mention only those minerals in which California is especially interested), make it necessary that a tariff should be placed on foreign importations if our domestic output of these ores is to continue.

The structural group (brick, cement, building stone, crushed rock, etc.) had some 'ups and downs' during the past year, but the prospects are for increased activity during 1922. Building work was tied up for some weeks in 1921 in the San Francisco district owing to strikes, but other parts of the state were not affected in the same degree. Active interest has been shown in the demand for many of the 'industrial' minerals and the salines.

The estimated quantities and values for 1921 are tabulated as follows:

$15,800,000	gold.
3,500,000	(3,500,000 fine ounces) silver.
1,477,710	(11,700,000 pounds) copper.
36,880	(800,000 pounds) lead.
43,520	(850,000 pounds) zinc.
113,800	(2400 flasks) quicksilver.
45,000	(500 fine ounces) platinum.
182,400,000	(114,000,000 barrels) petroleum.
3,900,000	(60,000,000 M. cubic feet) natural gas.
540,000	(54,000 tons, crude) magnesite.
27,000,000	brick, cement, building stone, crushed rock, etc.
3,500,000	miscellaneous 'industrial' minerals.
6,500,000	salines (including borax, potash, salt, soda).
$244,856,910	total.

Museum.

Each issue of the monthly chapter will contain a brief account of current museum activities. This will include a list of new acquisitions

received with names of donors, a report of the number of visitors registered and other items tending to keep the public advised of the advantages, from an educational standpoint, afforded by the exceptionally fine collection of rocks and minerals of both economic and academic value, comprising the 16,000 specimens on exhibit. The museum contains not only one or more samples of practically every known mineral found in California, but hundreds of specimens from other states and foreign countries as well.

It may not be generally known that the State Mining Bureau supplies a collection of forty typical minerals and ores, appropriately labeled, to any public school in the State upon request.

Aside from its purely educational features, the museum daily attracts throngs of tourists and travelers, and furnishes visual evidence of the immense mineral resources of the State.

Mineral specimens suitable for exhibit purposes are solicited and their donation will be appreciated by the curator.

From December 15, 1921, to January 15, 1922, inclusive, owing to holidays, the museum was open to the public a total of twenty-two and one-half days only.

During this period 448 callers left their names and addresses on the visitors' register. The total number of visitors is unknown, as no count is kept of those who do not register, but the number of the latter undoubtedly equals or exceeds those who do.

Teachers and their classes from the various schools of the bay region are usually among the group who do not find it convenient to register.

Thirty-six states of the Union and twelve foreign countries were represented by those who gave their home addresses.

LABORATORY.

FRANK SANBORN, Petrologist.

The correct answers to the queries, What is it? and, Has it any value? questions concerning minerals sometimes incited by mere curiosity, but more often originating with those who have been pioneers in building up the mining and mineral industry of the State, have been the initial step in much of the development recorded in the past forty years.

The State Mining Bureau since its organization has supplied the necessary answer in thousands of cases without cost to the individual; and has been largely instrumental in bringing to light the minerals of both scientific interest and practical utility found in California.

Few may fail to recognize the native yellow metal, but gold now falls far short of being the premier mineral product. On the contrary, cement, one of the most unobtrusive appearing products, exceeded gold in the value of its yearly output in 1920, as has petroleum for more than a decade.

The rapid increase in the number of structural and industrial minerals and salines, whose character, use and value are seldom recognized without the aid of laboratory tests, has demonstrated the real need of this service.

The constant demand on the laboratory facilities in the past has been gratifying, but it is believed that its usefulness will be increased if the results of its work are published.

A monthly laboratory report, summarzing the determination made, with notes on those of possible commercial value or scientific interest and other items, will therefore appear in this and subsequent issues of the Monthly Chapter.

During the thirty-day period covered by this report, which included more than the usual number of holidays, a total of 275 qualitative determinations were made on samples sent to the Bureau from practically every county in the State.

The number is somewhat above the average for this season of the year, when prospecting in many sections is impossible, and indicates an apparent healthy interest in the industry by those in the hills.

Samples submitted were of great variety, ranging from gem stones to paint pigments, and, as may be expected, the larger number were of doubtful commercial value.

A list of those of possible value, judged from the sample submitted only, is appended.

The Bureau will supply the name and address of the party who sent in any sample listed, upon request, if the reference number is given.

05– 1 Volcanic ash—contains some potassium.
05– 2 Mica-schist.
05– 3 Copper ore.
05– 4 Sphalerite—zinc sulphide.
05– 5 Hematite—iron ore.
05– 6 Silver-lead ore.
05– 7 Limonite—yellow ocher.
05– 8 Asbestos—amphibole variety.
05– 9 Copper ore—contains some gold and silver.
05–10 Chromite, also biotite mica.
05–11 Silica, with soluble sodium salts.
05–12 Limestone—good grade.
05–13 Volcanic ash—contains some potassium.
05–14 Volcanic ash—contains some potassium.
05–15 Talc—very good grade.
05–16 Limonite—yellow ocher.
05–17 Lead ore—some copper and silver.
05–18 Volcanic ash—some potassium present.
05–19 Manganese ore.
05–20 Copper—lead-silver ore, also volcanic ash.
05–21 Asbestos—amphibole variety.
05–22 Copper ore, also gold-bearing sand.
05–23 Limestone—possibly lithographic, also copper ore
05–24 Strontium ore, also volcanic ash and limestone.
05–25 Gold ore, also platinum.
05–26 Gold-silver-lead-copper ore.
05–27 Hydrous aluminum silicate—clay.
05–28 Ferruginous shale—paint pigment.
05–29 Gypsum.

LIBRARY.

E. Cooney, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of Federal and State governments and of educational institutions, both domestic and foreign.

It is not the scarcity of the latter publications, but rather the lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with the above source of current technical information, the Monthly Bulletin will contain under this heading a list of all books and official reports and bulletins received during the month, with names of publishers or issuing departments.

Files of all the leading technical journals will also be found in the library and county and state maps, topographical sheets, geological folios and current copies of local newspapers published in the mining centers of the State are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

Official publications received.

Eighth Biennial Report, 1920-1921, of the Director of the State Geological Survey to the Mississippi Legislature.

Production of Coke and Coal in Canada, Canada Department of Mines.

Proceedings of the Second Annual National Mine Tax Conference, at the Twenty-fourth Annual Convention of the American Mining Congress, Chicago, Illinois.

Oil Bradstreet and Mining Directory for 1921.

Proceedings of the American Philosophical Society of Philadelphia.

Department of Geology of the University of California, Vol. 12, No. 5—Extinct Vertebrate Faunas of the Badlands of Bautista Creek and San Timeteo Canon, Southern California.

Thirty-first Report of the State Inspector of Mines of South Dakota.

U. S. Commerce Reports.

Monthly Summary of Foreign Commerce of the United States.

Bulletin No. 726–F., U. S. G. S.—Structure and Oil and Gas Prospects of a Part of Jefferson County, Oklahoma.

Bulletin No. 722–C—Ore Deposits of the Salmon River, Portland Canal Region, Alaska.

U. S. National Museum Bulletin No. 82—A Monograph of the Existing Crinoids.

Bulletin No. 187, U. S. B. M.—Treatment of the Tungsten Ores of Boulder, Colo.

Proceedings of the Rochester Academy of Science, Vol. 6, No. 2—Minerals in the Niagara Limestone of Western New York.

Official publications received—Continued.

Reports of Investigations, U. S. Bureau of Mines—

Serial No. 2298—Lignite Carbonization, Carbonized Residue Briquets.
Serial No. 2299—A Fatal Quarry Accident from Falling Rock.
Serial No. 2300—Underground Loading Devices in Metal Mines.
Serial No. 2301—Destructive Distillation of Mixtures of Oil and Coal.
Serial No. 2302—Inspection and Assembly of Flame Safety Lamps at the Mine.
Serial No. 2303—Methane in California Gold Mines.
Serial No. 2304—The Treatment of Carbon Monoxide Poisoning.
Serial No. 2305—Recent Articles on Petroleum and Allied Subjects.

Mineral Industries Map, State of Illinois. State Geological Division.

U. S. Topographic Sheets—

Brooklet, Ga.	Volta, Cal.	Suncook, N. H.
Los Banos, Cal.	Clarks Hill, S. C.	Jamesburg, Cal.
Scotts City, Mo.	Rives Junction, Mich.	Saddlebuck Hills, Wyo.

PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, with the exception of cases where the functions of both are controlled or carried on by the same ownership.

Such exceptions are comparatively rare, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of consumers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

Insufficient publicity has heretofore been given to this feature of the Bureau's work. Through the medium of the monthly chapter, however, it will now be possible to give a wider circulation to current inquiries of this nature, and with that purpose in view, written or verbal inquiries that come to the attention of the Bureau will be summarized in each issue.

The name of the product wanted or offered only will be published, the name of the owner of the deposit, or buyer, and other details being supplied upon request.

In writing, the reference number of the item should be given.

Mineral products or deposits for which a market is sought.

02- 1 Ball Mill Pebbles.
02- 2 Bentonite—large deposit.
02- 3 Borax.
02- 4 Chrome Ore—high grade.
02- 5 Clay—bauxitic.
02- 6 Feldspar.
02- 7 Fluorspar.
02- 8 Gold Prospect—sale or lease $35 ton.
02- 9 Graphite.
02-10 Mica—muscovite.
02-11 Mineral Paint—paint rock.
02-12 Vesuvianite—Californite, gem material, selected grade.
02-13 Asbestos—in Inyo County.
02-14 Cement Copper.
02-15 Feldspar—good grade.
02-16 Firebrick and Tile.
02-17 Graphite.
02-18 Graphite.
02-19 Iron Deposit—in California.
02-20 Molybdenum Deposit.
02-21 Oil Shales—and capital to develop.
02-22 Placer Gold Property—will lease.
02-23 Oil Shale Deposit.
02-24 Sulphur—25 per cent to 60 per cent.
02-25 Asphalt—natural.
02-26 Fine Granite Sand.
02-27 Manganese and Antimony Ores.
02-28 Silica—large deposit near railroad.
02-29 Stamp Mill Tailing Dump—60,000 to 80,000 tons, average $3.

Mineral products or deposits for which a market is sought—Continued.

02-30 Crude Soapstone.
02-31 Off color Barite.
02-32 Quartz Cobbles.
02-33 Chromite—high grade, 50 per cent Cr_2O_3.
02-34 Crushed greenstone, one-quarter inch to dust.

Mineral products or deposits wanted.

03- 1 Agate.
03- 2 Asbestos—fiber.
03- 3 Chrome—about 150 tons high grade.
03- 4 Cobalt Ore.
03- 5 Dolomite.
03- 6 Gypsum—deposit of.
03- 7 Lime.
03- 8 Magnesite.
03- 9 Magnesite—carload lots.
03-10 Magnesite—refractory.
03-11 Manganese Ore 83 per cent or over, iron less than 1 per cent, copper less than .03 per cent, low in silica.
03-12 Mica—Biotite (black iron mica).
03-13 Onyx.
03-14 Sulphur.
03-15 Asbestos Deposit.
03-16 Clay, Ground Feldspar and Ground Flint—tonnage.
03-17 Clay Deposit.
03-18 Coal—deposit in California.
03-19 Fuel Gas Supply.
03-20 Gold Placers—in California.
03-21 Oil Sand—deposit.
03-22 Pyrite—in Southern California.
03-23 Roofing Slate, Marble, Onyx, Travertine—undeveloped.
03-24 Tar Sands—deposit.
03-25 Tar Sands—deposit.
03-26 Mariposite (green)—vicinity of Auburn.
03-27 White grinding Barite—deposit.

EMPLOYMENT SERVICE.

Following close upon the establishment of the Mining Division branch office, in 1919 a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

Announcement of the above service was made in press bulletins at the time, but due to the fact that no direct means were at hand for keeping the mining public advised of the service, and to the general stagnation in the industry during the past two years, the facilities offered were not used to the extent anticipated. However, a total of 156 technical men took advantage of the opportunity to register during 1920–1921, and notices of 16 'positions open' were received from employers during the same period, and applicants placed in touch with them.

With the brighter outlook facing the industry in 1922, and the publication of a monthly chapter of the State Mineralogist's report, it is believed that the service will become of increasing value. The Bureau contemplates registering technical men, or those qualified for supervisory positions, and vacancies of like nature only, as no attempt will be made to supply common mine and mill labor.

A list of applicants for positions and 'positions open,' received by the Bureau during each 30-day period preceding the date of publication of the monthly chapter, will be carried in each issue.

Each notice will be designated by a key number, and communications sent to the Bureau addressed to any key number will be forwarded to the proper party without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau to avoid possible loss.

Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

01–1—Draftsman, can also fill position combining typing and office work; age 27; four and one-half years experience railway, military and mining drafting; references; salary wanted $135.

01–2—Anything connected with geology; student; age 20; no experience.

01–3—Mine surveyor or engineer; graduate; age 26; two years varied experience oil and mining.

BUREAU PUBLICATIONS.

During the past forty-two years, in carrying out the provisions of the organic act creating the California State Mining Bureau, there have been published many reports, bulletins and maps which go to make up a library of detailed information on the mineral industry of the State, a large part of which could not be duplicated from any other source.

One feature that has added to the popularity of the publications is that many of them have been distributed without cost to the public, and even the more elaborate ones have been sold at a price which barely covers the cost of printing.

Owing to the fact that funds for the advancing of the work of this department have often been limited, many of the reports and bulletins mentioned were printed in limited editions which are now entirely exhausted.

Copies of such publications are available, however, in the Bureau's offices in the Ferry Building, San Francisco; Pacific Finance Building, Los Angeles; in Santa Maria, Santa Paula, Coalinga, Taft, Bakersfield, Auburn and Redding. They may also be found in many public, private and technical libraries in California and other states and foreign countries.

A catalog of all the publications of the Bureau from 1880 to 1917, giving a synopsis of their contents, is issued as Bulletin No. 77.

A list of the above, most of which are out of print, as well as those still in stock, both for free distribution and sale, revised to the date of publication, will appear in each issue of the monthly chapter.

Publications may be obtained by addressing any of the offices of the State Mining Bureau and enclosing the requisite amount in the case of publications which have a list price. The Bureau is authorized to receive only coin, stamps or money orders, and it will be appreciated if remittance is made in this manner rather than by personal check.

FEBRUARY, 1922

REPORT XVIII OF THE STATE MINERALOGIST

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DISTRICT REPORTS OF MINING ENGINEERS.

In 1919-1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each division working out from a local branch office.

This move brought the Bureau into close personal contact with operators, but did not materially shorten the time between the gathering of data in the field and its publication in the Report of the State Mineralogist at the end of an annual or biennial period.

Mining activities and development noted by district engineers in their respective fields are now embodied in monthly reports published in each issue of 'Mining in California' thus making these data available within a maximum period of thirty days, and the Monthly Chapter as far as possible a compendium of current mining progress throughout the State.

The counties included in each field division and the location of the local offices are shown on the accompanying outline map of the State. (Frontispiece.)

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the State's oil fields is included under this heading.

REDDING FIELD DIVISION.

W. Burling Tucker, Mining Engineer

The work of the Redding field division was greatly curtailed due to the fact that the successor appointed to the position of district engineer did not take up his duties until the first of February, so the time in which to get in touch with the different operators in this district was very limited. During the early part of February the northern part of the State was visited by heavy rain and snow storms, making it impossible to cover any outside territory in the Redding field division.

The following notes cover operations during the past thirty days that have come to the personal attention of the district engineer:

Shasta County.

There is no indication of an early resumption of copper mining in Shasta County, only a small amount of work is going on at a few of the properties, but this is largely of a maintenance character. The copper mining companies are awaiting an improvement in the price of copper before attempting operations.

The aerial tramway extending from the *Hornet mine* of the Mountain Copper Company to Mathewson, a station on the Southern Pacific Railroad has been completed and placed in commission. It is 2¼ miles in length, and has a capacity of 100 tons per hour, and replaces the old Iron Mountain Railroad, used by the company for ore shipments for many years. The company is shipping 500 tons of pyritic ore daily to chemical plants near San Francisco. M. J. Murphy, manager of the Mountain Copper Company, is in charge of operations.

At the *Bully Hill mine*, the Shasta Zinc and Copper Company has renewed construction work on the zinc oxide plant that was practically completed the latter part of 1921.

A number of changes and additions are to be made in the present plant to enable the company to produce a high-grade zinc-oxide product. The company expects to have the plant under operation within four months. Fifty men are employed, under the supervision of G. T. Jackson, manager.

There is quite a revival in gold mining in the French Gulch district, and a number of properties are being reopened, and active development operations are under way at the Gladstone, Milkmaid, Sybil, and Washington mines.

The *Gladstone mine* is under option to the French Gulch Mining Company, offices Mills Building, San Francisco. Frederic Searles, president; W. M. Simpkins, secretary. The mine is being unwatered and retimbered, and an active development campaign is planned by the management. Twenty-five men are employed. A. F. Duggelly, superintendent.

The *Milkmaid* and *Franklin Group* of mines are under option to Captain H. E. Smith of Shasta, California. The Milkmaid shaft is being unwatered, and the underground workings are being retimbered, and development work is under way.

The ten-stamp mill on the property has been repaired, and the mill has been put in operation on ore from the dumps, which is reported to carry values of from $4 to $6 per ton. Twelve men are employed. Roy Leach, superintendent.

The *Sybil* and *Niagara mines* are being operated by Harry M. Thompson and associates. The development work on these properties is progressing in a satisfactory manner, and it is reported that some rich ore has been struck in the Sybil mine. Fifteen men are employed.

The *Washington mine* in the French Gulch district is under bond to Thomas Salisbury and associates of San Francisco, and the property is being developed. Six men are employed on the development work.

The *American Gold Dredging Company's* dredge, on the Sacramento River, near Redding, which has been idle since February, 1921, resumed operations the first of February. Three shifts have been put on.

The *Noble Electric Steel Company* at Heroult, Shasta County, are shipping an occasional carload of iron ore to Los Angeles.

H. C. Austin who is operating a baryte deposit at Barium, near Copper City, Shasta County, is shipping two cars of ore per week to Oakland and San Francisco.

The freight rate on barytes from Barium to Oakland and San Francisco has been reduced by the Southern Pacific Railroad Company from 23 cents per 100 pounds, carload lots, to 20 cents.

Trinity County.

The hull of the *Gardella dredge* near Lewiston, Trinity County, has been completed and the machinery will soon be installed.

Many small gold properties throughout Shasta, Trinity and Lassen counties are being opened up. Prospecting throughout the different gold districts promises to be very active this spring and summer.

AUBURN FIELD DIVISION.

C. A. Logan, Mining Engineer.

The past month has been marked by two severe storms and unusually cold weather for this region. For the first time in many years snow lay on the ground for a week at Auburn. At present there is eight feet of snow at Blue Canyon and eleven and one-half feet at the Summit, with proportionate amounts all through the mountains.

There has been widespread interruption of telephone and electric service and water supply. Freezing and breaking of water ditches has been a hindrance to placer mining, and there has been some shortage of water used for power purposes at Grass Valley as well as interruptions to mining at some Mother Lode mines which depend on hydroelectric plants in the mountains.

At the same time, the heavy snowfall, which has been well packed by rain and cold weather, promises a fine supply of water for placer mining, power and irrigation during the coming season.

Work on most mines and prospects that are not equipped for steady operation in all kinds of weather is suspended in the mountain counties where the snow line is unusually low this year, and the mines that are working in the snow belt are cut off from the outside world. The spring activity at many small mines along the Mother Lode has already set in where roads are passable, and is a cheering omen in districts that have lain idle for years. Some work is also promised on the East Belt in Tuolumne County. The following items have been noted during the month. Many of the properties named have been covered in detail in our former reports.

El Dorado County.

There are no large mines operating in the county at present but a number of small outfits have become active. Besides the Grit mine and the Argonaut mine which have been described in previous reports, the following operations were going on early in February. The Grit mine has been closed down on account of financial difficulties and a lawsuit has been started by the minority stockholders. Five stamps were hauled to the mine to be added to the five previously in operation, but have not been put up.

Machinery has just been hauled to the property owned by *Samuel Akin* and others in the Cold Springs district four miles west of Placerville. Wolf and Levy were employing several men early in February.

Five stamps were running at the *Bonanza mine* on the Cosumnes River at Nashville, near the county line. This property began work since the first of the year. C. E. Padilla is the owner.

Work is going on at the *Gold Hill mine* three miles northeast of Kelsey near Travis Creek. C. N. and F. P. Brust of Kelsey own the property.

Some good ore has been crushed lately in a small two-stamp mill at the *Gold Star mine*, formerly known as the *Coe Hill mine*, a mile southwest of Garden Valley. A. Tetrault of Placerville and associates began work here in the late fall. There are a number of veins on which shallow shafts and holes have been sunk. Fifty tons milled from the dump of a shaft 50 feet deep and from a tunnel 125 feet long is said

by Tetrault to have paid $7 a ton in free gold, the concentrate not being saved. All the veins prospected are said to pan well in gold, but the ore milled was from only one vein.

The five-stamp mill working on rock from the dump of the *Havilah mine* at Nashville has been increased to ten stamps.

The *Jones mine* near Diamond Springs is being reopened under the direction of J. Quinn.

The *Lookout mine*, three miles south of El Dorado, is being worked by a few men under the supervision of the owner, Seymour Hill of El Dorado.

Some small placer mines are worked in the county each year when water is available. Early in February one of these properties produced two pieces of gold weighing 23 ounces and 16 ounces respectively.

Some good gravel is reported to have been found lately in the *Hook and Ladder mine* at Smiths Flat, but whether or not this is in important quantity has not yet been determined.

Nevada County.

Material from the dumps of one of the old copper mines at Spenceville was being shipped to the bay cities early in the month. The ochre in this dump material is to be used for making paint.

The prospect tunnel at the *Penn-California gravel mine* at Willow Valley has reached a length of 2700 feet. Some gravel encountered near the face of the tunnel is now being prospected by crosscuts.

A report from Grass Valley early in the month stated that King C. Gillette has again taken an option on the *California mine* west of Grass Valley in the Rough and Ready district. Several years ago he did considerable work on this property, which has lain idle since.

Placer County.

A resumption of work is promised at the old *Marguerite mine* near Penryn. This mine was worked in the sixties and had been abandoned for many years. Last year it was unwatered and kept dry long enough to permit sampling, but the quartz in reach had been mined and milled by the former operators and the sampling was not conclusive.

Some shipments of low grade ore from the *Dairy Farm mine* have been made lately. The ore was mined several years ago and since then has been lying beside the railroad north of Sheridan.

A stock company has been prospecting in search of the Grizzly Flat channel near the old *Morning Star mine* in the Iowa Hill district. To date occasional pan prospects have been reported, but no large body of pay gravel.

SAN FRANCISCO FIELD DIVISION.

C. McK. Laizure, Mining Engineer.

Contra Costa County.

Mountain Copper Company: Home office, 332 Pine street, San Francisco. This company, which for many years has operated a copper smelter near Martinez, is said to have recently been carrying on experiments that will probably result in the addition of another product to the company's output. The sulphide ores from their mines in Shasta

County, which contain a high percentage of iron, have been subjected to a treatment worked out by the company's chemists, which results in the production of an iron oxide pigment. So far, red is the only color which has been produced, but it is believed that it will be possible to make pigments of various colors.

Napa County.

Standard Portland Cement Company: Home office, Pacific Building, San Francisco, is reported to be dismantling its plant at Napa Junction, which formerly was a large producer of cement, but which has been idle since 1918. It is understood that in the future this company's operations will be confined to its plant at Davenport thirteen miles northwest of Santa Cruz.

San Benito County.

California Asbestos Mining Company: Norris K. Davis, president, home office, 400 Seventh street, San Francisco. This company has taken a lease and bond on four claims on Clear Creek near Hernandez, owned by the Liberty Asbestos Company, and commonly known as the *Long-Ryan mine.* Considerable chrysotile ore has been developed by open cut methods, and the company is now constructing a mill of the revolving hammer type in which it is planned to reduce the ore at the property and ship nothing but clean fibre.

San Mateo County.

American Manganese Products Company: Main office, 350 Post street, San Francisco; engineering office, 405 Hobart Building, San Francisco; and works, Redwood City, California. Emory Winship, president; A. G. Suydam, consulting engineer; E. H. Westling, chief chemist, W. Chestnut street, Redwood City. This company has been experimenting for the past eight months with a patented process developed by Mr. Westling for the manufacture of chemical manganese dioxide from the low-grade siliceous manganese ores characteristically found in California. The preliminary work is nearing completion and it is believed that production on a commercial scale will soon be a reality.

Briefly, the method of manufacture employed consists of wet grinding of the crude manganiferous ore; passing SO_2 gas through the pulp thereby converting the manganese compounds present to manganese sulphate, in solution, leaving behind the silica which is removed by filtration; adding calcium nitrate (supplies of which are imported from Norway) to form manganese nitrate, which remains in solution; and heating the solution to a temperature sufficiently high to drive off the N_2O_4 fumes, leaving MnO_2 as the dry residue. The nitric oxide fumes are passed through water, making nitric acid as a valuable by-product. Twelve men are employed.

West Coast Porcelain Manufacturers: Henry Weiss, manager, Millbrae, California. Sales office, Rialto Building, San Francisco. The

plant owned by this company is on the main line of the Southern Pacific Railroad and was built in 1918 for the manufacture of sanitary ware. Clays used come from Amador and Riverside counties, and from England. The company is glad to receive and test samples of California clays which might meet their requirements as raw materials. An average of eighty men is employed.

Tulare County.

Kaweah Molybdenum Mines Company: Edwin Letts Oliver, president; L. V. Riddle, secretary; home office, 619 Crocker Building, San Francisco. This company owns sixteen unpatented claims and one mill site in the Mineral King district, T. 25 S., R. 31 E., the nearest post office being the town of Three Rivers. Lemon Cove, forty-eight miles west of the property, is the railroad shipping point. According to development work which has been done since the discovery of the deposit in 1916, it is a wide dissemination of molybdenite in granite, which has been proved to have a surface extent of more than 500 x 2000 feet. The average elevation of the claims is 9500 feet. Timber for all purposes is available within a distance of two miles and there is an adequate water supply.

The company has just completed plans for the installation of a ten-inch pipe line which will be capable of generating 250 horsepower.

The country is rugged and the winters are severe, although operations could be carried on throughout the year if proper preparations were made. The equipment at the present time consists of camp buildings and tools for hand mining only, and work thus far has been done in the summer months. A considerable tonnage of ore carrying a minimum of five per cent molybdenite has already been developed by open cut methods.

LOS ANGELES FIELD DIVISION.

M. A. Newman, Mining Engineer.

That mining is gradually coming back there is no doubt. The writer found evidence of this, both in the mountain and desert mining districts of southern California. True, the prospector is not seen in numbers comparable to the prewar period, but he still exists and his ranks are being gradually increased.

Imperial County.

In the Chocolate Mountains in Imperial County, the tailings of the *Paymaster mine* are being cyanided.

At the *True Friend mine* in the Poorman district of the Chocolate Mountains, Imperial County, a shaft sunk to a depth of 12 feet shows a vein 14 feet wide, assaying 20 ounces silver per ton. This shaft is now being sunk to a depth of 150 feet. The property shows all the earmarks of making good. It shows values over an outcrop 1000 feet

in length. The vein occurs as a contact between diorite and schist. The property is controlled by Messrs. Beal and Byron of Brawley, Imperial County.

Fifteen miles west from El Centro, Imperial County, on the San Diego and Arizona Railroad, is a station called Maria. From here a narrow-gauge railroad is being built to the gypsum deposit of the *Imperial Gypsum Company*, 25 miles distant. To date, ten miles of this road has been built, and the road will probably be completed within the next ninety days. The Imperial Gypsum Company is to be congratulated on the immense deposit which it possesses. There is no question that the tonnage runs into the millions—for that the writer will vouch. As to the purity of the gypsum, the company claims better than 98% gypsum. As the company is in the hands of reputable business men, it hardly seems probable that they would have committed themselves to the expenditure of several hundred thousand dollars for a railroad unless they had satisfied themselves as to the purity of this gypsum deposit. Mr. Coons of Bakersfield and S. W. Dunaway of El Centro are respectively president and vice president of the company.

Kern County.

Jo Rand Smelting Company: Information that the Jo Rand Smelting Company, a new corporation, incorporated under the laws of the State of California, is going to build a modern smelter at Mojave will be received with the greatest interest and satisfaction by mine owners and operators in Inyo, Kern and San Bernardino counties, and adjacent sections in Nevada and Arizona, as there are a great number of properties containing thousands of tons of low-grade gold ores, silver ores, and lead-silver ores blocked out in mines of this district, which under past and present conditions can not be shipped to the distant reduction plants at a profit. Both the Southern Pacific Company and the Santa Fe Railroad Company have established commodity rates from shipping points in Arizona, Nevada, and adjacent points in Inyo, San Bernardino and Kern counties to Mojave. These rates will result in a tremendous saving to operators in these districts, and under the circumstances a tremendous revival of mining of low-grade ores in the Calico, Johannesburg, Daggett, Fenner, Oatman, Kingman, El Paso, Slate Range, Cerro Gordo, Darwin, Big Pine, and other sections can be looked forward to.

The officers of the Jo Rand Smelting Company are well known throughout the West in mining and industrial circles, and are as follows: Mr. Bela Kadish, president, Los Angeles; Mr. W. J. Grindle, vice president, Los Angeles; Mr. R. L. Gilmore, secretary and treasurer, Bakersfield; Mr. Geo. Bush, director, Sacramento.

Mr. Kadish, the president, was vice president and executive officer of the North Port Smelting and Refining Company in British Columbia for many years, and was at one time owner and president of the Goldfield Sampling Works at Goldfield, Nevada.

Mr. Grindle, the vice president, is widely known throughout the West as a successful oil and mining operator. Is now operating in Inyo County and in Nevada at Battle Mountain, and is president of the Calitroleum Oil and Gas Company, and president of the Bangor Oil Company.

Mr. Gilmore, the secretary and treasurer, is a consulting mechanical engineer, and is well known on the Pacific Coast, and will have active charge of construction and other details.

Mr. Geo. Bush, director, is legislative counsel for the State of California, as well as a director in several large corporations.

The main office will be located in Bakersfield, and active construction is to start at once on the plant. The initial units of the plant will have a capacity of two hundred tons per day and all smelting will be done upon a lead basis.

San Bernardino County.

In the Randsburg district, 2250 feet south of the California Rand Silver Company (the *Kelly mine*) is the *Silver Dyke Group*, consisting of three claims. This group is being developed by a shaft, which at a depth of 30 feet has 12-ounce silver ore for its full width. As the outcrop showed but a few ounces of silver per ton, the owners of this group feel every reason to be elated over the favorable development to date.

A very promising prospect in the West Calico district, San Bernardino County, is the *Silver Contact mine*. This is being developed by Mr. H. M. Holmes. A shaft is now being sunk and has maintained an averaged value of 20 ounces silver and 8% lead from the start. These values represent a width of about 4 feet.

San Diego County.

The Julian district of San Diego County will in the near future see considerable activity. A fine concrete highway is now being built into the district and this will link it directly with San Diego and solve its transportation problem.

The *Hubbard mine* in this district has commenced operations, and W. M. Van Dyke has erected an experimental flotation plant to test out the Julian district base ores.

OIL FIELD DEVELOPMENT OPERATIONS.

R. E. Collom, State Oil and Gas Supervisor.

The record of new wells started since January 1, 1922, shows a marked tendency toward curtailment of development operations in San Joaquin Valley fields and considerable drilling activity in the three new southern fields, Huntington Beach, Long Beach and Santa Fe Springs. From the above must be excepted the Elk Hills oil field, in Kern County, where drilling operations are active.

The Elk Hills oil field is one of the most important sources of petroleum and natural gas in the state. The easterly portion of the

field deserves special comment. It has the highest average daily production of oil per well of any oil field in the state and the lowest production of water per well. The average daily production of oil per well is 415 barrels and of water less than 2 barrels.

At Santa Fe Springs, although there is a great deal of drilling activity, the discovery well of Union Oil Company, 'Bell' 1, is the only well producing in the newer part of the field as of February 15, 1922. This well is flowing 3000 barrels of oil per day of 35 degrees Baumé under a pressure of 650 pounds per square inch.

The gas zone at Santa Fe Springs, lying above the main producing oil sand, has hindered development considerably. In the vicinity of the discovery well the gas zone is entered at depths between 2000 and 2500 feet. While drilling through the gas zone with rotary tools, Union Oil Company has had two serious blow-outs, wrecking wells 'Alexander' 1 and 'Bell' 2 and forming craters where the derricks once stood.

Since January 1, 1922, up to February 11, 1922, the following new wells have been reported ready to drill:

Company	Section	Twshp.	Range	Well	Field
ALAMEDA COUNTY:					
Atlantic and Western Oil Co.	6	25	3	1	Alameda County
FRESNO COUNTY:					
West Coalinga Oil and Dev. Co.	6	21	15	2	Coalinga
Coalinga Kern Oil Co.	14	20	14	5	Coalinga
Helen D. Oil Co.	22	13	11	1	Fresno County
KERN COUNTY:					
Associated Oil Co.	26	31	23	51	Midway
Associated Oil Co.	26	31	23	71	Midway
Shale Hills Development Co.	2	27	18	1	Kern County
Coalinga-Kern Oil Co.	21	28	28	5	Kern River
Shell Co.	28	27	22	4	Kern County
Honolulu Consolidated Oil	6	32	24	61	Midway
Honolulu Consolidated Oil	6	32	24	71	Midway
C. C. M. O. Co.	22	31	22	17	Midway
Honolulu Consolidated Oil	6	32	24	6	Midway
Union Oil Co.	34	31	23	10	Midway
Myron A. Folsom	32	31	24	1	Midway
C. T. Dougherty	19	25	18	1	Kern County
Comanche Point Oil Co.	23	32	29	1	Kern County
Standard Oil Co.	11	28	27	2	Kern River
Caliposo Petroleum Co.	18	28	28	1	Kern River
Tarr & McComb, Inc.	8	29	28	6	Kern River
Union Oil Co.	4	11	23	2	Sunset
Union Oil Co.	32	31	24	3	Midway
Associated Oil Co.	26	31	23	4	Midway
Union Oil Co.	26	30	24	2	Elk Hills
Honolulu Consolidated Oil Co.	14	32	24	81	Midway
C. J. Berry	34	12	24	6	Sunset
Taft Oil Co.	25	25	18	3	Devils Den
Taft Oil Co.	25	25	18	4	Devils Den
Taft Oil Co.	25	25	18	5	Devils Den
Taft Oil Co.	25	25	18	6	Devils Den
Taft Oil Co.	25	25	18	18	Devils Den
Pacific Oil Co.	31	31	24	12	Midway
Pacific Oil Co.	31	31	24	20	Midway
Pacific Oil Co.	1	32	23	20	Midway
Pacific Oil Co.	1	32	23	27	Midway
Pacific Oil Co.	1	32	23	23	Midway
Murvale Oil Co.	28	31	23	M-5	Midway
Murvale Oil Co.	12	32	23	M-11	Midway
Associated Oil Co.	26	30	24	41	Elk Hills
Standard Oil Co.	31	27	28	2	Kern River
Pacific Oil Co.	35	30	24	16	Elk Hills

Company	Section	Twshp.	Range	Well	Field
Pacific Oil Co	35	30	24	14	Elk Hills
Pan-American Petroleum Co	1	31	24	1-E	Elk Hills
Pan-American Petroleum Co	6	31	25	2-C	Elk Hills
Honolulu Consolidated Oil Co	14	32	24	9	Midway
Pacific Oil Co	5	11	23	2139	Sunset
C. C. M. O. Co	22	31	22	14	Midway
Tannehill Oil Co	34	12	24	21	Sunset
Totem Oil Co	30	25	19	2	Devils Den
KINGS COUNTY:					
Turner and Goldsberry	8	17	23	1	Kings County
Interstate Oil Co	15	32	23	9	Midway
Dougherty and Co	56	28	27	5	Kern River
Union Oil Co	11	28	27	Water well	Kern River
Giffen-Kaine Syndicate	13	28	27	1	Kern River
Associated Oil Co	34	31	23	76	Midway
Associated Oil Co	34	31	23	56	Midway
Associated Oil Co	22	31	23	21	Midway
Big Chief Oil Co	2	11	24	5	Sunset
Blair Oil and Refinery Co	23	32	23	1	Midway
Tarr & McComb	8	29	28	7	Kern River
LOS ANGELES COUNTY:					
Petroleum Midway Co., Ltd	19	4	12	1	Long Beach
Ocean View Oil Co	30	2	10	2	Whittier
St. Helens Riverside Prop	2	2	12	8	Montebello
Prudential Petroleum Co	29	4	12	1	Long Beach
Colorado Oil Co	22	2	11	12	Whittier
Interstate Oil Co	20	4	12	1	Long Beach
Big Jumbo Oil Co	29	4	12	1	Long Beach
General Petroleum Corp	19	4	12	Signal 1	Long Beach
General Petroleum Corp	19	4	12	1	Long Beach
Temescal Oil Co	29	4	12	1	Long Beach
Sawtelle-Santa Monica Oil Syndicate	32	1	15	1	Los Angeles County
Shell Co	29	4	12	Andrews 1	Long Beach
Shell Co	29	4	12	Bixby 1	Long Beach
Shell Co	29	4	12	1	Long Beach
Cal-Mex Oil and Refining Co	19	4	12	1	Long Beach
Petroleum Midway Co., Ltd	6	3	11	1	Santa Fe Springs
Petroleum Midway Co., Ltd	6	3	11	Folx 1	Santa Fe Springs
Andrews Petroleum Corp	17	3	16	8	Newhall
Union Oil Co	32	3	11	1	Santa Fe Springs
Union Oil Co	31	3	11	5	Santa Fe Springs
Union Oil Co	31	3	11	1	Santa Fe Springs
Thos. A. O'Donnell	29	4	12	1	Long Beach
Puente Hills Oil Syndicate	16	2	10	1	Los Angeles County
General Petroleum Corp	5	3	11	4	Santa Fe Springs
C. C. M. O. Co	8	4	14	1	Redondo
Union Oil Co	20	4	12	1	Long Beach
Union Oil Co	31	3	11	4	Santa Fe Springs
C. C. M. O. Co	9	4	14	1	Redondo
Shell Co	29	4	12	1	Long Beach
St. Helens Petroleum Co	2	2	12	1	Montebello
General Petroleum Corp	5	3	11	2	Santa Fe Springs
General Petroleum Corp	5	3	11	3	Santa Fe Springs
General Petroleum Corp	6	3	11	1	Santa Fe Springs
Union Oil Co	6	2	11	2	Santa Fe Springs
United Oil Co	19	4	12	1	Long Beach
R. R. Bush Co	20	4	12	1	Long Beach
Walsh Petroleum Co	23	1	13	1	Los Angeles Count
Holms and Co	29	4	12	1	Long Beach
Schroeder Oil Syndicate	4	3	16	1	Newhall
Petroleum Midway Co., Ltd	30	4	12	1	Long Beach
Petroleum Midway Co., Ltd	29	4	12	1	Long Beach
Amalgamated Oil Co	6	3	11	1	Santa Fe Springs
Amalgamated Oil Co	5	3	11	1	Santa Fe Springs
Amalgamated Oil Co	5	3	11	3	Santa Fe Springs
White Oil Syndicate	29	4	12	1	Long Beach
Great Angelus Oil and Land Corp	21	8	9	1	Los Angeles County
Coalinga Mohawk Oil Co	31	2	11	Campos 1	Santa Fe Springs
Coalinga Mohawk Oil Co	31	2	11	1	Santa Fe Springs
Geo. F. Getty	29	4	12	1	Long Beach
NAPA COUNTY:					
Griffiths Oil Co	29	8	3	3	Napa County
Griffiths Oil Co	29	8	3	4	Napa County

Company	Section	Twshp.	Range	Well	Field
ORANGE COUNTY:					
Petroleum Midway Co., Ltd.	35	5	11	2	Huntington Beach
Petroleum Midway Co., Ltd.	2	6	11	2	Huntington Beach
Petroleum Midway Co., Ltd.	25	3	9	15	Richfield
Miley-Keck Oil Co.	2	6	11	6-A	Huntington Beach
Union Oil Co.	34	5	11	11	Huntington Beach
Union Oil Co.	33	3	9	4	Richfield
Union Oil Co.	34	5	11	4	Huntington Beach
Amalgamated Oil Co.	28	3	9	Bayha 2	Richfield
Amalgamated Oil Co.	28	3	9	2	Richfield
Standard Oil Co.	25	3	9	15	Richfield
Standard Oil Co.	2	6	11	5	Huntington Beach
Amalgamated Oil Co.	2	6	11	12	Huntington Beach
Eddystone Oil Corp.	2	6	11	4	Huntington Beach
Eddystone Oil Corp.	34	5	11	4	Huntington Beach
Standard Oil Co.	3	6	11	10	Huntington Beach
Petroleum Midway Co., Ltd.	11	6	11	Clark 1	Huntington Beach
Petroleum Midway Co., Ltd.	11	6	11	Snyder 1	Huntington Beach
Petroleum Midway Co., Ltd.	2	6	11	Pearce 1	Huntington Beach
Amalgamated Oil Co.	28	3	9	2	Richfield
Bolsa-Chica Oil Co.	11	6	11	2	Huntington Beach
Union Oil Co.	29	3	9	3	Richfield
Standard Oil Co.	32	3	9	17-A	Richfield
Rio Bravo Oil Co.	35	5	11	1	Huntington Beach
Standard Oil Co.	34	5	11	9	Huntington Beach
Standard Oil Co.	2	4	11	1	Orange County
Petroleum Midway Co., Ltd.	35	5	11	1	Huntington Beach
Petroleum Midway Co., Ltd.	33	3	9	7	Richfield
Dolke-Thomas Oil Syndicate	27	3	10	1-A	Coyote Hills
Olinda Land Co.	9	3	9	24	Brea Olinda
Rhoads Oil Co.	11	6	11	5	Huntington Beach
SAN MATEO COUNTY:					
W. A. Sage	Cassenelli Ranch			1	San Mateo County
SANTA BARBARA COUNTY:					
Puritan Oil and Refining Co.	Hope Ranch			1	Santa Barbara Co.
SANTA CLARA COUNTY:					
Douglas S. Watson	5	12	4	1	Santa Clara County
SONOMA COUNTY:					
Sage & Olson	Miller Ranch			1	Sonoma County
VENTURA COUNTY:					
J. N. Bissell	33	2	20	1	Conejo
Ada Oil Association	34	2	20	2	Conejo
Ada Oil Association	34	2	20	3	Conejo
Ada Oil Association	34	2	20	4	Conejo
Ada Oil Association	34	2	20	5	Conejo
Oak Ridge Oil Co.	13	3	21	8	South Mountain
Wilson Development Co.	6	2	17	1	Simi
Camarillo Refining and Pet. Co.	27	2	20	1	Conejo
Cooper Petroleum Co.	33	2	20	37	Conejo
E. R. Carey	2	1	21	1	Conejo
Calumet Oil Co.	3	3	19	12	Bardsdale
Cooper Petroleum Co.	33	2	20	39	Conejo
H. A. Singer	28	2	20	1	Conejo
Cline & Clemson	14	2	18	1	Ventura

SPECIAL ARTICLES.

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the Bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff, containing much information that will add to the permanent value of the Monthly Chapter, are included in each number of 'Mining in California.'

It is anticipated that these special articles will cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations; as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the text of new laws and official regulations and notices affecting the mineral industry.

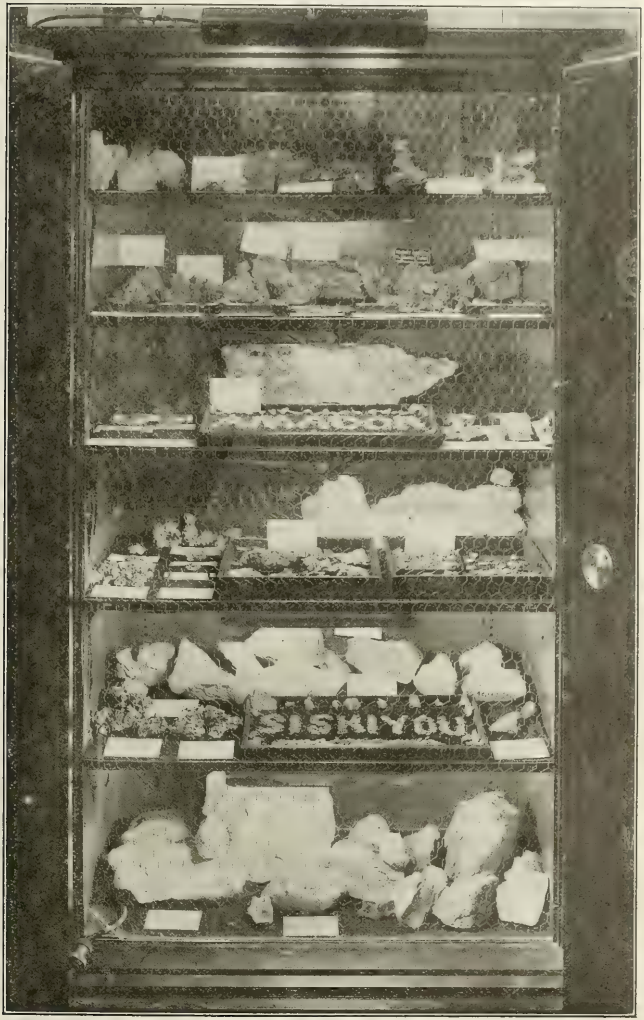
CALIFORNIA'S EXHIBIT AT THE AMERICAN MINING CONGRESS EXPOSITION, CHICAGO, ILLINOIS, OCTOBER 17-22, 1921.

By Walter W. Bradley.

In connection with the convention of the American Mining Congress in the Coliseum at Chicago, October 17–22 last, there was held an Exposition of Mines and Mining. The sessions of the congress were held in the assembly room on the second floor of the annex, while the exhibits of machinery, appliances, and minerals occupied the entire ground floor of both the main Coliseum and annex.

There were instructive displays of many and varied kinds dealing with the mining, transportation and treatment of ores, both metallic and nonmetallic. Coal mining, however, was represented in greater proportion than the other branches, doubtless due to the proximity of the important coal districts of the United States. In the center of the main floor, space was reserved for exhibits by states and other governmental departments. Besides California, the following were represented: Alaska, Colorado, Republic of Mexico, Utah, University of Illinois, U. S. Bureau of Mines, U. S. Forest Service, U. S. Geological Survey, Lake Superior Iron District. The following is a brief description of their more important items. The Alaskan exhibit contained framed pictures of many Alaskan views, ore samples, and also displays of agricultural and fishery products as well. One feature of their exhibit was a miner with gold-pan and tub panning gold from sand brought from the beach at Nome. Colorado's feature was her display of radium ores and products, the latter being shown in a dark-room especially built for the purpose. In addition there were cases of mineral specimens showing Colorado's important ores, and one with a display of clay products. Mexico sent a creditable display of ores and minerals from widely distributed parts of the republic. The Assistant Secretary of the Interior was in attendance at the congress, and President Obregon's favorite band also came, and entertained the delegates with excellent renditions of several favorite Spanish and operatic airs. The Utah exhibit consisted mainly of colored panoramas and pictures, with some mineral specimens. The display of the Lake Superior Iron District included a model, carved in wood, of one of the large, open-pit iron mines, showing the geological structure.

California's exhibit was advantageously located partly in front of and immediately to the left of the main entrance to the Coliseum. With more than 50 different ores and minerals produced commercially by a total of 58 counties, it was not an easy task to decide on the number and kind of specimens to send and the nature of the display that would adequately represent to the visitors at Chicago the many resources of this truly wonderful state. Because of California's reputation as the 'Golden State' and the fact that she still leads all other states in output of the yellow metal, because the sight of gold is always attractive to the human eye whether trained or untrained, and because the subject of assistance to the gold miner was to receive attention at the congress sessions, it was decided to place that metal foremost in the exhibit.



California's Gold Exhibit in safe at American Mining Congress, Chicago.
Photo by Kaufman and Fabry Co.

The outstanding feature, therefore, and the one which did actually create the most attraction and comment was a steel safe, faced with plate glass, containing gold nuggets, gold dust, and free gold in quartz, of a total bullion value of at least $25,000. The specimen value of much of the material shown was several times the bullion value. This display was made possible by the generosity and coöperation of not only a number of California's operators who donated the funds to finance the exhibit, but also to those individuals and companies who entrusted to the State Mining Bureau some of their treasured and valuable specimens for the purpose. The Bureau wishes to here give due acknowledgment to the following who contributed to the fund: Carson Hill Gold Mines, California Rand Silver, Inc., Pacific Gas and Electric Company, California Metal and Mineral Producers Association, Empire Mines, Marysville Dredging Company, Shell Company of California, Idaho Maryland Mines Company, Valdor Dredging Company, Yuba Development Company, Fremont Mine, Engels Copper Mining Company, Pacific Coast Borax Company, Sierra Magnesite Company, Inyo Talc Company, and Western Rock Products Company.

Acknowledgment of appreciation is also due the following for the loan of valuable specimens without which the display could not have been made: Siskiyou County Board of Supervisors; Placer County Board of Supervisors; J. W. Preston, Jr., for K. D. Winship Estate, Amador County; Double O Mining Company, Placer County; North Star Mines Company, Nevada County; Mrs. Sadie Howe, Tuolumne County; Argonaut Mining Company, Amador County; Walsh Bros., Placer County; Scott Valley Bank, Siskiyou County; California Rand Silver, Inc., San Bernardino County; Burton and De Nure, Siskiyou County; Fred Grotefend, Shasta County; W. P. Hammon, Yuba County; Tillotson Mining Company, Placer County; Montacali Mines Syndicate, Calaveras County; Oro Fina Mine, Placer County; Grit Gold Mine, El Dorado County; Table Rock Mining Company, Sierra County; Golden Center Mine, Nevada County; Georgia Hill Gold Mining Company, El Dorado County; H. H. Sherrard, Manager, Tuolumne County Exhibit; George C. Noonan, Siskiyou County; Fippen and Hayden, Siskiyou County; Carson Hill Gold Mines, Inc., Calaveras County; Errol MacBoyle, Nevada County; Orman Lutz, Mariposa County; Pacific Asbestos Corporation, Calaveras County; Engels Copper Mining Company, Plumas County. Especial mention is due the Siskiyou County Board of Supervisors for their sending in its entirety the excellent collection owned by that county, consisting of gold-quartz specimens and nuggets, which has taken prizes at several expositions and fairs and has a bullion value of approximately $15,000. Thanks are also due to the Geo. W. Hunt Company, agents for the National Safe Company, Cleveland, Ohio, for the loan of the safe in which the gold was displayed.

The safe was lighted within by tubular, electric, show-case lamps, and wired plate-glass (instead of plain plate) was used in front of the shelves as an added safeguard against any attempt that might be

made to break in. The specimens were arranged on five shelves. In case of two samples (Amador and Siskiyou) small-size placer gold was arranged in the form of the letters spelling the name of the county from which the metal had come. Included in the Siskiyou collection was a single placer nugget worth $550. Besides placer gold, the display included several beautifully crystallized specimens of lode gold, some of which induced particular comment. Specimens of platinum, diamonds, and other California gem stones were also shown. Several of the best specimens from the permanent collection in the State Mining Bureau museum were included.

In addition to the real gold displayed in the safe, facsimiles were shown of some of California's famous nuggets, facsimile bars representing the average monthly bullion clean-up ($100,000) of the Carson Hill Gold Mines, Inc., and a large, gilded, wooden model representing the average annual gold yield of California for the 72 years, 1849–1920 inclusive. The total for the 72 years was $1,720,218,101, and the average $23,891,918, being the equivalent of 65.8 cubic feet in volume and 39.5 tons, avoirdupois, in weight. Photographs of one of the large gold dredges of the Yuba Consolidated Goldfields Company were hung on the wall, likewise pictures of bullion bars representing a week's clean-up from one and from eight dredges.

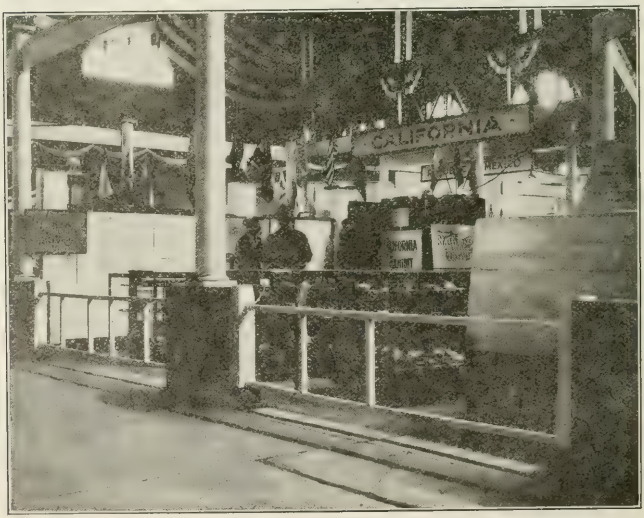
California's petroleum resources were represented by panoramic photographs of the principal oil fields, and by charts giving production data, one of which showed the comparative yield of other states illustrated by means of proportionately-drawn derricks.

The remainder of the floor space allotted to California was utilized by eight glass show-cases, with three shelves each, in which were displayed nearly 400 specimens representing the many ores, metallic and nonmetallic, that are found in this remarkably resourceful state. They were arranged in definite order according to substances. A few of these specimens were especially donated for the purpose of this exposition; but most of them were selected from the permanent collection in the museum of the State Mining Bureau.

From the many favorable comments made and the interest shown by the continuous stream of visitors in front of the gold safe and circulating through the exhibit, it is felt that the effect was well worth while, and that California's resources were attractively presented to many thousands who might otherwise have been unaware of them.



California's Mineral Exhibit at American Mining Congress, Chicago. Gold Safe in center; Mineral Cases in foreground; Model Gold Bar at left.



Part of California's Mineral Exhibit at American Mining Congress, Chicago. Oil Production Charts at left; Mineral Cases in center; Model Gold Bar at right.

GENERA OF DIATOMS CHARACTERISTIC OF MARINE AND FRESH WATERS.

By G. Dallas Hanna[1] and William M. Grant.

Diatoms are unicellular, microscopical plants which appear to have suddenly sprung into existence near the beginning of the Tertiary period. They are world wide in their present distribution and occur in almost incredible abundance under favorable circumstances. The largest species are barely visible to the unaided eye, yet when examined under the microscope they display some of the most gorgeous beauties of nature. They have skeletons of pure, amorphous silica which is secreted in most perfect geometrical designs. Because of this delicacy of form and the consummate skill required in the proper examination of them they have long been the playthings of microscopists.

Also because of their composition and their abundance they are among the most important builders of organic deposits which are known in geology. Probably they far exceed any other group of plants or animals in the bulk of the sediments which they produce, not even excepting the much heralded coral. Some diatom deposits in California are 6000 feet thick, practically pure silicious remains all the way. And in some large lakes the organisms live so abundantly that the bottoms are covered to an unknown depth.

In the present ecology of the sea the diatom holds the important position of being the foundation upon which all other living things must depend. They are the transformers of inorganic matter into pulsating protoplasm.

Of late years geologists have come to recognize that the Tertiary diatoms are the chief source of the great oil fields of California. Many facts have been brought to light to strengthen this theory since it was first brought to the attention of the world. Not the least important of these has been an analysis of oil which was extracted from living diatoms by Dr. Albert Mann of the Carnegie Institution of Washington. The results of this have not as yet been published but he has stated that in its properties the oil seems more like that derived from an animal source than a vegetable, still it comes closer to petroleum than any other oil known to man.

Besides the above important roles filled by diatoms a few of the economic uses to which they are put may be mentioned briefly.

As abrasives in various polishes they have long been used. Silver polish, many hand and scouring soaps, toothpastes and powders owe their existence to the diatoms which they contain. Large quantities are used in filters for the refining of sugar but perhaps the greatest quantities are used (1) in dynamite to hold and dilute the nitroglycerine and, (2) mixed with magnesia and asbestos in the manufacture of heat resisting furnaces and insulators.

Not all diatoms are suitable for all of the above purposes. The heavy marine forms make the best insulators while the smallest, purest fresh-water species are best for toothpastes. This brings up the question

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which is very often asked by geologists, "Can freshwater and marine forms be distinguished and if so, how?" It is in order to answer this query that the present paper has been prepared.

DIATOM DEPOSITS.

The diatoms of most *direct* economic importance to man are the fossils which have been deposited, preserved and elevated above the surface of the water in many places. They have been found in varying degrees of purity and widely distributed. When the beds are composed of diatoms only, they are pure white and the material is very light in weight for its bulk. Pure diatomaceous earth however is not very common. More often it is mixed with more or less clay or other foreign material. This changes the color to buff, gray, green, blue or red and sometimes the deposits are black due to impregnation with petroleum. Almost all Tertiary shales, clays and marls contain greater or less percentages of diatoms. In California, those which are particularly rich belong to the 'Monterey' series, or the middle miocene.

Not all material, however, which is light in color and weight and is silicious is diatomaceous earth. Amorphous silica and volcanic ash are substances commonly mistaken therefor. It must be emphasized that the only sure way to determine the character of a deposit is by an examination with a compound microscope. Hand lenses and binoculars do not have sufficiently high magnification for this purpose. Cheap instruments can be used in the field but for the refined study of these organisms the best equipment in existence is none too good. In fact the test of excellence of microscopes for a great many years has been made by the examination of certain delicate species of diatoms.

Over 8000 species of diatoms have been named. More than half of this large number have been fossilized. For the most part they are described in rare, foreign publications which are wholly inaccessible to the average worker. Many species have been described from the California deposits but there is not a single complete copy of the publication which contains most of them in any west coast library to our knowledge.

It is not only possible to tell whether a given deposit has been laid down in freshwater or in salt water but it can be determined with fair certainty if it was brackish. Not only this, if the deposit is marine it is possible to determine something of the depth of the water at that locality at the time. Bottom living species can not exist below the line of light because this they must have for the formation of the chlorophyl which distinguishes them from animals. If the bottom species are absent and the deposit is made of pelagic forms we know the water there was deep.

The uses to which diatoms could be put in the following of strata and the determination of the ages of rocks can not be stated. Sufficient work has not been done on a single deposit for use in comparison. Many species, however, are of very wide distribution at the present time so that if the same condition has prevailed in the past they should be excellent horizon markers. The difficulty in the use of mollusks for

this purpose has been the fact that single species were not of sufficient geographical distribution to enable one to correlate distant deposits, one with another. It is hoped that the intensive study of the microscopical organisms, particularly the diatoms, radiolarians and foraminifers will aid in overcoming this obstacle.

There are some genera of diatoms which are found both in salt water and in fresh water, some are exclusively freshwater in habitat and a great many are marine. One genus is almost always associated with brackish waters. As a broad rough classification, long spindle-shaped diatoms indicate freshwater while circular ones indicate marine conditions. This is not entirely true, however, and an examination of genera should be made in every case. There are some circular freshwater diatoms and some long slender saltwater ones.

NOMENCLATURE.

The diatom skeleton is usually called a *frustule*. This is normally composed of three parts which are put together like a pill box. The top and bottom are called *valves* and the ring or hoop between them is called a *girdle*. When a form is seen on edge it appears rectangular whether it is circular or long and slender in valve view. The characteristic markings appear on the face of the valves, except in some species which grow in long cylindrical form.

Many species grow individually and multiply by a simple division of the frustule at the girdle. Others, however, grow in chains and are attached to each other by various kinds of horns or processes.

The names of genera and their respective values have been adopted from the well known work by Henri Van Heurck, 'A Treatise on the Diatomaceae.' Also many of the text figures have been copied from that publication.

We are under deep obligation to Dr. Albert Mann of the Carnegie Institution for assistance in identifying the diatoms which are illustrated on the plates.

ARRANGEMENT.

In the following account all genera which are confined to fresh waters are grouped together. Those which are found in brackish water form the next group and they are followed by the large number of strictly marine genera. Finally a few genera which are found in all waters and are encountered in almost every gathering are placed at the end. We believe that this arrangement will prove more useful to the working geologist than a strictly systematic one. If the latter were adopted confusion might result from the fact that some genera confined to fresh waters are biologically very closely related to others which live exclusively in the sea. The character of the habitat has not caused a sharp demarcation in the evolution of the various groups of diatoms such as we find among mollusks.

Freshwater genera.

Cymbella Agardh, plate I, figure 2; plate IV, figure 2.

Valve cymbiform, the raphe and central nodule being near the center. Sometimes a stauros is developed about the central nodule. Raphe generally very heavy.

Surface marked with lines of beads which slightly radiate from the center. Raphe forming an angle at the central nodule and the terminations situated at the apex of each end.

This freshwater genus is widely distributed. It is distinguished from *Amphora* by the position of the raphe and central nodule, and from *Navicula* by the excentric shape of the valve.

Encyonema Kützing, figure 1.



FIG. 1. *Encyonema prostratum* Ralfs. Freshwater.

Valve somewhat cymbiform but with the raphe straight, not forming an angle at the central nodule. Also the terminations of the raphe are distant somewhat from the ends of the valve. The markings are more or less heavy lines or rows of beads on each side of the raphe.

A common freshwater genus of wide distribution.

Surirella Turpin, figure 2.

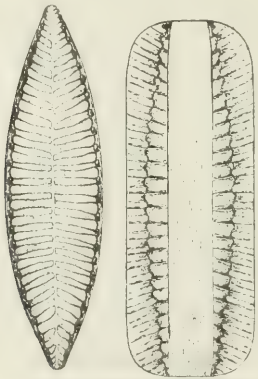


FIG. 2. *Surirella biseriata* Brebison. Freshwater.

Valve oval or spindle shaped, usually flat but sometimes twisted. Marked with heavy flattened ribs which may extend to the center from each side or they may only extend part way from the margins.

This genus is almost exclusively freshwater in its habitat and many beautiful species are known.

Amphipleura Kützing, figure 3.



FIG. 3. *Amphipleura pellucida* Kützing. Freshwater.

Valve narrowly lanceolate with a raphe in the center but no central nodule. The nodules at the ends of the raphe are much elongated. The surface appears smooth and hyaline with all ordinary microscopes. Under the most favorable conditions, however, it is possible to see that it is covered with delicate beading. On account of the perfection which optical equipment must attain for this resolution, *Amphipleura* has long been one of the best objects for the rigid test of microscopes. The genus has but few species all of which are confined to fresh waters.



FIG. 4. *Gomphonema geminatum* Lynberg. Freshwater.

Gomphonema Agardh, figure 4.

Valve longer than wide but with one apex narrower than the other. There is a median raphe and central nodule. The markings consist of radiating lines of beads.

The species of this genus are almost exclusively freshwater in habitat. They are related to *Navicula*.

Epithemia Brebison, plate II, figure 3.

Valves alike, arcuate in shape, without a raphe or central nodule. Surface sculptured internally with coarse striæ and externally with lines of beads which radiate slightly from the concave margin.

The species of this genus are almost exclusively fresh water in habitat. In certain California deposits of fossils they are very abundant.

Fragilaria Lyngbye, figure 5.

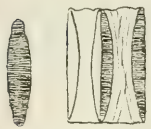


FIG. 5. *Fragilaria virescens* Ralfs. Freshwater.

Valves symmetrical, without raphe or nodules. Marked with fine transverse striæ, but without ribs or beads. The rectangular frustules are united in long filaments. A hyaline space is sometimes seen in the usual position of the raphe.

The species of this genus are so nearly all characteristic of fresh water that for practical purposes they may be classed with the flora of that habitat.

Diatoma De Candolle, figure 6.

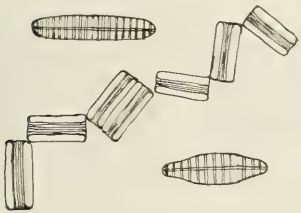


FIG. 6. *Diatoma vulgare* Bory. Freshwater.

Valves spindle shaped or lanceolate, with rather distant transverse bars and an indistinct median hyaline line. Frustules quadrangular in girdle view and united in life in long chains, the individuals attached cornerwise.

The species of this genus live in fresh water and are widely distributed and common.

Eunotia Ehrenberg, figure 7.

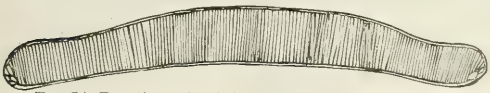


FIG. 7. *Eunotia major* (Ehrenberg). Freshwater. Other species are marine. (?)

Valve arcuate, linear, rounded on the ends. No raphe or nodules. Surface sculptured with transverse striæ but no coarse ribs. In girdle view the frustules are united to form a rectangular mass.

All of the many species of *Eunotia* appear to live or to have lived in fresh waters.

Stictodiscus Ehrenberg, plate III, figure 1.

Valves circular with radiating, close set lines of beads; these become sparse or absent near the central area. Around the border there are numerous evenly spaced spines. In vertical view these appear as dark spots on account of the upper portions being out of focus.

The few species of this genus are occasionally found in abundance in fresh waters. A particularly rich deposit is found near Klamath Falls, Oregon, where the example illustrated was obtained. The genus bears close similarity to some marine groups such as *Coscinodiscus* but can be distinguished by a careful examination of the border spines.

Brackish water genera.

Mastogloia Thwaites, figure 8.



FIG. 8. *Mastogloia lanceolata* Thwaites. Brackish water.

Valve naviculoid, spindle shaped, with a row of siliceous plates on the outer margins.

This genus is almost always found in brackish water. Except under high powers it is not readily distinguished from *Navicula* and would ordinarily be taken for one of that group.

Pleurosigma W. Smith, plate IV, figure 1.

Frustules more or less elongated and sigmoid. A raphe extends through the center of the valve and has a central nodule. Surface sculptured with striæ which cross each other at 60° or more. These markings are difficult to see with low powers or uncorrected lenses and for a long time one species, *P. angulatum*, was used as a test object for microscopes.

Marine genera.

Amphora Ehrenberg, figure 9.

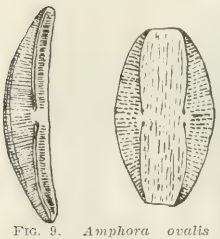


FIG. 9. *Amphora ovalis* Kützing. Chiefly marine.

Frustules generally oval or oblong with the girdle or central band hyaline, or marked with faint longitudinal lines. Valves cymbiform, with the central nodule near or at the concave margin and often surrounded by a hyaline area called a stauros. The raphe is heavy and curved to conform with the valve. The markings on the valves consist of lines of beads which slightly radiate from the central area.

Amphora is a group chiefly confined to marine waters. A few species may be found in brackish water and under exceptional circumstances it may be seen in fresh water. It is so predominately marine, however, that its presence, in the absence of other information, may be taken as conclusive proof of the marine origin of a particular fossil deposit which may be examined. It is world wide in distribution and over 200 species have been placed in it. It is not apt to be confused with any other genus except *Cymbella* of fresh water. That group, however, has the central nodule and hyaline area not at one side of the valve but nearer the center.

Rhabdonema Kützing, figure 10.

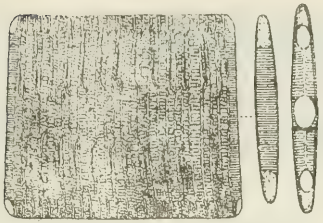


FIG. 10. *Rhabdonema adriaticum* Kützing. Marine.

Frustules forming filaments. Valves oval or spindle shaped, with a hyaline space at each end and through the middle as a narrow line. Markings consist of transverse ribs which bear heavy beads.

The genus is exclusively marine and should not be confused with some similarly shaped genera of freshwater diatoms.

Campylodiscus Ehrenberg, figure 11.

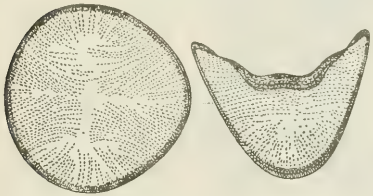


FIG. 11. *Campylodiscus echeneis* Ehrenberg. Marine.

Valves circular but much curved horizontally, saddle shaped, with a larger or smaller hyaline space in the center. Marked with coarse ribbing, beads and lines.

About 90 species have been placed in this genus and almost all of them are marine forms. A few have been found in fresh water but they are not abundant there. Its presence in a deposit may be taken as almost positive evidence of the marine origin thereof.

Raphoneis Ehrenberg, figure 12.

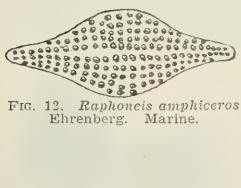


FIG. 12. *Raphoneis amphiceros* Ehrenberg. Marine.

Valves lanceolate or spindle shaped. Marked with a hyaline space through the center longitudinally but without raphe or nodules. Surface beaded, the beads in transverse, slightly radiating rows.

The great modification of shape and variation of sculpture of the members of this genus have lead to the designation of many nominal species, all of which are marine.

Entopyla Ehrenberg, figure 13.



FIG. 13. *Entopyla australis* Ehrenberg. Marine.

Valves long and slender, very much curved longitudinally. The concave valve has large terminal nodules and heavy transverse bars which reach only to the median line from each side. The convex valve is similar but lacks the terminal nodules. In girdle view the frustule has internal septa.

The few species of the genus are exclusively marine.

Gephyria Arnott, figure 14.

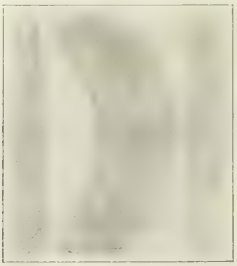
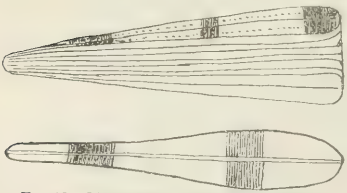


FIG. 14. *Gephyria media* Arnott. Marine.

The genus is very closely related to *Entopyla*. It has dissimilar valves and the same shape but it lacks the internal septa and usually the transverse markings are finer.

The six species are marine.

Licmophora Agardh, figure 15.



Valves linear or cuneate in shape with a hyaline narrow line centrally. Marked transversely with fine striæ. Frustule triangular in shape, with internal septa showing in girdle view.

The numerous species of this common genus are all marine.

FIG. 15. *Licmophora gracilis* (Ehrenberg). Marine.

Rhizosolenia Ehrenberg, figure 16.



FIG. 16. *Rhizosolenia styloformis* Brightwell. Marine.

Frustules long and slender, sharply pointed at each end, approximately circular in cross section. Composed of numerous imbricate or annulate plates which are clear and transparent in most cases.

The members of this genus are marine and pelagic in habitat. There are between thirty and forty species known On account of their delicacy they are not well preserved as fossils as a rule.

Chætoceros Ehrenberg, figure 17.

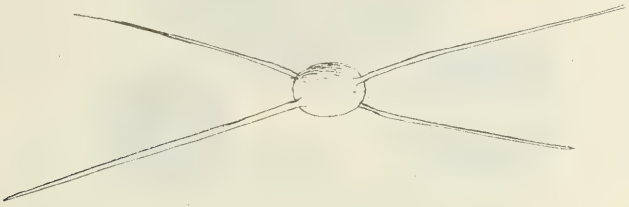


FIG. 17. *Chætoceros wighamii* Brightwell. Marine.

Frustules circular or elliptical, unmarked, usually united in long chains by means of interlocking horns.

Like the last, the species of this genus are pelagic and marine in habitat. Great variation is displayed, even in the same chain of individuals. The terminal member of each chain is usually greatly modified and looks very unlike the remainder. In it the horns are heavily developed and barbed.

Isthmia Agardh, plate I, figure 3.

Frustule trapezoidal, flattened, with a broad girdle around the center. The girdle and both valves are strongly sculptured with flattened beads.

The few species of this genus are widely distributed and very common on our sea coast. It is entirely unlike any other group, found either in fresh or salt water.

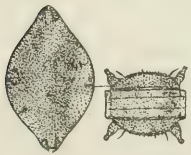


FIG. 18. *Bidulphia rhombus* Ehrenberg. Marine.



FIG. 19. *Bidulphia granulata* Roper. Marine.

Bidulphia Gray, figures 18, 19.

Frustule irregularly quadrangular in girdle view, oval in cross section, ornamented with four or more large blunt horns; often also with a few spines. Surface variously sculptured with hexagons or beads.

The above applies to *Bidulphia* proper. Several other groups, long recognized as distinct genera have been united with it. The most important among these is *Triceratium* which is common in all oceans and many deposits of fossils. (Plate I, figure 1.)

Several hundred species have been recognized in the various subgenera of *Bidulphia*, all of which are marine in habitat. It would be difficult to find a deposit of marine diatoms without some species of *Bidulphia* or *Coscinidiscus*.

Eupodiscus Ehrenberg, figure 20.

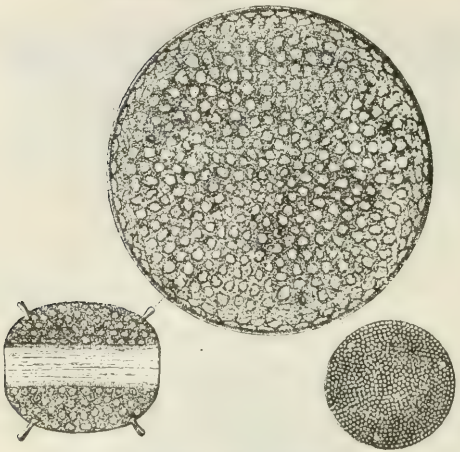


FIG. 20. *Eupodiscus argus* Ehrenberg. Marine.

Valves circular, slightly convex exteriorly. Sculptured with one to four strong spines which are blunt on the ends. The surface also is marked by numerous irregular cells or beads.

Eupodiscus is an exclusively marine genus but it not common on the Pacific Coast of the United States if it is found at all. The species are heavy and massive and consequently sink faster during the preparation of the gatherings than most other diatoms. For this reason, when decanting light material they should be looked for among the larger sand grains which rapidly settle.

Aulacodiscus Ehrenberg, plate III, figure 2.

Valves circular marked with beads which are usually arranged in radial and concentric form. Margin ornamented with numerous high blunt spines between which the silica is somewhat scalloped, thus making these diatoms some of the most beautiful which are known.

This genus consists of several species all of which are marine. One, *A. oregonus* is very common on the west coast both as a fossil and living.

Actinoptychus Ehrenberg, plate III, figures 3, 4.

Valves circular divided into six or more segments. Each segment is in a different plane from those adjoining which makes it impossible to have the entire surface in perfect focus at one time. The surface of the segments is irregularly marked with beads or cross hatched lines. The central area is hyaline. A border is usually developed which is wide and heavy.

The species of this genus are exclusively marine in habitat.

Asterolampra Ehrenberg, figure 21.

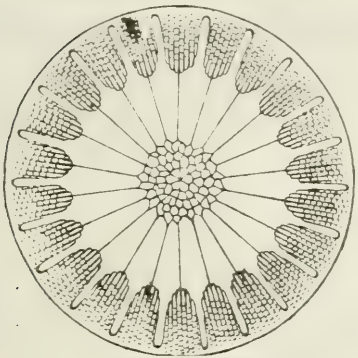


FIG. 21. *Asterolampra exima* Greville.
Marine.

Valve circular with numerous radiating rays of heavy hyaline silica. The interspaces are marked with cross hatched lines.

The species are exclusively marine, and many of them are known only as fossils.

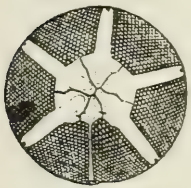


FIG. 22. *Asteromphalus hookeri* (Ehrenberg).
Marine.

Asteromphalus Ehrenberg, figure 22.

This genus is similar to *Asterolampra* but the center is somewhat asymmetrical. One of the radiating ribs of silica is longer than the others and less massive.

Several species are known, all marine and usually very widely distributed.

Arachnoidiscus Ehrenberg, plate II, figures 1, 4.

Valve circular divided into segments by bars of silica. Also the surface is marked with raised flat beads which are arranged in concentric rows. The margin is variously marked with scallops or loops.

Individuals of this genus are abundant on the California Coast and in many of the marine deposits of fossils. Only a few species are known and they are all marine. It is one of the most beautiful organisms in nature and it gets its name from its general resemblance to the web of a spider.

Coscinodiscus Ehrenberg, plate V, figures 1, 2, 3, 4.

Valves circular, rarely elliptical, slightly convex in the center. Surface marked with cells or beads which may be sparse or closely arranged. Almost endless variation is found in the markings, but spines are not developed. In this respect the genus differs from other circular forms.

The number of species in the genus is very large and all of them are marine. So numerous are they that scarcely a marine gathering of diatoms, either fossil or recent, pelagic or bottom, can be made without getting them in some quantity. And often it is possible to secure them in almost any quantity with scarcely any

other forms being present. At times large patches of the North Pacific Ocean, miles in extent, become colored brown on account of the abundance of *Coscinodiscus* in the water.

Actinocyclus Ehrenberg, plate I, figure 4.

Valves circular, slightly convex in the center, variously sculptured with cells or beads which are arranged in radiating rows. The genus is like *Coscinodiscus* in all essential respects except that near the margin on one side there is a small hyaline area or nodule. Sometimes the margin is ornamented with a series of low spines.

Actinocyclus is exclusively marine like *Coscinodiscus* but the number of species is far less.

Cosmopolitan genera.

Stauroneis Ehrenberg, plate IV, figure 3.

Frustule spindle shaped with a raphe in the center. The central nodule is spread out entirely across the valve so as to produce a broad hyaline band, the cross, from which the genus takes its name. The surface otherwise is marked with numerous rows of fine beads, which under low powers appear as lines.

The genus is closely related to *Navicula* and like it, is found both in fresh and salt water. It is illustrated here because some of the species are abundant and world wide in distribution.

Navicula Bory, plate IV, figures 4, 5, 6.

Frustules spindle shaped or oval with a central raphe which is straight. Surface variously marked with transverse rows of beads or striæ.

About 1,500 species have been described in this genus. Many of them are of wide distribution and some are of freshwater, others of marine habitat. Naturally among so many species there is very great variation in shape and sculpture but all attempts to divide the group into other genera have failed. Of the species illustrated *N. distans* is a common freshwater type while *N. dilatata* conforms to the are constricted in the middle. *Navicula* has been truly called the cosmopolitan diatom.

Cocconeis Ehrenberg, plate II, figure 2; plate IV, figures 7, 8.

Frustule oval in shape with the upper and lower valves unlike. The upper valve does not have a true raphe, or central and terminal nodules. The lower valve, however, is thus provided. The markings consist of more or less radiating lines of beads.

The genus is both marine and freshwater in habitat and is introduced here because of its general similarity to some strictly marine genera. The student is warned not to confound it with the oval species of *Auliscus* or with a circular diatom which may have been tipped partly on edge under the microscope.

Synedra Ehrenberg, figure 23.

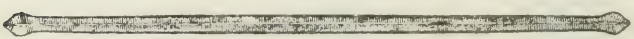


Fig. 23. *Synedra capitata* Ehrenberg. Freshwater? Other species are marine.

Valves very much elongated, lanceolate, with a clear hyaline space down the center. Surface marked with transverse striæ.

A great many species are known in this genus and they are recognized by their very great length as compared with their breadth. In this respect they are comparable with no other genus considered herein except *Nitzschia*, the forms of which are asymmetrical.

The species of *Synedra* are confined for the most part to freshwater but there are some found in marine and brackish habitats. The genus is given here because it is often encountered.

Nitzchia Hassall, figure 24.



FIG. 24. *Nitzschia lanceolata* Thwaites. Marine? Other species are freshwater.

Valves usually long and slender, pointed bluntly at each end. One side of each valve is thickened and furnished with a series of short ribs. The remainder of the surface is furnished with various formations of lines and delicate punctations, for which a high power objective is required to study.

Nitzschia contains a great many species, some of which are found in freshwater, others in the ocean and still others in brackish water. It is shown here because it is met with so frequently in the examination of diatom gatherings.





FIG. 25. *Melosira sulcata* Ehrenberg. Marine.



FIG. 26. *Melosira granulata* Ehrenberg. Freshwater.

Melosira Agardh, figures 25, 26.

Frustules united into a cylindrical chain and joined usually by small teeth which interlock. Each individual, when seen in side view, appears quadrangular in outline, but circular when seen in end view. In both cases the species are variously sculptured with protuberances, lines, and beads.

Some marine species of the genus are world wide in distribution. Some live in fresh water and the circular appearance of the valves when seen on end should not cause them to be confused with the numerous marine genera of circular diatoms. There is one species of *Melosira* which alone forms some very large deposits in California, Nevada, Idaho and Oregon. This is *Melosira granulata* and is illustrated because of the frequency with which it is seen in the freshwater lake deposits.

Cyclotella Kützing, figure 27.



FIG. 27. *Cyclotella striata* Kützing. Freshwater. Other species are marine.

Valves circular, usually very small, and usually with a hyaline space in the center which is marked with fine dots. Outside the central area the valve is marked with radiating lines of various lengths and intensity.

The species of this genus are very commonly met with in fresh water, although some are marine in habitat. It is the only common circular diatom found in fresh water and can be distinguished from marine forms by the sculpture. The surface is not marked with a series of beads or cells such as is found in *Coscinodiscus*.

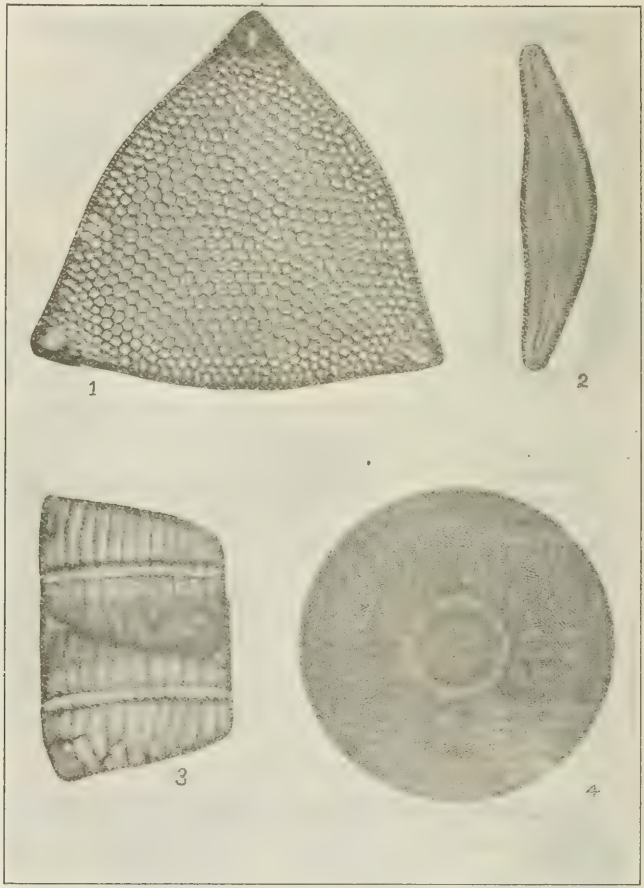


PLATE I.

1. *Triceriatum brocckii* L. Fort. Marine.
2. *Cymbella lanceolata* (Agardh). Freshwater.
3. *Isthmia nervosa* Ehrenberg. Marine.
4. *Actinocyclus japonicus* Castracane. Marine.

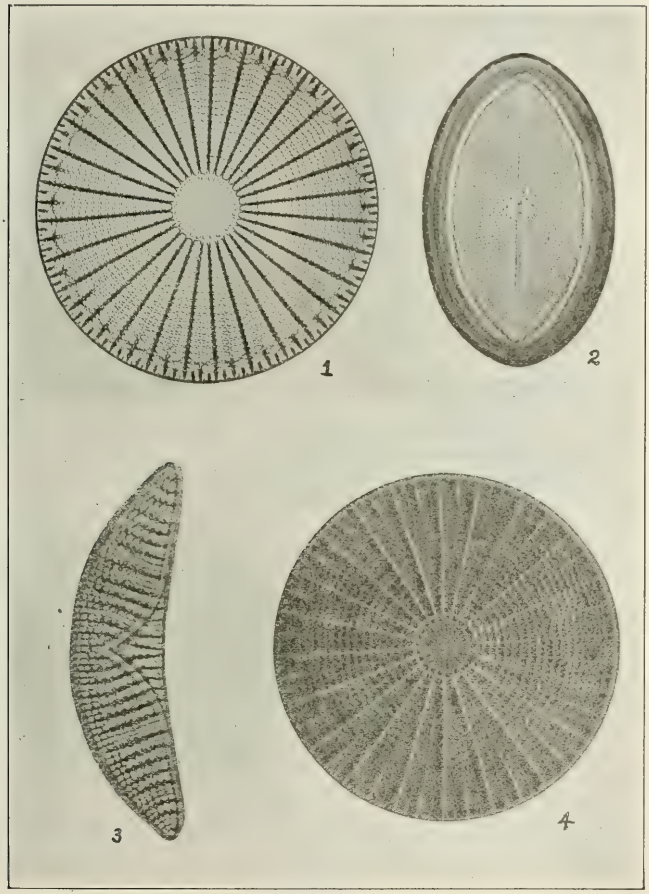


Plate II.

1. *Arachnoidiscus ehrenbergii* Bailey. Marine.
2. *Cocconeis placentula* Ehrenberg. This specimen is from a gathering of freshwater material. Other species of the genus are marine.
3. *Epithemia turgida* Kützing. Freshwater.
4. *Arachnoidiscus ehrenbergii* Bailey. Same specimen as figure 1. Photographed to show the structure of the valve.

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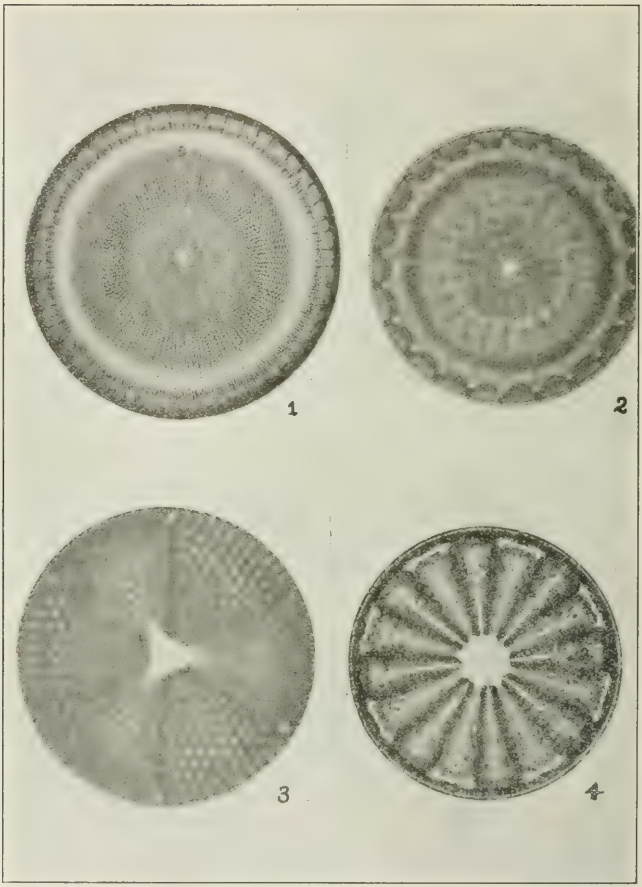


PLATE III.

1. *Stictodiscus niagarw* Ehrenberg. The members of this genus live in fresh water and great care must be taken not to confuse them with *Coscinodiscus*. This specimen came from Klamath Falls, Oregon.
2. *Aulacodiscus oregonus* Harvey and Bailey. Marine. Very common on the west coast.
3. *Actinoptychus undulatus* (Bailey). Marine. This very common and exceedingly variable diatom is found in deposits supposed to be Oligocene in age and on up the scale to the present time.
4. *Actinoptychus splendens* (Shadbolt). Marine.

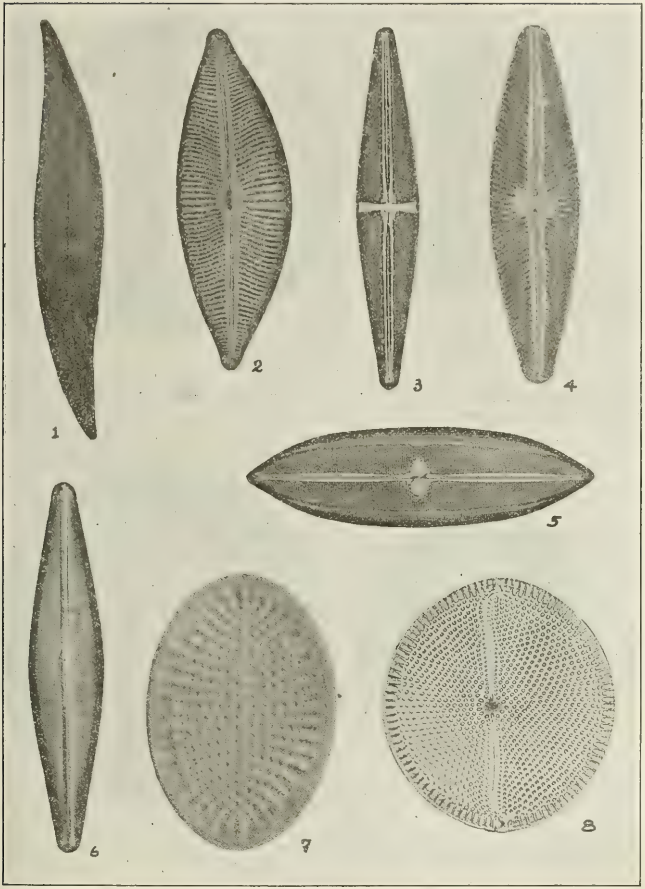


PLATE IV.

1. *Pleurosigma normanii* Ralfs. The genus lives almost exclusively in brackish water. This specimen came from Belvedere Island in San Francisco Bay.
2. *Cymbella ehrenbergii* Ralfs. Freshwater.
3. *Stauroneis phœnicentoron* (Nitzsch). Found both in fresh and marine waters.
4. *Navicula distans* (?) (W. Smith). Freshwater. This specimen came from a deposit near Klamath Falls, Oregon.
5. *Navicula dilatata* Ehrenberg. Marine.
6. *Navicula inelegans* Grove and Sturt. Marine.
7. *Cocconeis baldjikiana* Grunow. This species is marine. A few others inhabit fresh waters.
8. *Cocconeis splendida* Gregory. Marine.

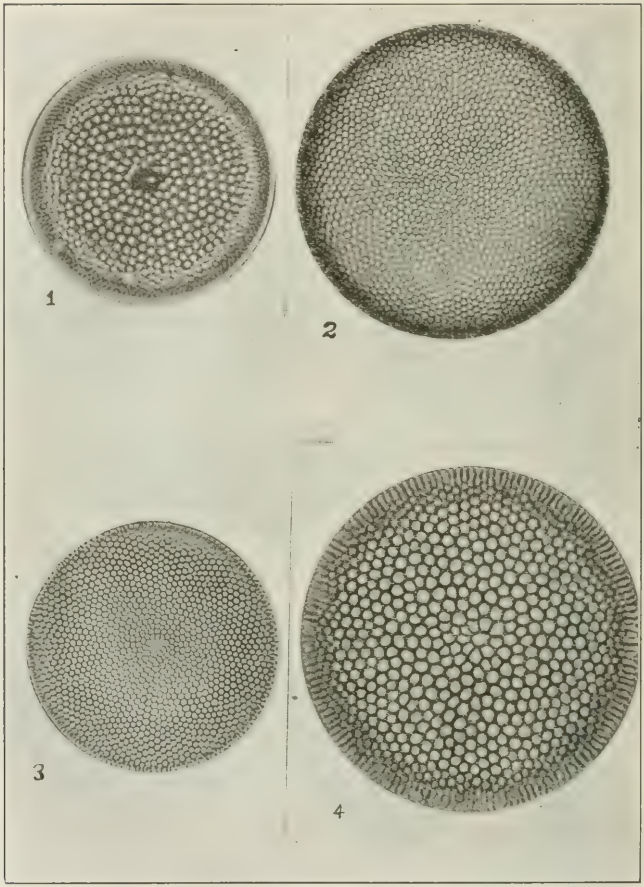


PLATE V.

1. *Coscinodiscus velatus* A. Schmidt.
2. *Coscinodiscus marginatus* Ehrenberg.
3. *Coscinodiscus asteromphalus* Ehrenberg.
4. *Coscinodiscus robustus* Ehrenberg.

NOTE.—All of the species shown on Plate V are from the great deposit at Lompoc, California.

CHANGE IN MINE ASSESSMENT YEAR.

The Bureau continues to receive inquiries from more remote sections in regard to the changing of the period for doing annual assessment work on unpatented mining claims, and for the benefit of those who may not be fully advised, the text of the new law is here given.

The law, introduced as H. R. 4813, entitled, 'An Act changing the period for doing annual assessment work on unpatented mineral claims from the calendar year to the fiscal year beginning July 1 each year'; was approved by the President on August 24, 1921, and became effective as of that date.

This law also provides that on all valid claims, the annual period ending December 31, 1921, shall continue to 12 o'clock meridian (noon) July 1, 1922. In other words '1921 work' is extended to noon, July 1, 1922. '1922 work' must be done between noon, July 1, 1922, and noon, July 1, 1923, and so on.

The text of the new law follows:

> Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 2 of "An Act to amend sections 2324 and 2325 of the Revised Statutes of the United States concerning mineral lands," approved January 22, 1880, be, and the same is hereby, amended to read as follows:
>
> "Sec. 2. That section 2324 of the Revised Statutes of the United States be amended by adding the following words:
>
> '*Provided*, That the period within which the work required to be done annually on all unpatented mineral claims located since May 10, 1872, including such claims in the Territory of Alaska, shall commence at 12 o'clock meridian on the 1st day of July succeeding the date of location of such claim: *Provided further*, That on all such valid existing claims the annual period ending December 31, 1921, shall continue to 12 o'clock meridian, July 1, 1922.' "

PROGRESS REPORT ON PLACER GOLD INVESTIGATION.

By Chas. S. Haley.

The following is a summary of my work on dry placers during the past month:

The district covered embraces San Diego County, Imperial County, and a portion of Riverside County.

Within this district there are several placer deposits, which have been mentioned in previous reports of the Bureau, but not many of them are of any great economic value.

The only placer which appears to have been originated by an ancient river channel is one which comes down from the Julian and Banner districts by way of Ramona and San Vincente creek towards La Jolla. This deposit was worked extensively by Mexicans with dry washers, in the colonial days, and it is believed that that is the best method to work it at present, provided there is any gravel left which is worth while.

In Imperial County there is a deposit of broken down schist carrying some values from disseminated quartz veins, which runs through the Chocolate Basin and the Chucawalla Mountains, and another which runs through the Borego Valley. Neither of these deposits will value more than 15 cents a yard, if worked on any considerable scale.

The only placer deposits in Imperial County which appear interesting at all are a few along the Colorado River. At Laguna and above Yuma, over a million dollars has been taken out by dry washers. The deposit appears to be a disintegrated schist and slate, containing quartz stringers, which have carried some gold.

The erosion caused by the Colorado River at the base of a low range of hills has resulted in the accumulation of this matter. The river wash itself does not carry much value, but the disintegrated matter above has considerable gold in it. The same condition applies to the Picacho Basin, about fifteen or twenty miles above this region. Neither of these deposits appears to be of great interest at present, as most of the gold has been taken out in the only manner in which it could be taken without working large portions of gravel which are practically valueless. The Mexican with his dry washer worked by hand was not up against the problem of overhead in the moving.

In Riverside County near Blythe, there is still a little gravel of the Colorado which carries values, but most of the concentration appears to be on the opposite side of the river, in Arizona. Here the La Paz Gold Mining Company plans to operate with hydraulic, by pumping the water from the river.

PROGRESS REPORT ON SPECIAL MOTHER LODE BULLETIN.

By C. A. Logan.

On account of the protracted storms of the past month, it has not been possible to visit mines or do much field work for the Mother Lode Bulletin. The time available for this bulletin has been used to bring up-to-date a mining map of sections of the Mother Lode and to collect information on the present condition and ownership of patented mines. This work has been carried well forward for El Dorado County.

Many owners now resident in that county, and men who have worked underground in mines closed down for years, have been interviewed to learn as much as possible regarding underground conditions in mines where the workings are at present inaccessible. Past history of operation and production of numerous properties has been gathered. This work is a necessary preliminary to extended field work, which will be completed as soon as the weather permits.

SECRETARY'S OFFICE.

W. W. Thayer, Secretary.

The California State Mining Bureau was created April 16, 1880, by legislative act. In March, 1893, the original act was repealed and an amended act approved and passed by the legislative body. Again on June 16, 1913, a new Mining Bureau Act was approved which became effective August 10, 1913, repealing all former acts, and forming the basic law under which the Bureau now functions.

It is doubtless true that both the mining and lay public have not in the past always recognized the part played by the Bureau in the development of the state's mineral resources. Innumerable inquiries regarding them, originating within and without its borders and in foreign countries, have been answered with ultimate results reflected by a consistent growth in the value of the state's mineral output since the records of production were first compiled by the Bureau in 1887.

It is believed that a better understanding of the economic position occupied by the Bureau will be imparted to the public whose funds support it, by embodying in the Monthly Chapter a review of the executive activities.

The responsibility for the coördination of effort of each department, to the end that the utmost efficiency may be maintained with the limited and variable appropriations accorded the Bureau by successive legislatures, rests upon the office of secretary.

Activities referable to that office, such as reports of new maps and publications issued, amount of mail handled, changes and enlargements in offices, changes in personnel of the staff, property and equipment, financial statements, etc., are therefore included herein.

New Publications.

During the month the following Bureau Publications have been made available for distribution:

Bulletin No. 89.—Petroleum Resources of California, with Special Reference to Unproved Areas. This publication was written by Lawrence Vander Leck, an oil geologist, of recognized ability in his chosen field. In preparing his report Vander Leck spent twelve months in the field and no part of the state is so remote that it was overlooked when the author wrote down his conclusions as to whether or not oil or gas could reasonably occur there. Information of this character, relative to northern and central California in particular, is available nowhere else, either in government or private documents. The Bulletin is cloth bound, contains 188 pages of text, twelve illustrative drawings, six photographs and six maps. Price *$1.25* including delivery charges.

Preliminary Report No. 8.—A Review of Mining in California During 1921, with notes on the outlook for 1922. The material offered in this review is a compilation of the notes prepared by the Bureau's field engineers, covering various phases of the mining industry which they have observed in the course of their work during the past year. It does not presume to be a detailed record of the mines and mineral deposits of the state, information of that nature being available in the

Reports XIV, XV, XVI, and XVII of the State Mineralogist, as well as in various bulletins which have been issued on particular branches of our mineral industry.

This review does, however, attempt to convey at a glance some idea of the general mining situation here, in 1921, and to mention items of interest which have been noted during that period, particularly as regards new development and activities, as well as to show something regarding the future outlook for this industry. Preliminary Report No. 8 is distributed free.

Summary of operations—California Oil Fields, November 1921, Vol. 7, No. 5.

Mining in California, January 1922 (Monthly) Vol. 18, No. 1.

Oil Field Map No. 16, Ventura-Ojai Fields, Revised to January 15, 1922.

Oil Field Map No. 20, Long Beach Oil Fields, Revised to February 1, 1922.

Distribution of Publications.

The Bureau's publications are constantly in demand, requests for copies coming from all over the United States and foreign countries.

Publications Distributed During the Month of February 1922.

Publications.	Number distributed
Report XI State Mineralogist	2
Report XIV State Mineralogist	9
Report XVII State Mineralogist	16
Mines and Mineral Resources of Del Norte, etc.	2
Mines and Mineral Resources of Fresno, etc.	4
Mines and Mineral Resources of Imperial, etc.	2
Report XV State Mineralogist	3
Mines and Mineral Resources of Alpine, etc.	3
Mines and Mineral Resources of Butte, etc.	1
Mines and Mineral Resources of El Dorado, etc.	6
Mines and Mineral Resources of Los Angeles, etc.	6
Mines and Mineral Resources of San Diego, etc.	2
Mines and Mineral Resources of Monterey, etc.	3
Mines and Mineral Resources of Kern, etc.	1
Mines and Mineral Resources of San Bernardino, etc.	10
Plumas County Report	2
Sierra County Report	3
Amador County Report	1
Bulletin No. 6, California Gold Mill Practices	2
Bulletin No. 23, The Copper Resources of California	1
Bulletin No. 37, Gems, Jewelers' Materials and Ornamental Stones of California	4
Bulletin No. 50, The Copper Resources of California	1
Bulletin No. 72, Geologic Formations of California	20
Bulletin No. 75, Mining Laws, United States and California	67
Bulletin No. 76, Manganese and Chromium in California	1
Bulletin No. 77, Catalogue of the Publications of the California State Mining Bureau, 1880–1917	2

Publications—continued.

	Number distributed
Bulletin No. 83, California Mineral Production for 1917	21
Bulletin No. 85, Platinum Resources of California	8
Bulletin No. 86, California Mineral Production for 1918	1
Bulletin No. 88, California Mineral Production for 1919	1
Bulletin No. 89, Petroleum Resources of California, with Special Reference to Unproved Areas	328
Bulletin No. 90, California Mineral Production for 1920	184
County Maps and Register of Mines	27
Geological Map of California (Mounted)	17
Preliminary Report No. 6, Review of Mining in California, During 1919	24
Preliminary Report No. 8, Review of Mining in California, During 1921	1590
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Mails and files.

The Bureau maintains in addition to its correspondence file a mine report file which includes reports on some 7500 mines and mineral properties in California. Also there is available to the public a file of the permits granted to mining and oil corporations issued by the State Commissioner of Corporations.

During the month 832 letters were received and answered. They are practically all requests for information, and the inquiries cover all phases of prospecting, mining and developing mineral deposits, reduction of crude minerals and marketing of refined products.

Drafting.

The Bureau maintains an up-to-date drafting department, where topographic and geological maps, tracings, oil well logs, and oil field maps are prepared. The increasing work in this department necessitated making an addition to the force during the past month.

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

Walter W. Bradley, Statistician and Curator.

Statistics.

There are several thousand individual producers of mineral products in California, and the task of compiling accurate and dependable statistics covering their activities is an extremely difficult one.

The Bureau's data is authoritative, all figures, with the exception of those for gold and silver which are supplied through the courtesy of the United States Geological Survey, being obtained by direct communication with the producers.

Since the inauguration of the Monthly Chapter it is possible to publish the production figures for any mineral within a maximum period of thirty days from the date on which the returns are complete.

It is hoped that the early appearance of the figures for some of the minerals will induce other producers to coöperate, to the end that the complete statistical bulletin may be incorporated in one of the early mid-year issues of the Chapter. Blank forms were sent out in January, and the 1921 data are now coming to hand, so that we shall doubtless be in a position to give some of the figures in the March issue.

The dissemination of data on the consumption of mineral products in California, figures for which are rarely obtainable, is a new feature to be forthcoming. This state can easily supply its own needs in many lines, if the consumer will only realize the extent of the natural resources within our own borders. Much material is shipped in here from points outside of California that could be supplied from local sources, and in many cases of equal quality.

Museum.

Last October, following the convention of the American Mining Congress in Chicago at which a display of California's minerals was made (described elsewhere in this Chapter), the writer made a tour of inspection of the principal mineral museums of the United States and Canada. A particular study was made of their installations, the types and construction of cases, and systems of displaying the specimens. The following were visited: Colorado State Museum, and Colorado Museum of Natural History, Denver; Field Museum of Natural History, Chicago; Canadian Geological Survey, Ottawa, Canada; Agassiz Museum, Harvard University, Cambridge, Mass.; Boston Society of Natural History, Boston; American Museum of Natural History, New York; Smithsonian Institution (National Museum), Washington, D. C.; also some private collections in Boston and New York. It is hoped that in the near future we can put into effect in our own museum some features suggested by installations observed during that trip.

Each issue of the Monthly Chapter will contain a brief account of current museum activities. This will include a list of new acquisitions received with names of donors, a report of the number of visitors registered, and other items tending to keep the public advised of the advantages, from an educational standpoint, afforded by the excep-

tionally fine collection of rocks and minerals of both economic and academic value, comprising the 16,000 specimens on exhibit. The Museum contains not only one or more samples of practically every known mineral found in California, but hundreds of specimens from other states and foreign countries as well. An account of the arrangement and classification of specimens in this collection will be given in an early issue of 'Mining in California.'

Aside from its purely educational features, the Museum daily attracts throngs of tourists and travelers, and furnishes visual evidence of the immense mineral resources of California. The State Mining Bureau supplies a collection of forty typical minerals and ores, appropriately labeled, to any public school in the state upon request.

Mineral specimens suitable for exhibit purposes are solicited and their donation will be appreciated by the curator, as well as those who utilize the facilities of the collection.

Among the specimens received recently, and catalogued, for the Museum, are the following:

Nos. 19504 to 19516. Several varieties of polished *Jasper*, utilized for jewelry purposes. From Santa Clara County, California, by H. E. Harper, Santa Clara.

No. 19517. *Uraninite* or *Pitchblende* (uranate of uranyl). From the Kirk mine, Gilpin County, Colorado. Ore from this mine was shipped to Paris in 1900; and up to 1908 all of the radium there produced is stated to have come from 20 T. of high-grade ore from the Kirk mine. Wm. Beddig, donor, Oakland.

No. 19518. *Ferberite* (iron tungstate). From Nederland, Boulder County, Colorado, by Wm. Beddig, Oakland.

No. 19519. *Sphalerite* (zinc sulphide), 'triboluminescent' *Zincblende* variety. Shows light glow in darkness on scratching. From Mariposa County, California, by R. C. Papworth, Oakland.

No. 19520. *Magnesite* (magnesium carbonate). Showing characteristic conchoidal fracture. From Stanislaus County, California, by W. H. Cone, San Francisco.

No. 19521. *Gypsum* (hydrous calcium sulphate). High-grade, massive. From Imperial Gypsum Company's claims near Dixieland, Imperial County, California, by Walter Snook, Maricopa.

No. 19522. *Arsenolite* (arsenic trioxide), 'artificial.' From bag-house fume, Selby smelter, after burning through spontaneous combustion in collecting chambers. C. R. Hilton, donor, Modesto, California.

No. 19523. *Heterogenite* (hydrous cobalt oxide). From Yellow Pine Mining District, Clark County, Nevada, by Oliver E. Conner, Jr., Cleveland, Ohio.

No. 19524. *Copper Ore* (sulphides). From Clarke-Keller mine, Nevada County, California.

No. 19525. *Graphite* associated with pyrite and calcite in gold-bearing quartz, from Norwegian mine, Tuttletown, Tuolumne County, California, by R. Nelson, Tuttletown.

No. 19526. *Dumortierite* (basic aluminum silicate, with part of Al replaced by Bo), from Humboldt Queen Cañon, Pershing County, Nevada, by H. H. Dievendorff and L. D. Gassaway, San Francisco.

No. 19527. *Magnesite* (magnesium carbonate). High grade, massive. From Quinto claims, Stanislaus County, California, by A. D. Davenport, Gustine, California.

No. 19528. *Chiastolite* (var. of Andalusite) (aluminum silicate). From Lancaster, Massachusetts, by Boston Society of Natural History, Boston, Massachusetts.

No. 19529. Lockport *Dolomite* (Niagara group-Silurian). Rim rock of Niagara Falls. From Goat Island, Niagara Falls, New York, by Walter W. Bradley, Berkeley, California.

No. 19530. Mica *Schist* from corner of St. Nicholas ave. and 175th st., New York City, by Walter W. Bradley, Berkeley, California.

No. 19531. Mica-hornblende *Schist*, from foot of Bright Angel Trail, Grand Cañon of Colorado River, Arizona, by Walter W. Bradley, Berkeley, California.

No. 19532. *Sandstone* (red), from Supai formation (early Carboniferous, on Bright Angel Trail, Grand Cañon of Colorado River, Arizona, by Walter W. Bradley, Berkeley, California.

No. 19533. *Malachite* (basic copper carbonate) and *Chalocite* (copper glance), in quartz sand, cementing the grains of sand. From Navajo Indian Reservation, Coconino County, Arizona, by Lloyd C. Ashley, San Francisco, California.

No. 19534. *Iceland Spar* (var. of Calcite, calcium carbonate). Suitable for optical purposes. From near Cedarville, Modoc County, California, by J. D. Patterson, Cedarville, California.

No. 19535. *Chalcedony* (silica), pseudomorph after Barite, with associated bitumen. From Phipps quicksilver mine, San Benito County, California, by Walter W. Bradley, Berkeley, California.

No. 19536. *Gold Ore*, stated to assay over $200 per ton, from Moore mine, Jackson, Amador County, California, by Moore Mining Company, San Francisco, California.

No. 19537. *Witherite* (barium carbonate). Massive. From El Portal mine, Mariposa County, California, by M. C. Seagrave, San Francisco, California.

No. 19538. *Sandstone* pebbles. Water-worn. Flat shape due to jointage or bedding. From Cache Creek, Yolo County, California, by J. D. Bennett, San Francisco.

No. 19539. *Soapstone* (talc) (hydrous magnesium silicate). From near Shingle Springs, El Dorado County, California, by A. W. Prouty, Shingle Springs, California.

No. 19540. *Gold*, crystallized in quartz, from Duncan mine, near Hornitos, Mariposa County, California. Loaned by Dr. David Hadden, Oakland, California.

During the month a total of 371 visitors signed their names on the Museum register, and in addition there are frequently others who fail to take note of our request for their signatures.

LABORATORY.

Frank Sanborn, Petrologist.

The correct answers to the queries, What is it? and Has it any value?, questions concerning minerals sometimes incited by mere curiosity, but more often asked by those who have been pioneers in building up the mining and mineral industry of the state, have been the initial step in much of the development recorded in the past forty years.

The State Mining Bureau since its organization has supplied the necessary answer to thousands of cases without cost to the individual; and has been largely instrumental in bringing to light the minerals of both scientific interest and practical utility found in California.

The rapid increase in the number of structural and industrial minerals, and salines, whose character, use and value are seldom recognized without the aid of laboratory tests, has demonstrated the real need of this service.

The constant demand on the laboratory facilities in the past has been gratifying, but it is believed that their usefulness will be increased if the results of the work are published.

A monthly laboratory report, summarizing the determinations made, with notes on those of possible commercial value or scientific interest and other items, therefore appears in each issue of 'Mining in California.'

A list of those of possible value, judged from the sample submitted only, is appended.

The Bureau will supply the name and address of the party who sent in any sample listed, upon request, if the reference number is given.

05–30 Magnetite—contains gold
05–31 Gold ore, also platinum
05–32 Chalcedony—blue green gem stone
05–33 Sillimanite
05–34 Magnesite
05–35 Chromite, also andradite
05–36 Sodium sulphate
05–37 Gold bearing quartz
05–38 Gold bearing quartz
05–39 Chalcopyrite—contains gold
05–40 Lead-silver ore, also zinc sulphide with silver and gold
05–41 Manganese, lead and zinc with copper and silver
05–42 Gneiss with cuprite and chalcopyrite
05–43 Clay
05–44 Lead-copper ore—silver and gold present
05–45 Volcanic material — potassium present
05–46 Asbstos—amphibole variety
05–47 Soapstone
05–49 Marl—calcerous
05–50 Silver ore — pyragyrite, high grade, with some gold
05–51 Magnesite—high grade
05–52 Diatomaceous earth
05–53 Sulphur
05–54 Copper ore—gold and silver present
05–55 Barite
05–56 Gold bearing quartz
05–57 Iceland spar—optical grade
05–58 Gold ore
05–59 Pumice
05–60 Corundum—ruby, emery
05–61 Witherite
05–62 Chloropal
05–63 Pumice, also diatomaceous earth and limestone.
05–64 Limestone—good grade
05–65 Pyrophyllite
05–66 Mica—biotite
05–67 Scorodite
05–68 Silicified material, with salts of potassium
05–69 Sand—contains gold
05–70 Thenardite
05–71 Soapstone
05–72 Manganese oxide
05–73 Clay
05–74 Magnetite
05–75 Clay—burns white, also feldspar
05–76 Manganese oxide
05–77 Talc—contains iron sulphide

During the thirty-day period 244 samples were received and determined. In addition to these there were 12 samples brought to the laboratory by people who sought information of an unusual nature, such as the results obtained by fusing an ore with a particular flux, etc. A small percentage of the samples received each month are interesting in a mineralogical if not in a commercial way. Of two such samples received one was a massive impure scorodite (hydrous ferric arsenate) locality not stated; and the second contained true corundum, ruby, crystals disseminated through limestone. The latter came from the Baldy Mountains in San Bernardino County, and judging from the sample submitted, it is possible that the gem variety of corundum, ruby and sapphire, may be found in the deposit. This occurrence is similar to that in which gem rubies are found in Burma. The crystals in the sample received lacked size, only, to make them of commercial value.

For a number of years, a 'mysterious white metal' has been reported at irregular intervals from several localities in California, but particularly from the 'lava beds' area of Modoc and Lassen counties. In recent months this subject has been given special attention in the laboratory of the State Mining Bureau and by the U. S. Bureau of Mines Experiment Station at Reno, Nevada. The correspondence quoted herewith shows the conclusions reached, and should retire the ghost of this 'mysterious metal,' at once and for all time:

"California State Mining Bureau

San Francisco, California, February 4, 1922.

"Dr. S. C. Lind,
Supt. U. S. Bureau of Mines Experiment Station,
Reno, Nevada.

re 'white metal' investigation:

Dear Sir: "As stated in our letter of April 11, 1921, this subject has come to the attention of the laboratory of the State Mining Bureau at various times during the past twenty years or more. Until recently the samples submitted came entirely from the northern end of the state, particularly Lassen and Modoc counties, and they have invariably been basic igneous rocks, mainly basalt.

"In no case have we been able to reduce or produce any 'white metal' from the materials submitted. Of a number of samples investigated and analyzed, it was noted that the material usually contained rock-forming minerals which rendered the rock rather easily fusible, also the element titanium was present. From the behavior under these tests, our present chemist, Mr. Frank Sanborn, suggests that in fusing the rocks in question it is possible that a piece of iron coming in contact with the molten mass would have a crude iron-alloy formed on the surface—possibly ferro-silicon or a complex ferro-alloy. His conclusion is that the so-called 'white metal' is probably such an alloy.

"He also learned that a friend of his, Mr. C. F. Sherwood, 503 Market street, San Francisco, spent considerable time and money in 1920–21, investigating this 'mysterious metal,' or 'white metal' in hopes that he could form a hard steel with acid-resisting properties suitable for mine pumps, cyanide filters, etc. The rock came from Modoc County, California. The following is a copy of a complete analysis made on this material by Walter L. Gibson, Oakland, Cal.:

"Walter L. Gibson,
successor to
Assay Office, Chemical Laboratory,
824 Washington Street,

Oakland, Cal., September 16, 1920.

"The Oliver Sherwood Company,
503 Market street,
San Francisco, California.

Gentlemen: "A sack of rock deposited by you at this laboratory for analysis, further known as Lab. 69482, gave the following results:

Silica	44.50%	
Sulphur	0.27	Combined as FeS_2
Iron	0.23	
Iron oxide (Fe_2O_3)	9.89	
Iron oxide (FeO)	7.55	
Alumina	10.51	
Lime	10.00	
Magnesia	3.82	
Titanium oxide (TiO_2)	2.00	
Phosphoric acid	0.90	
Water @ 100 C	2.30	
Water above 100 C	2.00	
Potassium oxide (K_2O)	0.57	
Sodium oxide (Na_2O)	5.10	
Carbonic acid gas (CO_2)	Trace	
Nickel	Trace	
Total	99.64%	

(Signed) Walter L. Gibson."

"Mr. Sherwood informed our Mr. Sanborn that his investigations did not yield any results of practical value.

"On several occasions during the past eighteen months when such rocks have come to the State Mining Bureau for identification, we have written the parties, asking for a sample of the metal said to have been reduced; but we have not yet

received any in reply. Recently, however, a sample was brought in by a party who had become 'interested in the mysterious metal.' He had a generous sample of the rock and some of the metal claimed to have been reduced from it. This metal resembled the skimmings from a mass of molten solder, and proved to consist mainly of lead with impurities (apparently tin, copper, etc.). This metal could not have come from the rock that was submitted for identification.

"Dr. A. S. Eakle, professor of mineralogy, University of California, states that in the summer of 1915 while in Mono County, California, near Topaz, an occurrence of such a 'white metal' ore was reported to him and that he gathered some samples of the rock which proved to be quartzite containing pyrite. His informant repeated his experiments in Dr. Eakle's presence; and although not as successful in obtaining an actual reduction of metal as in his reported tests, Dr. Eakle says that the following had probably occurred: As the material was heated in a blacksmith's forge, there was plenty of carbon (coal or coke) present to reduce some iron from the pyrite. The iron may have alloyed with some silica to form ferrosilicon, or with some carbon to form steel. The hole made in the shovel in the reported tests may have been made by the sulphur attacking the shovel rendering it brittle at the point of attack or the forge blast may have burned a hole through if the shovel was worn thin.

"Under separate cover we are mailing you samples of rocks from two localities received at this office as yielding the 'white metal.' Needless to say, we found none such in either sample. As our laboratory is equipped for qualitative work only, we are limited in our scope when it comes to research work.

"We will appreciate copies of your report when you have completed these investigations.

Very truly yours,

(Signed) FLETCHER HAMILTON,
State Mineralogist."

"DEPARTMENT OF THE INTERIOR
Bureau of Mines
Rare and Precious Metals Experiment Station,
Reno, Nevada.

February 10, 1922.

"MR. FLETCHER HAMILTON,
State Mineralogist,
San Francisco, California.

DEAR SIR: "I am very much indebted for your letter of February 4th on this subject. The question of 'white metal' has also been brought to our attention repeatedly during the past several years.

"At one time in Colorado we examined very carefully a specimen of rock supposed to contain 'white metal' and were unable to detect anything which should give the properties alleged to iron. Since coming to Nevada, we have reviewed the whole subject very carefully with the Mackay School of Mines, and consulted other authorities. The consensus of opinion seemed to be that there was nothing in the claims whatsoever, and we decided that the problem was not worthy of further investigation and made no publication on the subject.

"If unusual properties are imparted to iron in forging it in the presence of such rock we believe that they are due to the heat treatment and also that a surface alloy may be formed, as suggested by Dr. A. S. Eakle, quoted in your letter.

"We do not propose to make any investigation of the present sample from Modoc County, as we had long ago decided the subject does not merit further work, and we are very pleased to be confirmed in this view by your opinion."

Very sincerely yours,

(Signed) S. C. LIND,
Superintendent.

LIBRARY.

E. Cooney, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received during the month, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the state are avaliable for reference.

The library and reading room are open to the public during the usual office hours when the librarian may be freely called upon for all necessary assistance.

Official Publications Received.

Governmental.

Smithsonian Institution—United States National Museum, Annual Report 1921.
Smithsonian Institution—United States National Museum, Vol. 24, Pt. 1; New Plants from Guatemala and Honduras.
Smithsonian Institution—United States National Museum, Vol. 12.
United States Commerce Reports
Philippine Journal of Science, August 1921.
Philippine Journal of Science, October 1921.
Kentucky Geological Survey—Vol. IV, Geology of the Golconda Quadrangle.
Canada Department of Mines—Mines Branch, Annual Report, 1920.
Western Australia Geological Survey—Bulletin No. 78, The Mining Geology of Kookynie, Niagara and Taulpa, North Coolgardie Goldfield.
Bulletin No. 78—The Mining Geology of Comet, Vale and Goongarrie, North Coolgardie Goldfield.
Bulletin No. 80.—The Mining Centers of Junius and Jasper Hill, Murchison Goldfield.
Bulletin No. 81.—The Geology and Mineral Resources of the Yalgoo Goldfield.
Boletin Minero—Mexico.
Boletin del Petroleo—Mexico.
Boletin No. 14, Estadistica Minera de la Republic—Argentine.
Boletin No. 4, Sumaria—Argentine.
Geologicas el La Precordillera—Argentine.

Scientific Societies and Educational Institutions.

California Academy of Science, Proceedings—Vol. XI, Nos. 7-8-9-10-11-12-13-14-15-16-17.
Philadelphia Academy of Natural Sciences, Annual Report.
Royal Society of South Australia, Transactions and Proceedings.
Mining and Metallurgical Society of America—Bulletin No. 152.

Official Publications Received—Governmental—continued.

Canadian Institute of Mining and Metallurgy, Bulletin.
Institute of Mining and Metallurgy, London—Bulletin, January 1922.
Schools of Mines and Metallurgy, University of Missouri—Bulletin, the Problem of the St. Peter Sandstone, August 1921.

Books.

Field Methods in Petroleum Geology, by Cox, Dake and Mulenburg.
The Examination of Petroleum, by Hamor and Padgett.

Maps.

U. S. Geological Survey—Orangedale School Quadrangle, Fresno County, Cal.

PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of consumers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

Sufficient publicity has not heretofore been given to this feature of the Bureau's work, but in 'Mining in California' a suitable medium is provided for current inquiries of this nature, and therefore, written or verbal inquiries that come to the attention of the Bureau are summarized in each issue.

The name of the product wanted or offered, only, is published; the name of the owner of the deposit, or buyer, and other details being supplied upon request.

In writing, the reference number of the item should be given.

Mineral products or deposits for which a market is sought.

02–35 Silica—high grade lode quartz; now shipping
02–36 Asbestos fiber—lower grades
02–37 Molybdenite
02–38 Cinnabar deposit—new discovery; large
02–39 Gold prospect—San Bernardino County
02–40 Asbestos fiber
02–41 Pottery clay
02–42 Gypsum deposit—in New Mexico
02–43 Potash feldspar—large deposit
02–44 Ochre
02–45 Barytes—Assay: $BaSO_4$–95.98; SiO_2–2.24; Al_2O_3–.29; Fe_2O_3–.25; CaO–1.14 MgO–.44
02–46 Asbestos deposit

Mineral products or deposits wanted.

03–28 Talc—powdered or sawed into pencils; carload lots.
03–29 Feldspar—in Northern California
03–30 Limestone—deposits tributary to Porterville
03–31 Pottery clay, ball clay and fire clay—will test samples of clay from any deposit in California
03–32 'Dash'—$\frac{3}{8}$-inch screened crushed rock for stucco
03–33 Natural gas—for manufacture of carbon black
03–34 Barite and cobalt—deposits
03–35 Silica
03–36 Asbestos—amphibole

EMPLOYMENT SERVICE.

Following close upon the establishment of the Mining Division branch offices, in 1919 a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

The Bureau contemplates registering technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

A list of applicants for positions and 'positions open,' received by the Bureau during each 30-day period preceding the date of publication of the Monthly Chapter, is carried in each issue.

Each notice is designated by a key number, and communications sent to the Bureau in reply to any notice will be forwarded to the proper party without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau, to avoid possible loss.

Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

01–4 Superintendent. Age 45. Married. Eighteen years experience, California, South Dakota and Alaska, in dredging, hydraulic and lode mining. Last 10 years superintendent and general superintendent. References. Salary wanted $250.

01–5 Assayer and Chemist. Age 26. Single. Four years experience assayer and chemist; 2 years chemist, cement plant; 2 years chemist, copper company; 2 years in United States Army. References. Salary wanted $175.

BUREAU PUBLICATIONS.

During the past forty-two years, in carrying out the provisions of the organic act creating the California State Mining Bureau, there have been published many reports, bulletins and maps which go to make up a library of detailed information on the mineral industry of the state, a large part of which could not be duplicated from any other source.

One feature that has added to the popularity of the publications is that many of them have been distributed without cost to the public, and even the more elaborate ones have been sold at a price which barely covers the cost of printing.

Owing to the fact that funds for the advancing of the work of this department have often been limited, many of the reports and bulletins mentioned were printed in limited editions which are now entirely exhausted.

Copies of such publications are available, however, in the Bureau's offices in the Ferry Building, San Francisco; Pacific Finance Building, Los Angeles; in Santa Maria; Santa Paula; Coalinga; Taft; Bakersfield; Auburn and Redding. They may also be found in many public, private and technical libraries in California and other states, and foreign countries.

A catalog of all the publications of the Bureau from 1880 to 1917, giving a synopsis of their contents, is issued as Bulletin No. 77.

A list of the above, most of which are out of print, and another of those still in stock, for free distribution or sale, revised to the date of publication, appears in each issue of 'Mining in California.'

Publications in stock may be obtained by addressing any of the offices of the State Mining Bureau, and enclosing the requisite amount in the case of publications that have a list price. The Bureau is authorized to receive only coin, stamps or money orders, and it will be appreciated if remittance is made in this manner rather than by personal check.

MARCH, 1922

REPORT XVIII OF THE STATE MINERALOGIST

DISTRICT REPORTS OF MINING ENGINEERS.

In 1919-1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each division working out from a local branch office.

This move brought the Bureau into close personal contact with operators, but did not materially shorten the time between the gathering of data in the field and their publication in the Report of the State Mineralogist at the end of an annual or biennial period.

Mining activities and development noted by district engineers in their respective fields are now embodied in monthly reports published in each issue of 'Mining in California,' thus making these data available within a maximum period of thirty days, and the Monthly Chapter as far as possible a compendium of current mining progress throughout the State.

The counties included in each field division and the location of the local offices are shown on the accompanying outline map of the State. (Frontispiece.)

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the State's oil fields is included under this heading.

REDDING FIELD DIVISION.

W. B. Tucker, Mining Engineer.

Shasta County.

The Mascot and *West End group of mines,* situated in the Shasta Mining District, near Whiskytown, have recently been bonded to C. D. Jones and Company of Los Angeles. W. M. Parsons is directing the development work.

It is reported that the *United States Smelting, Refining and Mining Company,* owner of the Mammoth mine and smelter at Kennett, is negotiating for the purchase of the Balaklala mine.

At the *Gladstone mine* in the French Gulch Mining District the drifts and tunnels above the 300-foot level have been cleaned out and retimbered. Ore production has commenced, and ten stamps of the thirty-stamp mill are being overhauled to start milling operations.

The Mount Shasta Silica Company of Weed has been incorporated to develop and mine a large deposit of diatomaceous earth. The deposit is located in the northeastern part of Shasta County, close to the line of the Pacific Gas and Electric Company's railroad from Bartle to Pit River. Nineteen placer locations have been made by the company.

Siskiyou County.

The Lone Pine mine, situated in Squaw Gulch near Cecilville, is being operated by John Maxwell and Chas. Morgan. A tunnel is being driven to cut the vein, at a point where intersecting gold-bearing stringers meet the main ledge.

S. Carpenter and *E. M. Robertson* have started a drift in the gravel bar at the junction of the East and South Forks of Salmon River to cut the back channel in the South Fork run.

Lewis Roff, Almond Strickling and Archie Farnsworth have leased a portion of the *Conzetti Placer mine*, on the South Fork of Salmon River, and are hydraulicking.

W. L. Tickner and *A. G. Brown* are hydraulicking on the East Fork of Salmon River across from the workings on Shadow Creek Flat.

The Cub Bear mine, 12 miles southeast of Etna Mills, has resumed operations. F. A. Gowing of Berkeley is opening up the *Mountain Laurel* and the *Gold Ball Group* of mines near Sawyers Bar.

The Highland mine, 12 miles west of Callahan, is being operated by Herman Mattern of Ashland, Oregon.

Trinity County.

Several placer companies, including dredging, hydraulic and drift, are preparing to resume mining operations along the Trinity River and tributary streams. The active territory includes areas near Weaverville, Junction City and Minersville. The lease of ten acres on the Paulsen ranch, near Lewiston, held by the *Bablew Mining Company* of Los Angeles, has been acquired by the *American-Italian Hydraulic Company*. The new operators have arranged to work the ground with monitors, operating under a head of 100 feet of water from Rush Creek. A large deposit of gold-bearing gravel has been demonstrated, and hydraulicking will start as soon as the banks have been loosened by dynamite. E. A. S. Whittard has charge of operations for the company.

The Union Hydraulic mine near Weaverville has been leased by T. B. Arbuckle, and it is reported that the *Lorenz Hydraulic mine*, a short distance from Weaverville, is under operation.

AUBURN FIELD DIVISION.

C. A. Logan, Mining Engineer.

Calaveras County.

There has been little change in the mining situation in this county during the past three months outside of the favorable developments in the deep levels of the Melones mine, where the Carson Hill Gold Mines, Inc., has been operating.

Angels Camp Deep Mining Company is reliably stated to have spent $90,000 on the mine and $45,000 on the mill up to July 1, 1921.

On the 200-level from the Pioneer Shaft they ran 375 feet, of which 165 feet was on a formation averaging six feet wide, but of too low average grade to pay for milling. On the south end of this drift a crosscut was run and a raise put up to connect with the Hale Shaft. A prospect of good grade which was left by former operators in the Hale Shaft is said to pinch 12 feet below the old sump. On the 400-level from the Pioneer Shaft, only a little crosscutting was done. On the 500-level, a total of 750 feet of crosscuts were run. A crosscut 530 feet long was run to find the lead opened on the 200-level. A formation 32 feet wide was encountered and drifted on for 230 feet, but little ore

was found; the question has been raised as to whether this drift was carried far enough south. Early in March it was reported that the company is to be reorganized under the name of the *California Exploration Company*. They are said to be planning to resume sinking the two shafts.

Bullion Hill Mining Company, six miles north of Murphy, continues operation in good ore. A formation carrying lens-shaped ore bodies is being mined now for a length of 135 feet above the adit level, which is 1287 feet long. It is planned to begin sinking a shaft near the face of the adit soon. The five-stamp mill has been turning out over $5,000 a month since milling began, according to the company's officials. Development is being delayed on account of a pending law suit.

Carson Hill Gold Mines, Inc., has purchased Melones mine and plant, with the exception of the power system, for a cash price of $450,000, according to A. D. Stevenot, superintendent. The Melones winze has been sunk to 4000 feet depth, and Mr. Stevenot states that very good ore has been opened and is being drifted on at this depth. The company's plant of 30 stamps and three Hardinge mills is now crushing slightly over 16,000 tons of ore a month. Operating costs have been considerably reduced during the past year.

Calaveras Copper Company is employing only two or three men on development work underground.

Operation has been resumed at the *Sanguinetti Gravel mine* near Vallecita following the installation of a larger pump.

At the *Tanner mine* near Murphy two stamps are running part time on ore taken from development.

Work has been resumed at the *Triple Lode mine*, west of Altaville. A heavier hoist has been installed and underground exploration is going on.

Pacific Asbestos Corporation is the successor of the California Asbestos Company, American Asbestos Company, American Asbestos and Manufacturing Company and the Asbestos Producing Company of California, which in succession since 1904 have made efforts to exploit the property. The company owns 310 acres of patented land and has options on 300 acres adjoining it, in Secs. 15, 16 and 21, T. 1 N., R. 13 E., on the west side of North Fork of Stanislaus River. J. A. Voorhies, manager, 631 Phelan Building, San Francisco.

One thousand feet south of the north end of the property No. 3 adit has been driven north in the serpentine about 170 feet. This shows a good prospect of chrysotile asbestos. Between 200 and 300 feet south of this portal is a shaft now open about 30 feet deep on the west side of the asbestos zone, and 300 feet east of it is a cut and tunnel 40 feet long. Both these show good asbestos prospects. Fifteen hundred feet south of these and 250 feet lower on the side of the river canyon, No. 1 adit has been driven about 250 feet; it is in harder serpentine which does not carry asbestos in the same amount as in the upper workings, although the fiber is in evidence on the surface between the workings. No. 2 adit is 80 feet long and a little above No. 1.

The upper workings mentioned above indicate a promising asbestos-bearing area about 500 feet long and 300 feet wide. The company's

engineer, W. J. Woolsey, claims that they have an area 2500 feet long north and south by 1000 feet east and west which is indicated to carry enough asbestos to pay a profit, but this was not all covered by the writer. Mill runs made some years ago are said to have shown about 5% fiber in rock taken from No. 3 adit. The fiber ranges up to one inch in length and appears to be of good quality.

Improvements and equipment include a concrete-covered camp building, ammonia refrigeration plant, 3-drill air compressor, 3 air drills, 2500 feet of air pipe line, blacksmith shop, 4 ore cars, 600 feet of track, electric motors of a total of 200 h. p., 3 miles of 17,000-volt electric line and some asbestos milling and screening machinery from a small mill formerly used experimentally. The company hopes to have a new mill in operation during the present summer, but have not yet begun construction. The property is seven miles from Copperopolis and about the same distance from the railroad at Chinese, which could be reached by bridging the river and repairing an old stage road.

At the *Victor Gravel mine* cemented gravel has been struck, and the company is contemplating erecting a mill.

Other gravel mines in which there is a probability of work being resumed the coming spring are the *Ozark, Bard Hill and Slab Ranch.*

Tuolumne County.

Much activity in reopening old mines and prospects has been evident in this county during the past year. Unfortunately, some of this work has been halted inopportunely after the spending of considerable money for unwatering, repairing and surface plants.

Alabama and *Crystalline mines* at Jamestown are under option to the *Tonopah Mining Company.* The old Crystalline Shaft, 600 feet deep, is being fitted with a new headframe. It will be unwatered and repaired and the old workings investigated. There are two levels driven from this shaft at depths of 283 and 593 feet, respectively, with 3000 feet or more of crosscuts and drifts. The mine is equipped with a good hoist, steam plant and old mill. Electric power will be used. T. C. Black is superintendent.

Belmont Shawmut mine is in operation with 30 stamps of the mill running. A crew of 50 to 60 men are employed underground in sinking and development. A cyanide plant has been put up and is in operation.

Bonanza mine in Sonora was unwatered recently, but activity has been suspended, with practically no new work done underground. There is said to be hope for a resumption of work soon.

Chileno, Santissima, Rice, Stocker, Wilson and *Means, J. A. Gillis, Last Chance, Pine Tree* and *Carrington* claims and other locations on Jackass Hill near Tuttletown are under option to *Nevada Wonder Mining Company,* for whom T. C. Black is superintendent. The Chileno Shaft was down 175 feet when visited March 8 and is to be sunk to 450 feet as soon as possible, according to present plans. A crosscut tunnel is also being driven to explore the hill. The Chileno vein is a stringer lead of quartz and calcite in highly silicified amphibolite schist to the east of the mother lode. Where drifted on at about 150 feet depth the prospect is said to be good. The shaft passes into the footwall at about this depth.

The Chileno is equipped with hoist, 50 h. p. motor, compressor with 75 h. p. motor, and shop. Three shifts are employed in sinking.

Clio mine near Jacksonville on Tuolumne River continues in operation with a few men.

Harriman mine on Tuolumne River near Jacksonville has been undergoing development during the past year with encouraging prospects. Willis Lawrence is in charge as superintendent for a Delaware company.

National mine, in Secs. 23 and 26, T. 1 S., R. 15 E., is being developed under the direction of Robert Thom. The main adit has been run 400 feet with a drift 150 feet east from adit on the Contact Vein, which is a stringer lead on the contact of Calaveras formation and amphibolite schist. This is at a depth of 100 feet. A shaft has been sunk 125 feet below main adit at the face, giving a depth of 250 feet on a vein called the Slate Vein and a drift has been run 25 feet at a depth of 100 feet below the adit.

The mine has a 5-ft. Huntington mill, 3-drill compressor, air hoist, 50 h. p. gas engine and boarding house. There are also ten stamps that have not been erected.

Patterson mine, H. L. Huston, president. R. F. Lewis, secretary. Office, 485 California Street, San Francisco, California. This mine has been completely equipped with a mill and surface plant, and during the past two years a good deal of underground work has been done. The property formerly worked as the Patterson, together with a number of adjacent claims held under option, covers 4700 feet along the strike of the Patterson Vein, with a parallel vein, the Lennan, slightly developed. In the North Shaft the levels down to and including the sixth have been cleaned out and the 4th- and 6th-levels have been extended north. From the South Shaft the 160-level has been run 385 feet south and the 260-level has been run 120 feet south. From the 6th-level in North Shaft crosscuts were driven from the south drift and connection made with the South Shaft. Superintendent A. L. Witney states the Patterson fissure has been opened for a total length of 2200 feet, not, however, continuously nor all in ore. Two lenses of ore have been opened from the South Shaft, according to Witney, one of which he says is 147 feet long and of excellent grade. A depth of 385 feet on the dip of Lennan Vein was reached and it was drifted on in ore for 40 feet on the 400-level. This vein is said to be virgin to the surface, where good prospects are claimed for it.

A stope was started on one ore shoot and about 2700 tons were run through the mill. As this came out in the course of preliminary work, it unavoidably contained a large proportion of waste.

The mine is equipped with a double-drum hoist, 75 h. p. motor, at the main (North) shaft, 2 compressors each with 100 h. p. motor, Wheeler rock breaker with 30 h. p. motor and a small breaker, with a 200-ton storage bin under the crushers. Ore is trammed through a tunnel from this bin to the mill bins. There is a change house for 30 men, a timber-framing shed, 10,000-gallon water tank, office and assay office. In the mill there are 20 heavy stamps, run by a 50 h. p. motor, 14 ft. plates, 5 concentrating tables run by 15 h. p. motor, and clean-up

ball mill. A partly built cyanide plant contains 7 new redwood tanks and some machinery. It is hoped that the suspension of work is only temporary.

At the *Rawhide mine* some superficial work was done in the summer of 1921. Quite a sum of money was spent without accomplishing much, as the promoters were disappointed in the expectation of developing a new ore shoot. It appears that they were too sanguine regarding a prospect of free gold which they found on the surface. A small Gibson Mill was used for crushing a little rock, but the old works were not repaired.

Santa Ysabel mine (Nyman Consolidated) is 2½ miles southeast of Jamestown on Quartz Mountain. Repair work and reopening of the old workings has been under way at this property under the direction of W. W. Hurt.

Springfield Tunnel and Development Company has been delayed longer than expected in opening up the gravel in their claims under Table Mountain. A good prospect was reported several years ago in a shaft, but the water could not be controlled. A long drain tunnel has been driven to carry off this water. In approaching the old shaft with this tunnel, bad ground is said to have been struck and the work of draining the water has been slow, but it is believed the objective will be reached very soon.

Work has lately been started on the *Parole mine*, 3 miles north of Soulsbyville, and on the *Basin Slope* claims east of the North Fork of Tuolumne River. Early operation has also been promised at the *Hidden Treasure, Spring Gulch* and *Paymaster* on the East Belt southeast of Tuolumne, and at the *Verdun* claims on the Mother Lode near Stevens Bar bridge. A Keystone drill has been taken to the Russell Ranch in the Mountain Pass district to prospect for gravel.

SAN FRANCISCO FIELD DIVISION.

C. McK. Laizure, Mining Engineer.

Field trips were taken during the past month into Santa Clara County and through portions of Stanislaus, Madera, Merced and Fresno, lying in the San Joaquin Valley.

Conditions in general relative to the mineral industry in these regions were found to be rather quiet, although various plans for new development are only waiting on favorable weather and improvement in roads which will come with the dry season.

The following notes touch upon activities not previously recorded by the Bureau, or on changes which have taken place since last visited by a representative of this office.

Fresno County.

Mrs. Alice D. Hines, 1019 N Street, Fresno, California, owns three gypsum claims, 18 miles west of Dos Palos, containing a deposit of what is said to be high-grade material.

The property is equipped with a small grinding plant and necessary camp buildings.

Plans were completed by Mr. Hines for placing this property on an active producing basis, but were not consummated on account of his death some time ago. The entire group of claims, together with all equipment, is now offered for sale or lease.

Madera County.

Minarets and Western R. R., T. O. Russell, consulting engineer, 1514 H Street, Fresno, California.

The construction of this railroad by the *Sugar Pine Lumber Company of California*, while intended primarily as a lumber road for the use of the company, is of interest to the mining public, as it will be a common carrier, and when completed will be ready to accept all business offered.

Work is now being carried on from eight construction camps located at various points along the right of way.

The road will be about 56 miles long. It starts at Friant, Fresno County, but extends back into the high Sierras altogether in Madera County, traversing T. 10 S., R. 21 E.; T. 9 S., R. 21 E.; T. 8 S., R. 22 E., and terminating in the west half of T. 7 S., R. 23 E.

This entire district is more or less mineralized, but large-scale development has been retarded by lack of transportation facilities.

Among the mining towns which will be within a very short distance of this railroad are O'Neals, Coarse Gold and Fresno Flats.

The immense undeveloped iron ore deposits in the Minarets and in the vicinity of Mt. Raymond are also placed in a position where their exploitation would be much more feasible than it has been in the past.

It is understood that the contracting company which is building the railroad has given bonds guaranteeing its completion not later than April 1, 1923.

Jas. O. Rue, Box 665, Madera, California, has located a deposit of what appears from surface indications to be pure calcite in the Kaiser Mountain district, about 1½ miles from the Huntington Lake road. According to Mr. Rue, there would be no stripping necessary to work this deposit, the croppings of which are calcite crystals which resemble a mass of rock salt.

No development work has as yet been undertaken, but the width of the deposit is said to average 1200 ft. and has been traced along the strike for over a mile.

Merced County.

California Pottery Company, whose new plant at Merced was noted in the January Chapter, has met with such success that it is reported that plans are now under way to increase the installation from four kilns, now operating, to sixteen, in the near future.

The activity in building and the consequent demand for structural tile in the San Joaquin Valley is held responsible for the expansion of the pottery company's activities.

Santa Clara County.

Bernal Marl Fertilizer Company, Jas. A. Gantier, manager, 100 Grant Street, San Jose, California. L. W. Stetson, sales manager, care Hunt, Hatch and Company, Oakland, California.

This company owns and operates a limestone quarry on the east slope of the Santa Teresa Mountains, three miles by road southwest of Edenvale.

The limestone bed covers about 100 acres, and according to test drill holes averages over 200 feet thick. It varies in character from a calcareous marl containing an abundance of shells to a fine grained bluish gray limestone.

This material is quarried for use as a fertilizer or soil corrective, equipment at the quarry consisting of a P. & H. gasoline-driven excavator mounted on caterpillar trucks, the rock being hauled to the mill, a distance of about one-quarter mile, by truck.

The mill, which has just been enlarged and rebuilt, is arranged as follows:

The marl passes from the receiving bins by means of a mechanical automatic feeder to a Williams Hammer Mill, which will take sizes up to 30″ x 24″. It is steam jacketed so that the product is thoroughly dried while being crushed. Driven by 200 h. p. motor at high speed, and said to have a capacity of 500 tons in 24 hours.

The crushed material is taken by belt conveyor from the hammer mill to a Hummer Shaking Screen, which delivers product through 80 mesh to a patent sacker, from whence it is trucked about 1½ miles to the railroad.

Oversize from the Hummer screen is passed through a Williams Pulverizer and then to the sacking machine, and a certain amount of impalpable dust created at the screen is drawn off by a suction fan and sacked separately. This 'dust' is said to have peculiar properties, on account of its extreme fineness, which make it more valuable than the ordinary finished product.

A total of 500 h. p. of electric energy is consumed throughout the plant. Future plans of the company include the construction of a spur track from the main line of the Southern Pacific Railroad south of Edenvale and the installation of a tram line from the quarry to the mill, thus doing away with truck haulage both with the raw material and finished product.

The demand for agricultural limestone and marl, or 'Agstone,' as mentioned in a special article on another page of this publication, is rapidly increasing and it is believed that this industry has a promising future.

Stanislaus County.

Yankee Hill Gold Mining Company's dredge, described in Report XVII of the State Mineralogist, p. 254, has been sold to the *Quartz Creek Dredging Company* of Lewiston, Idaho.

This dredger was launched in May, 1920, but soon after digging operations were started it was torn from its moorings in the Stanislaus River, about 1½ miles below Knights Ferry, by a freshet, and has laid ever since on a sand bar above Orange Blossom bridge, east of Oakdale.

It is understood that the Idaho company will dismantle the dredge and remove the machinery.

LOS ANGELES FIELD DIVISION.

M. A. Newman, Mining Engineer.

Imperial County.

A large deposit of limestone has been located by *John Agnall* of Oasis, Imperial County. The deposit lies about six miles southwest from Oasis, and is within two miles of the State Highway. There is easily visible a tonnage of five million. The limestone body is underlaid by granite. Several samples of the limestone showed on analysis better than 90% $CaCo_3$.

Kern and San Bernardino counties.

There is no mining camp today that merits the attention of the public in general, and the mining public in particular, more than the Randsburg district, which as used here includes Randsburg, Johannesburg and Atolia.

Born as a gold camp the last decade of the nineteenth century, it produced close to $15,000,000, up to the beginning of the World War. Gold mining then almost disappeared, due to high costs, but when conditions looked worst the war demand for tungsten resulted in at least a $10,000,000 production of this metal from the district. With the war over, further mining of tungsten proved unprofitable, and prospects for the district looked far from rosy. At this most critical period, however, Randsburg was rejuvenated by Ham Williams' discovery of the Kelly mine, officially known as the California Rand Silver, Inc.

There are now 24 companies in the district. Of these, 14 are sinking shafts and all appear properly financed for real, legitimate mining.

The following is a list of these companies:

Bojo Mining Company; five claims; Baumgarden brothers and W. W. Leidley, Bakersfield. E. Hollowell, superintendent.

California Rand Silver, Inc.; Charles E. Meroney, general manager; Alfred Harrell, president.

Coalinga Mining Association; four claims. B. B. Eldren, superintendent.

Comstock Rand; five claims. Boca and Benko.

Grand Eagle Mining Company; six claims. A. H. Dixon, president. A. B. Day, superintendent.

Hidden Vault Hillside Mining Company; one claim, 120-acre placer. J. J. Kelly, general manager.

Kelly Rand Extension; one claim. J. C. Walser, president. A. C. Tupman, secretary.

Kern Rand Silver Mining Company; 11 claims. J. B. Dorsey, president. William Quackenbush, general manager.

Middle Rand Silver Mining Company; 15 claims. A. H. Swallow, president. M. Albertoli, superintendent.

Mizpah-Montana Mining Company; two claims. Riley Hughes, general manager.

Mojave Rand Mining Company; six claims. J. T. Martin, superintendent.

Monarch Mining Company; 16 claims. A. T. Kisselburg, president.

Myra Queen Mining Company; six claims. W. C. Borchers, president. George A. Hill, superintendent.

North Rand Silver, Incorporated; eight claims. W. J. Quackenbush, president. W. J. Williams, general manager.

Vienna Mining Company; 1 claim. G. A. Peer, president. J. T. McGillis, superintendent.

Pittsburgh-Mount Shasta Mining Company; seven claims. T. B. Scott, president. D. A. McCormick, superintendent.

Randsburg Silver Mining Company; three claims. J. W. Kelly, president. H. Alderson, superintendent.

Rand Silver Mining Company; three claims. B. R. Bray, president. Mr. Fitzgerald, superintendent.

Silver Bar Mining Company; two claims. C. F. Johnson, trustee.

Silver King Mining Company; four claims. Ed Gallaher, general manager.

Silver Lake Mining Company; 14 claims. S. H. Norris, president.

Silver Moon Mining Company; one claim. George Gallaher, general manager.

Silver Reef claims of Flynn and Elkins.

Silver Wave Mining Company; nine claims. Ross C. Miller, president. Kent S. Knowlton, secretary.

Stampeder Mining Company; six claims. Floyd Barnett, owner.

Wildcat Mining Company; four claims. Grady and Sill, owners.

Gold properties.

Yellow Aster Mining and Milling Company; J. C. Nicholson, general manager.

King Solomon Mines Company; J. Shipsey, general manager.

Baltic Mining Company.

Pinmore Mining Company.

Phoenix Mining Company; Mrs. Rose L. Murcham, owner.

These companies now employ close to 400 men, of which 125 are credited to the California Rand Silver, Inc.

The geology of the Randsburg Quadrangle is ably presented in Bulletin No. 430-A of the United States Geological Survey, by Frank L. Hess, and it is recommended to all interested in the region.

Mr. Ed Smith is developing a promising gold prospect a few miles from Afton Station on the Salt Lake Railway.

The unit system of oil financing introduced by Fred B. Foster Company, Texas operators, has been extended into the mining business by the A. M. Fuller Company, owners of the *Silver Dyke Mining Syndicate*, whose property is situated in the Rand mining district, Kern County.

The claims are located near the 'Kelly Mine' of the California Rand Silver, Inc., and other valuable properties.

The syndicate fractional parts are called 'mineral assignments,' instead of 'units' as in the oil business. These are being marketed at $100 each, there being 2000 all told. The owner of one assignment gets 1-2000th of the production, less the same proportion of the actual expense of operation.

San Diego County.

It is reported that work will be resumed in the near future on the *Chariot mine* in the Julian Mining District of the Cuyamaca Mountains.

OIL FIELD DEVELOPMENT OPERATIONS.

R. E. Collom, State Oil and Gas Supervisor.

Kern County.

Balboa Oil Company, in Section 24, T. 31 S., R. 23 E., M. D. B. and M., reports an excellent showing of oil at about 3000 feet in well No. 1. 8¼-inch casing was cemented at 2913 feet.

On account of surplus of production and the rapid filling of storage, several of the larger companies in the Midway district have curtailed production of oil, either by closing in or entirely shutting down wells. Curtailment of production during February, 1922, in the West Side fields of Kern County amounted to between 13,000 and 14,000 barrels of oil daily.

Los Angeles County.

Recent developments at Santa Fe Springs oil field, in Los Angeles County, have demonstrated the probable existence of an important commercial gas zone in that field. Three wells have gone wild while drilling through the gas zone, between depths of 2000 and 2500 feet. These wells, No. 'Alexander' 1, No. 'Bell' 2, and No. 'Howard' 1, were being drilled by Union Oil Company. Wells No. 'Bell' 2 and No. 'Howard' 1 lie about 2600 feet apart and both are probably very close to the axis of the anticlinal structure. In each instance the gas blowout completely wrecked the derrick and operating structure and formed a large crater around the drill hole. The gas flowing from the craters of wells No. 'Bell' 2 and No. 'Howard' 1 caught fire and burned with great intensity. The flow of gas was gradually checked by the weight of quantities of clay and sand, caving off the sides of the craters, and water and mud which was pumped into them.

Napa County.

It is reported that Associated Oil Company has acquired some land in Berryessa Valley, in Napa County, and will drill a well on Section 29, T. 8 N., R. 3 W., M. D. B. and M.

Vander Leck[1] reports several seepages of oil in the Knoxville shales in this area. They are found in the southwest quarter of Section 25, T. 9 N., R. 3 W., M. D. B. and M., on the J. W. Harris Ranch, and in the southeast quarter of Section 34, T. 11 N., R. 4 W., M. D. B. and M.,

[1]Vander Leck, Lawrence. Petroleum Resources of California, California State Mining Bureau, Bulletin 89, page 52, 1921.

on the Zem Zem Ranch; also on the 300-foot level of the Knoxville mine. A few wells were drilled in the Valley in 1904 and yielded a small production of oil.

A matter of particular interest, in connection with the showings of oil in the Berryessa Valley, is the report that the oil contains ichthyol.

Ichthyol is a peculiar form of asphaltic material employed in pharmaceutical practice as an antiseptic and medicament. When used in an ointment it is said to have great penetrating qualities.

The scarcity of true ichthyol in the United States has resulted in much research work seeking to extract ichthyol oil from domestic bituminous material. Thus far true ichthyol has been produced only in Austria, and since the war it has been increasingly difficult to obtain.

Ichthyol is produced by the Ichthyol Company of Hamburg. Synthetic ichthyol, of an inferior quality, has been made. The raw material comes from bituminous rock, filled with fish—hence the derivation of the name ichthyol—near Seefeld, in the Austrian Tyrol.

The material mined at this place is carefully selected and subjected to dry distillation. The distillate, ichthyol oil, is then sulphonated. The resultant ichthyol sulphonic acid is neutralized with concentrated ammonia and water. It is then evaporated to the consistency of syrup. Its efficiency as an alterative and antiseptic is ascribed to the sulphur it contains.

American-made substitutes, synthetically derived, sell for $3.50 to $5 per pound. True ichthyol ranges much higher in the New York market. It was quoted and sold at from $12 to $36 per pound during 1916 and 1917.

San Luis Obispo County.

Indian Dome Oil Company is drilling on the Miossi Rancho near Pismo. Well No. 1 is 510 feet deep, with 12½-inch casing.

Santa Barbara County.

Hurst and Leonis are drilling a well in the hills nine miles east of Lompoc, Section 33, T. 7 N., R. 33 W., S. B. B. and M. This well is being drilled with cable tools, using a gas engine for power.

The Puritan Oil and Refining Company is drilling three miles west of Santa Barbara on a mesa about 500 feet from the ocean shore. A showing of oil was reported at 56 feet.

From February 11, 1922, to and including March 4, 1922, the following new wells were reported as ready to drill:

Company	Section	Township	Range	Well	Field
Kern County.					
Pacific Oil Company	35	30	24	36	Elk Hills
Pacific Oil Company	31	30	24	15	Elk Hills
Pan American Petroleum Company	1	31	24	6-E	Elk Hills
Pan American Petroleum Company	1	31	24	2-E	Elk Hills
W. R. Ramsey	1	31	24	1-B	Elk Hills
W. R. Ramsey	1	31	24	2-B	Elk Hills
Standard Oil Company	11	28	27	3	Kern River
Union Oil Company	11	28	27	3	Kern River
Frank S. Wallace	10	30	22	1	McKittrick
American Oilfields Company	36	31	22	103	Midway
Boston Pacific Oil Company	32	31	24	9-B	Midway
C. C. M. O. Company	22	31	22	21	Midway
C. C. M. O. Company	4	32	23	3	Midway
C. C. M. O. Company	22	31	22	18	Midway
Consolidated Mutual Oil Company	28	31	23	14	Midway
Honolulu Consolidated Oil Co.	6	32	24	2	Midway
Honolulu Consolidated Oil Co.	6	32	24	4	Midway
Honolulu Consolidated Oil Co.	6	32	24	7	Midway
Honolulu Consolidated Oil Co.	6	32	24	8	Midway
Pacific Oil Company	31	31	24	23	Midway
Pacific Oil Company	35	31	23	4	Midway
Pacific Oil Company	27	31	23	20	Midway
Pacific Oil Company	7	32	24	40	Midway
B. B. and O. Oil Company	28	12	24	18	Sunset
C. J. Berry	34	12	24	8	Sunset
Wesco Petroleum Company	36	29	20	19	Temblor
Los Angeles County.					
Dabney Syndicate	29	4	12	6	Long Beach
General Petroleum Corporation	19	4	12	1	Long Beach
Holly Oil Company	35	5	11	2	Long Beach
Shell Company	29	4	12	1	Long Beach
Transport Oil Company	30	4	12	1	Long Beach
Occidental Petroleum Corporation	31	4	15	1	Newhall
Turner and Trickett	4	3	15	1	Newhall
B-G-T Oil Company	5	3	11	1	Santa Fe Springs
General Petroleum Corporation	5	3	11	68	Santa Fe Springs
General Petroleum Corporation	5	3	11	52	Santa Fe Springs
George F. Getty	5	3	11	1	Santa Fe Springs
Petroleum Midway Company, Ltd.	5	3	11	1	Santa Fe Springs
Monterey County.					
Danish Oil and Development Co.	24	15	2	1	----------
Napa County.					
Associated Oil Company	29	8	3	29-1	----------
Orange County.					
Amalgamated Oil Company	34	5	11	3	Huntington Beach
Miley-Keck Oil Company	2	6	11	14	Huntington Beach
Miley-Keck Oil Company	34	5	11	10	Huntington Beach
Miley-Keck Oil Company	2	6	11	17	Huntington Beach
Miley-Keck Oil Company	2	6	11	15	Huntington Beach
Miley-Keck Oil Company	34	5	11	9	Huntington Beach
Moore Syndicate	2	6	11	1-B	Huntington Beach
Rhoads Oil Company	11	6	11	4	Huntington Beach
Seal Beach Oil Company	14	5	12	1	----------
Merchants Petroleum Company	33	3	9	4	Richfield
Merchants Petroleum Company	33	3	9	8	Richfield
Merchants Petroleum Company	33	3	9	6	Richfield
Santa Barbara County.					
Standard Oil Company	Rancho San Carlos de Jonata			2	Los Alamos
Santa Cruz County.					
Danish Oil and Development Co.	Rancho Refugio			1	----------
Ventura County.					
Cooper Petroleum Company	33	2	20	40	Sespe
Wininger-Johnson Syndicate	1	4	20	1	Conejo

SPECIAL ARTICLES.

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the Bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff containing much information that will add to the permanent value of the Monthly Chapter are included in each number of 'Mining in California.'

It is anticipated that these special articles will cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations, as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the text of new laws and official regulations and notices affecting the mineral industry.

NOTES ON IRON ORE OCCURRENCES IN CALIFORNIA.

By E. S. Boalich.

During recent years increasing interest has been shown in the occurrence of iron ores in California, which might be of commercial importance.

In the past very little attention has been given to the exploitation of these resources, but this has never been due to lack of ore. No cheap coke has been available in the State, and economic conditions have not been favorable for the development of an iron smelting industry.

The records of the Mining Bureau contain a great deal of scattered information relative to the occurrence of iron deposits from Shasta County in the north to Riverside in the south.

A few years ago plans were made by the Bureau to have a formal report written on this subject, following a field survey of the entire State. These plans had to be set aside, due to several unforeseen circumstances. Although this investigation will eventually be carried on, there is no immediate opportunity to do so because of inadequate funds.

In the endeavor to temporarily meet the situation which arises when an inquiry as to the State's iron ore resources is received, the following notes have been prepared, simply using the Bureau's files and records as a source of data. The individual investigator will find the original records available for reference if at any time he should wish to go into the subject thoroughly. These notes will indicate something as to the wide distribution of iron ores here and will, it is hoped, offer a starting point to those who are looking for such information and who have not been successful in finding it.

The subject matter is segregated by counties, alphabetically arranged, and is given as briefly as possible.

Butte County.

Several claims have been located on showings of iron ore within an area of five or six miles in the foothills about 25 miles northeast of Chico; practically no development work has been carried on to date.

Calaveras County.

Iron ore occurs in large amount a short distance north of Murphy, and a prospect is also reported near Valley Springs.

El Dorado County.

At a point eight miles northeast of Folsom there is situated an iron mine which was once developed by three shafts, the deepest one of which is 312 feet.

Los Angeles County.

A deposit of magnetite exists a short distance from the Southern Pacific Railroad at Russ Station, Soledad Canyon. Some years ago a small furnace using oil as a fuel was erected at the deposit, but proved a failure.

Another deposit of undetermined size has been worked in a small way about ten miles northwest of Acton.

Madera County.

In the eastern portion of Madera County, on the southern slope of the Minaret Mountains, there is a deposit of magnetite which appears to be very high grade and which has been traced for more than 2000 feet in length. It averages 400 feet wide for that entire distance, and has been exposed by erosion on the northeast end for a depth of 250 feet. On the basis of these figures, there should be 30,000,000 tons of iron ore available, and development might easily show a greater amount.

On the west slope of Mount Raymond a little development work has been done on some immense bodies of magnetite and hematite ore, the amount of which has never yet been estimated.

Nevada County.

There are two distinct exposures of iron croppings in this county, southwest of Nevada City, indicating an iron belt about 15 miles long. No real prospecting has ever been done in this area.

Placer County.

A considerable deposit of magnetic iron ore occurs near Hotaling, five miles northwest of Clipper Gap. Over 15,000 tons of pig iron were produced here in 1883 by the California Iron and Steel Company, but lack of a cheap fuel has prevented further development.

Plumas County.

Magnetite of unknown extent, but of fair quality, occurs at various points in Plumas County, notably in T. 22 N., R. 9 E.

Riverside County.

In the Eagle Mountains in Northern Riverside County there occurs an extremely interesting deposit of high-grade iron ore, which was described in detail in Bulletin No. 503, issued some years ago by the United States Geological Survey. From tests made, the content of metallic iron in the ores averages between 64 and 67 per cent, and no impurities, such as phosphorus, are present in sufficient amount to be injurious.

For comparison, it may be noted that the ore mined in the Lake Superior District averages less than 58 per cent metallic iron. The largest single deposit in this district is exposed for a distance of nearly 6000 feet. A moderate estimate of the total quantity available in the Eagle Mountain deposits now exposed is about 75,000,000 tons.

This estimate might be immeasurably increased if it should be assumed that the ore-bearing beds continue farther down the dip than they have been exposed by erosion.

San Benito County.

Numerous surface indications of iron ore are found on the Mount Hamilton Range of mountains, particularly between Stayton and Panoche Pass.

San Bernardino County.

The existence of large iron ore deposits in the desert region of San Bernardino County has long been known. It has been estimated that at least 20,000,000 tons of high-grade ore are available in the better known deposits alone, such as the Cave Canyon Group, north of Baxter; Iron Age, east of Dale; Iron Mountain Group, ten miles west of Silver Lake; and Providence Mountain deposit, four miles east of Kelso. Other deposits occur in the Kingston Mountains, west of Amboy, south of Blythe Junction, and in the lava beds south of Daggett.

San Diego County.

The occurrence of a belt of iron ore has been noted a little north of Julian, and a second deposit, made up principally of hematite, is reported in Eagle Peak Canyon.

San Luis Obispo County.

A deposit of iron ore, said to outcrop at intervals for over four miles, is exposed five miles west of San Luis Obispo. This deposit is within eight miles of deep-water transportation at Port Hartford.

Shasta County.

Shasta County is capable of supplying iron ore for an important industry. There are permanent deposits on both sides of the Pit River, and also extensive surface indications north of the Pit River and east of the McCloud River.

For several years an electric smelter was operated at the town of Heroult on the Pit River, but it is understood that operations had to be suspended because it was not possible to meet Eastern competition.

Sierra County.

There is a large deposit of iron ore in Secs. 11 and 14, T. 21 N., R. 11 E., about ten miles by road and trail northwest of Sierra City, at an elevation of 7000 feet.

Siskiyou County.

Iron ore has been noted at several points along the Klamath River.

Sonoma County.

Three miles inland from Fisk's Mill on the Lancaster Ranch a body of iron ore has been slightly exploited. It is part of a belt running north and south for miles along the coast.

Six miles east of Fort Ross is a considerable body of hematite which strikes in a northerly direction.

On the west fork of the Gualala River is a large body of hematite.

Tehama County.

Important indications of iron deposits have been noted in the vicinity of Beegum.

Conclusion.

The following references on iron ores in California are to be found in many public libraries and in all offices of this Bureau:

Report I of the State Mineralogist.
Report IV of the State Mineralogist.
Report V of the State Mineralogist.
Report XII of the State Mineralogist.
Report XIII of the State Mineralogist.
Report XIV of the State Mineralogist.
Report XV of the State Mineralogist.
Report XVII of the State Mineralogist.
State Mining Bureau Bulletin 38, Structural and Industrial Materials of California.
U. S. Geological Survey Bulletin 213, Contributions to Economic Geology, 1903
U. S. Geological Survey Bulletin 225, Contributions to Economic Geology, 1904
U. S. Geological Survey Bulletin 430, Contributions to Economic Geology, 1910
U. S. Geological Survey Bulletin 503, Iron Ore Deposits of Eagle Mountains, 1912
U. S. Geological Survey, Mineral Resources of the United States. [Various years.]

ECONOMIC MINERALS OF THE AVAWATZ MOUNTAINS.

By W. Burling Tucker.

There are two general types of economic deposits in this area of San Bernardino County, those found in the igneous and metamorphic rocks, such as talc, limestone, barite, metalliferous ores, etc., and those included within the Lake Beds, such as salt, gypsum, celestite, ochre, and many other products, the quantity and value of which have not yet been determined. These two types are geologically greatly dissimilar, but outcrop in such a way as to be closely associated geographically.

Areas of igneous and metamorphic rocks include the ridges of limestone in which the chief mineral resource is talc. Besides this product, there is considerable barite, and indications of copper, silver, gold and iron.

Talc.

The talc in this region was observed to occur always at contact of, or very close to, a certain dark basic igneous rock, which exists as dikes or sills. In every case the other contact rock was a belt of impure limestone and white or greenish chert. The talc is evidently an alteration of amphibole, probably the variety tremolite, formed by contact metamorphism between igneous rock and impure limestone. The talc is pure white to light gray in color, and varies in hardness from solid outcrops, which are moderately hard, to very soft, crumbly masses.

The talc near the intrusive rock is usually the softest and the purest. It is bedded in the limestone, evidently as a result of the metamorphism of certain layers of limestone. During the alteration from tremolite to talc, silica separates out and now occurs as nodules and seams throughout the talc; the silica is in very small amounts. Four deposits were examined. The three largest are at Sheep Creek and the fourth is northeast of Jumbo Salt.

The deposits at the mouth of Sheep Creek are in an impure limestone zone about 125 feet in thickness. Most of the talc is found in the fifty feet next to the igneous intrusion, the best being right at the contact. Of this fifty feet, about one-half is talc of the soft and hard varieties. A cut near the top of the cliff has penetrated the talc for 15 to 20 feet at about a 45-degree angle to the bedding. About two-thirds of talc exposed is soft white talc, the other one-third being hard gray talc. A cut near the base of the cliff was started in the igneous rock, but has not yet penetrated the talc. About 600 feet to the west is another drift into good quality talc at the igneous contact. Thirteen hundred feet westward, along the outcrop from Sheep Creek, the deposit is displaced by cross faulting, on the west side of which the limestones are no longer vertical, but dip southerly into the hill at about 10 degrees, and the igneous rock is in the nature of a sill overlying it. The talc here underlies the gabbro. Southwest of the Sheep Creek talc area there are two discontinuous zones of talc in the face of the hill, which follow a gabbro dike. This deposit varies in thickness from five to ten feet, the thickest and best exposed being at the cut. The deposit northeast of Jumbo Salt

is likewise associated with a gabbro intrusion, the dip of which is 30 degrees southerly. This deposit appears to be of a very good material and quite extensive. In thickness this mass of talc averages over ten feet, of which five feet is good quality. The Sheep Creek deposit outcrops for 2000 feet with a width of 50 feet. Estimated tonnage of 400,000 tons. The other deposits are not as large.

Barite.

Barite exists in large quantites over a portion of the gneiss areas, especially from the Jumbo Salt deposit westward. The mineral occurs in veins and seams through the gneiss or as masses in the many gash veins, which criss-cross the gneiss in all directions. As a result, it is well disseminated throughout the gneiss masses, and concentrated in but a few places. Most of it is closely associated with dark hematite material, from which it could be separated only with difficulty. It is more or less stained with hematite, which would exclude it from the principal uses, which are as a paint pigment and filler for paper. No deposits were seen which appeared to be concentrated enough or sufficiently free from iron to make them of much value. The largest quantities of barite were observed on the north side of the middle granite ridge on both sides of Pipe Line Wash.

Limestone and Marble.

The marble occurs in a broad belt striking across Sheep Creek Canyon, and is in inexhaustible quantities. It is highly crystalline, but as is to be expected in such a large mass, grain and color vary greatly. Some of the marble is perfectly white, has a fine even texture, is not grained or banded by colored minerals nor does it discolor on exposure. Most of it is banded and seamed with gray material, like marble used for surface flagging. The marble is a mile and a half to two miles above Lower Sheep Creek Spring.

Gypsum.

There are extensive deposits of gypsum in these properties that are suitable for manufacture of plaster to the amount of many millions of tons.

With an average bedded thickness of 250 feet for the gypsum series, which outcrops over an area nine miles by one mile, it can be readily seen that even a small per cent of the whole would give inexhaustible quantities.

Gypsum of all grades of purity can be had here. In many places the gypsum is found in positions unusually favorable for mining. If necessary, it can be extracted practically free from clay.

ANALYSIS.

Sand and clay insolubles	Salt	Calcium carbonate	Calcium sulphate	Water	Total	Pure gypsum
2.32%	0.05	1.16	74.12	19.74	97.39	93.86%

Salt.

Salt is found in the deposits in enormous quantities. It occurs in a zone above the gypsum. The exact thickness of the salt beds could not be determined, but abundant evidence was secured to show that every deposit was at least 100 feet, and that the full thickness, near what is known as the Valley Salt deposit, would be over 250 feet. In fact, one section measured west of this deposit shows about 500 feet thickness. These measurements apply to a series of rock salt, saline clays and sands. Possibly the pure rock salt beds are in the minority, but the exact proportions can not be estimated at the surface. The gypsum series has an average thickness of about 150 feet, and while there is no set rule for proportion of gypsum and salt in solution in large lakes, salt is nearly always greatly in excess, and almost never in small proportions. This fact, in conjunction with the shrinkage of the old lake before salt could be deposited and the consequent concentration of salt in low places makes it certain that several hundred feet of solid salt is to be expected.

Salt series is:

The salt is overlaid with saline clay and sands.

Reddish muddy shales and sand impregnated with salt and thin salt beds.

Rock salt often of great purity, individual beds often very thick, 50 feet or over, interstratified with insoluble clay, sand and anhydrite; total thickness and proportion of salt to insoluble material unknown. Basil beds, clay of buff color, separating salt from gypsum, 35 to 50 feet in thickness. Sometimes has thin salt and gypsum interbedded. The salt is usually massive and does not show crystalline structure. The color is usually reddish or brown, though there are occasional seams of clear white salt. The discoloration is due to small quantities of iron oxide and insoluble matter. The latter is usually clay, disseminated through the mass in small irregular seams. Chemical analyses show purity as high as 98 per cent. It is likely that good workable beds will be found averaging this or a greater purity, though the average for the whole series is probably less. Estimates of quantity are difficult to make, on the information at hand. However, the data is sufficient to show conclusively that millions of tons could be mined without going below the surface. There are places where the salt stands over a hundred feet thick, above the canyon bottoms.

Celestite.

The mineral celestite is strontium sulphate ($SrSO_4$) with theoretical proportions of SrO=56.4% and SO_3=43.6%. The pure mineral is white and occurs crystalline, in nodules or massive. It is notably heavy and resembles barite. It has about the same hardness as limestone.

The celestite deposits underlie the gypsum strata. It occurs in enormous quantities, several measured outcrops showing zones of 10 to over 20 feet of celestite, and as a rule it follows the line of contact at the base of the gypsum. It is usually dark brown at the outcrop, though often light colored on fracture. It is associated with jaspers and chalcedony, with which it was evidently precipitated and which often replaced it. Millions of tons can be had by going only 100 feet below the surface of

the canyons. In favorable localities, as at Salt Basin, the celestite directly backs good gypsum, so that the celestite can be removed from the same workings after the exhaustion of the gypsum.

At this place, which is characteristic of other deposits, the celestite beds are 10 to 15 feet thick and directly underlie the gypsum. The celestite is tilted here 70 degrees northerly.

Approximate estimates of tonnage of different materials contained in Avawatz Mountains, Sheep Creek, Jumbo Salt, Salt Basin, Valley Salt and West End areas:

SHEEP CREEK:

Talc	400,000 tons
Gypsum	4,000,000 tons

JUMBO SALT AREA:

Salt	9,000,000 tons
Gypsum	7,000,000 tons

SALT BASIN:

Salt	8,000,000 tons
Gypsum	6,000,000 tons
Celestite	600,000 tons

VALLEY SALT:

Salt	5,000,000 tons

WEST END:

Gypsum	4,000,000 tons

of good quality.
Large quantity of good celestite.

'AGSTONE' AND ITS POSSIBILITIES IN CALIFORNIA.

By C. McK. Laizure.

Agstone is the name used by the trade to designate agricultural limestone, which is nothing more than raw limestone of more or less purity, in the form of screenings and meal, or finely pulverized, used for agricultural purposes as a soil sweetener, adjuster or corrective. It is sometimes referred to as a fertilizer, but there is lack of agreement as to whether or not it is a true fertilizer, in a strict sense.

Great interest has been aroused in the last few years in the use of agricultural limestone, and centered in the eastern United States there is a very active National Agricultural Limestone Association composed of producers of 'agstone.'

In January the annual convention of the association was held in Columbus, Ohio, and some interesting discussions regarding the use and need of agricultural limestone took place. Some notes are here given, taken from the report of the convention as it appeared in 'Rock Products,' Chicago, Illinois.

Four representatives of the Soils Department of Ohio State University made addresses. The general trend of their talk was that practically 90 per cent of all farm lands in the country needed agricultural limestone; that the farmer was slowly but surely finding out that agricultural limestone paid bigger and better dividends than any other investment he could make. Also that farmers using commercial fertilizer would get doube value from it, if it were used with agricultural limestone.

'Agstone' producers do not claim that their product is a cure for all ills found on a farm; there must be proper drainage, crop rotation and other practical methods used in farming in order to get the best results from the use of agricultural limestone.

Producers present at this convention agreed to furnish free 'agstone' for all demonstrations conducted by the Soils Department of the Ohio State University, provided these soil tests are made to determine how much limestone should be spread per acre to neutralize soil acidity. This action was taken in order to make sure that limestone is given a fair chance to prove its usefulness as a soil corrective and crop booster.

It was further brought out that the need and use of agricultural limestone is being discussed at many farm institutes, farm bureaus, granges and other rural meetings, and that the future for agricultural limestone looks brighter now than ever before.

The 'agstone' industry is no longer an infant. The product is now given a place under its own name on the commodity list of the Interstate Commerce Commission.

In many localities the 'agstone' idea is sold to the farmers 100 per cent, but vast areas of farming sections in the country are yet awaiting its message. It was the general belief that within a few years every successful farmer would look upon and use agricultural limestone as a part of his farming program.

Because of the interest shown in limestone by the Missouri farmers during the past two years, the Missouri State College of Agriculture found it necessary to secure data from every possible source to present the information requested. In this connection a moving picture film was secured that illustrated the practical needs for limestone.

For the year ending December 1, 1921, Missouri county reports showed 41,253 tons of limestone pulverized and applied to the soil, an increase of 125 per cent over the 1920 figures for the same counties. In certain other states of the 'corn belt' a few single counties used almost as much as the above figure for Missouri.

The total production of limestone in California for 1920, *not* including that used in cement manufacture nor lime for building purposes, but accounting for all that utilized as a smelter flux, for glass and sugar making and other chemical and manufacturing processes, including fertilizers, 'roofing gravel,' whiting for paint, kalsomine, terrazza, chicken grit and for CO_2 (carbon dioxide gas) was 90,120 tons. Of this total it is estimated that from 20,000 to 25,000 tons was agricultural limestone.

This estimate includes clam-shell marl used as a fertilizer and certainly indicates that there is room in this State for the 'agstone' industry to expand, if producers will apply 'selling methods' to dispose of their product and educate prospective users to a full realization of its benefits.

Under the heading, 'Growing need for lime on California soils,' 'Cement, Mill and Quarry,' Chicago, Illinois, says: "The lime requirement of Northern California soils aggregates many millions of tons and the fertility of large areas not properly limed is seriously impaired, according to University of California experts. It is pointed out that the natural supply of lime has in the main been leached out of the soils by drainage and cultivation, and that the farmers have not been sufficiently awake to the necessity of replenishing the supply.

The loss of farming profits as a result of the condition can not be estimated, but students of the subject are convinced that it is serious. The excessive acidity of most of the soils hinders proper plant development and crop fruition, and the only way the condition can be corrected is by liberal application of lime. * * *.

A soil survey to determine the extent of soils suffering from excessive acidity is being made. From preliminary surveys it is stated that the principal loams of the interior are largely in a neutral condition, very low in humus and production vitality.

Liming to the extent of two or more tons an acre is recommended for the main body of these soils. Northward in the valleys the lime requirement increases and in the coast counties where the rainfall is heavier, the lime requirement is estimated at from 6 to 10 tons per acre."

Analyses of agricultural limestone vary greatly, ranging from 98% calcium carbonate ($CaCO_3$) a very pure limestone, to as low as 54% $CaCO_3$ and 44% $MgCO_3$, the latter being a dolomitic limestone or dolomite which is a mixture of calcium and magnesium carbonates. The true mineral dolomite contains 45.65% $MgCO_3$. 'Agstone' in which neither the calcium carbonate, nor the combined calcium and magnesium carbonate contained, reach such a high percentage, is also produced but it is relatively less efficient for agricultural use.

Agricultural limestone shows a great variety in price from one end of the country to the other. The average price of 'agstone' in the United States was $2.75 per ton in 1921 or 25 cents higher than the 1920 price. The increase is accounted for by the fact that production of agricultural limestone was abnormally low in 1921, and also that agricultural limestone is more carefully prepared now than formerly, resulting in a greater production cost. The unusual variation in prices at different localities is due to variations in the fineness of the material.

Published quotations are on material varying from 75% through 200 mesh, to that which screen tests 50% through 4 mesh. Various percentages of intermediate degrees of fineness are also made and sold. In this connection it is well to note that the results that might be obtained by using limestone of different degrees of fineness, including screenings, was discussed by producers and soil experts at the Agricultural Limestone Convention referred to previously. The soil experts said that experiments are being carried on along these lines at the present time, but that finely pulverized limestone will give quicker results and neutralize soil acidity almost upon contact with the soil, though splendid results for money spent had also been obtained by the use of 'agstone' meal and screenings.

Prices as of March 11, 1922, ranged from $7.75 per ton at Alton, Illinois, for 'agstone' analyzing 96% $CaCO_3$, 0.3% $MgCO_3$ 90% through 100 mesh; to 50 cents per ton at Garnett, Oklahoma, for 'agstone' analyzing 86% $CaCO_3$, 50% through 4 mesh.

California quotations on the above date were:

Colton, California—Analysis 90.95% $CaCO_3$, 1-3% $MgCO_3$ all through 14 mesh, bulk $4 per ton.

Terminal California—Analysis 97.3% $CaCO_3$, .04% $MgCO_3$, 65% through 200 mesh, 90% through 100 mesh, 95% through 80 mesh, 100% through 50 mesh; sacks $5 per ton, bulk $4.50 per ton.

Reports of experiments on acid soils in many states prove that there can be no question of the benefit to be derived from using limestone, to mention but one of the natural mineral soil correctives or fertilizers, and one that occurs abundantly in this state. The Association of Natural Soil Fertility Resources has recently been organized, with headquarters in Chicago, for the purpose of promoting the use of mineral fertilizers, to study their use in cooperation with the agricultural experiment stations of the country, and to determine and enlarge the regions in which they can be economically supplied.

There is much evidence that limestone needs only to be pushed to increase its agricultural use many fold and that California offers a splendid field for development of the 'agstone' industry to the benefit of both the mining and agricultural interests.

High freight rates bear heavily on the sale of agricultural limestone; notwithstanding, shipments in the eastern states are made as far as 500 miles. In many of the states it has been possible to get reductions on 'agstone' rates, and there is little doubt but that if the proper representations were made by the agricultural interests and limestone producers of California to the Railroad Commission or to the railroads

direct, a rate could be obtained that would enable the industry to expand enormously.

In a product of this kind the margin of profit per ton will necessarily be small. But if aggressive 'selling methods' are employed, and advantage is taken of the educational work of agricultural institutions that are teaching the farmer the advantage of using it, there is good reason to believe that quantity production, with corresponding satisfactory financial returns, will be required to fill the demand for 'agstone' that will ensue.

NOTES FROM OFFICE OF STATE SURVEYOR GENERAL, SACRAMENTO.

By W. S. Kingsbury, Surveyor General.

Minerals in lands owned by state now subject to lease.

Through the courtesy of Fletcher Hamilton, State Mineralogist, in endeavoring to cooperate with the various departments of the state government in securing the highest efficiency in public service and especially in stimulating the development of the mineral resources of the state to the mutual advantage of the people and the state government, space has been allotted in this publication to acquaint the public with the Mineral Leasing Bill, passed by the last legislature.

The Mineral Leasing Bill, being chapter 303, Statutes of California, 1921, provides that the minerals in all state-owned lands may be leased upon a reasonable royalty basis.

A copy of the bill, rules and regulations to carry out the provisions thereof, and a list of all vacant state school lands, consisting of approximately 800,000 acres, subject to the provisions of the bill, may be obtained from the State Surveyor General, Sacramento, California.

Leases may be secured to extract the minerals from the tide and submerged lands of the state lying below the line of high tide of the bays in the state and of the Pacific Ocean.

Lands below the waters of the navigable lakes and streams are also subject to the provisions of the bill.

PROGRESS REPORT ON PLACER GOLD INVESTIGATION.

By Chas. S. Haley.

The district covered during the past month is almost altogether embraced in San Bernardino County. The one exception is the Boquet Canyon district, Los Angeles County. This district apparently contains a little auriferous gravel, but of very low grade. The fact that it would be necessary to dump into agricultural territory and that water would be scarce and hard to get on the various properties make them of negligible commercial importance.

In the neighborhood of Randsburg, the Stringer district and the wash therefrom, running down towards St. Elmo, is now being worked in a small way with hand dry washers, by two Italians. In my opinion, they are working it by the only feasible method. Like the deposits mentioned last month, on the Colorado River, these are extremely spotty, and the average tenor is quite low. Water is prohibitive in cost.

The fact that these deposits are mostly laid down by torrential action of cloud bursts in the gulch makes them even more spotty than the average.

At Summit, about six miles north of Randsburg, there is an area of disintegrated schist, containing quartz stringers, which furnishes a dry placer of considerable extent. Water can be brought on it from a distance of about twelve miles, but the same spotty character noted in the Stringer district makes it to my mind, extremely inadvisable to do so.

There is an ancient channel north of Barstow coming down from Long Range, through Coolgardie, which was extensively worked 30 or 40 years ago, by hand methods. Apparently, the gulches which cross this channel furnish sufficient concentration to pay fairly good wages, but this concentration is entirely worked out, and the main body of gravel will not justify the expense of exploitation. Water would have to be brought at least 15 miles to cover this property.

In Lytle Creek, along the line of the Santa Fe Railroad, there was considerable work done some forty years ago. The area is mostly disintegrated granite and schist, containing quartz stringers, and where the gulches afforded sufficient concentration, it is reported that good wages were made.

This district is also of little interest to the prospective investor in gravel.

NEW REPORT ON THE MOTHER LODE DISTRICT.

By C. A. Logan.

A great deal has been learned in the past 70 years about the Mother Lode quartz mines, at the expense of large sums of money and much time, that is not available today for the use of those who are looking for profitable employment of their money in mining. In many cases, the lack of this knowledge is a very real detriment to the development of promising areas. Much of this experience has been lost to the present generation by the dissolution of mining companies, by the death of men who worked in the mines, by fires, and by what may be termed hoarding on the part of a few companies and engineers, who mistakenly look upon the activities of some public agencies as encroachments on the field of private practice. This latter attitude is unprofitable, both to the individual and to the community. Certain it is, that the life of mining, here as elsewhere, depends on reliable publicity, the spirit of adventure, and the willingness to dig deeper; the last of which, translated to date, means larger sums for prospecting and development than have been needed heretofore. But the man who digs needs to know all there is available regarding the past history of the camp, in order that he may dig with the greatest possible chances of success. If he succeeds, the spirit of adventure awakens in others, and the breath of life remains in the camp; if he fails, as he does quite often, from the lack of sufficient knowledge of the problem at hand, much more is lost to the community than the money he has spent. If an ore shoot has been bottomed, it is better that the fact be known so that the operator may have an idea of the odds before unwatering the mine. If your neighbor has a promising claim, and you have not enough money to buy it, it is sound business to boost it whether you think the ore shoot pitches into your ground or not; if his ground develops into a mine yours will certainly receive attention and may at least make a good mill site or tailing pond.

It may be thought unfortunate that under present conditions most of the money available for mining is in the hands of conservative companies who endeavor to lessen the inevitable chances of mining by demanding such things as assay plans and bullion receipts. The average prospector, could he afford the one or secure the other, would naturally feel beyond the need of searching for a buyer. With the facts as they are, however, it behooves him to dig intelligently and with full knowledge of what has been done by those who were there before him. It may be well to state here that the writer classes also as prospectors most of the small companies or partnerships who have operated along the north and south ends of the Mother Lode in the past. There are still long distances that have never been adequately prospected by properly financed companies. The ultimate purpose of the prospector should be to develop his property to the point where it will appeal to the large companies, if he is working on the Mother Lode; in the case of smaller and richer veins this does not apply with such force. Capital should be devoted almost entirely to underground work to show the size and tenor of ore bodies, with expenditures for mills limited to the

amount needed for preliminary tests of the ore. With a proven ore body, it is easier to finance mill building, than it is to get extra money for underground work, after prematurely erecting plants.

There has been no comprehensive report published on the Mother Lode during the last eight years, although many important developments have gone on in Amador, Calaveras and Tuolumne counties which have proven the possibilities of the belt in depth. There have been no comprehensive maps or geologic studies of the Lode in the past 20 years, and such as were previously made are scattered in publications that are out of print and not available for general use. Much valuable information on the subject is buried in the files of idle companies, mine owners, mining engineers and surveyors. If this can be collected under one cover, and brought up to date by investigations of accessible mines, it is believed it will prove of great benfit.

These considerations have led Fletcher Hamilton, State Mineralogist, to direct the writer to prepare a new report on the Mother Lode. It is hoped to include in this, adequate maps, plans and sections of mine workings, details of underground operations and production, and pertinent information on geology and mineralogy. For much of this we must depend on the friendly help of owners and engineers, whose life work has put them in possession of much data that will be helpful to themselves and the districts in which they are interested, if these can be made available to the public.

Working from the Auburn office, the writer has already accomplished a good deal on the report, and plans to cover the Lode in detail during the coming spring and summer.

SECRETARY'S OFFICE.

W. W. THAYER, Secretary.

The California State Mining Bureau was created April 16, 1880, by legislative act. In March, 1893, the original act was repealed and an amended act approved and passed by the legislative body. Again on June 16, 1913, a new Mining Bureau Act was approved which became effective August 10, 1913, repealing all former acts, and forming the basic law under which the Bureau now functions.

It is doubtless true that both the mining and lay public have not in the past always recognized the part played by the Bureau in the development of the state's mineral resources. Innumerable inquiries regarding them, originating within and without its borders and in foreign countries, have been answered with ultimate results reflected by a consistent growth in the value of the state's mineral output since the records of production were first compiled by the Bureau in 1887.

It is believed that a better understanding of the economic position occupied by the Bureau will be imparted to the public whose funds support it, by embodying in the Monthly Chapter a review of the executive activities.

The responsibility for the coordination of effort of each department, to the end that the utmost efficiency may be maintained with the limited and variable appropriations accorded the Bureau by successive legislatures, rests upon the office of Secretary.

Activities referable to that office, such as reports of new maps and publications issued, amount of mail handled, changes and enlargements in offices, changes in personnel of the staff, property and equipment, financial statements, etc., are therefore included herein.

New Publications.

During the month the following Bureau publications have been made available for distribution:

Summary of Operations California Oil Fields, December 1921, Vol. 7, No. 6.

Mining in California, February, 1922, (Monthly) Vol. 18, No. 2.

Distribution of Publications.

The Bureau's publications are constantly in demand, requests for copies coming from all over the United States and foreign countries.

Publications distributed during the month of March, 1922.

Publications.	Number Distributed.
Report XV State Mineralogist	2
Report XVII State Mineralogist	24
Mines and Mineral Resources of Del Norte, etc.	3
Mines and Mineral Resources, of Fresno, etc.	1
Mines and Mineral Resources of Imperial, etc.	1
Mines and Mineral Resources of Alpine, etc.	1
Mines and Mineral Resources of Butte, etc.	2
Mines and Mineral Resources of El Dorado, etc.	1
Mines and Mineral Resources of Los Angeles, etc.	1

Publications	Number Distributed
Mines and Mineral Resources of Monterey, etc.	2
Mines and Mineral Resources of San Bernardino, etc.	3
Mines and Mineral Resources of Nevada County	5
Mines and Mineral Resources of Plumas County	4
Mines and Mineral Resources of Sierra County	10
Bulletin No. 37, Gems, Jewelers' Materials and Ornamental Stones of California	4
Bulletin No. 67, Minerals of California	2
Bulletin No. 72, Geologic Formations of California	5
Bulletin No. 75, Mining Laws, United States and California	25
Bulletin No. 76, Manganese and Chromium in California	2
Bulletin No. 78, Quicksilver Resources of California	5
Bulletin No. 85, Platinum Resources of California	7
Bulletin No. 89, Petroleum Resources of California	340
Bulletin No. 90, California Mineral Production for 1920	25
Preliminary Report No. 3, Manganese and Chromium	1
Preliminary Report No. 4, Tungsten, Molybdenum and Vanadium	1
Preliminary Report No. 5, Antimony, Graphite, Nickel, Potash, Strontium and Tin	1
Preliminary Report No. 6, Review of Mining in California during 1919	1
Preliminary Report No. 8, Review of Mining in California during 1921	664
Mining in California, Monthly Chapter Report XVIII, January, 1922	735
County Maps and Registers of Mines	1
Shasta County Forest Map	4
Sierra County Forest Map	6
Siskiyou County Forest Map	1
Desert Region Map	4
Inyo County Geological Map	1
Minaret District Map	2
Forest Map, Mounted	1
Geological Map of California, Mounted	10
Plumas County Mineral Map	1
Oil Field Maps	318

Mails and Files.

The Bureau maintains in addition to its correspondence file a mine report file which includes reports on some 7500 mines and mineral properties in California. Also there is available to the public a file of the permits granted to mining and oil corporations by the State Commissioner of Corporations.

During the month 1085 letters were received and answered. They are practically all requests for information, and the inquiries cover all phases of prospecting, mining and developing mineral deposits, reduction of crude minerals and marketing of refined products.

Drafting.

The Bureau maintains an up to date drafting department, where topographic and geological maps. tracings, oil well logs, and oil field maps are prepared.

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Statistician and Curator.

Statistics.

There are several thousand individual producers of mineral products in California, and the task of compiling accurate and dependable statistics covering their activities is an extremely difficult one.

The Bureau's data is authoritative, all figures, with the exception of those for gold and silver which are supplied through the courtesy of the United States Geological Survey, being obtained by direct communication with the producers.

Since the inauguration of the Monthly Chapter it is possible to publish the production figures for any mineral within a maximum period of thirty days from the date on which the returns are complete.

It is hoped that the early appearance of the figures for some of the minerals will induce other producers to cooperate, to the end that the complete statistical bulletin may be incorporated in one of the early mid-year issues of the Chapter. Blank forms were sent out in January, for the 1921 data, and a second request was mailed the second week in March to those from whom no reply had come in. We shall doubtless be in a position to give the figures for some minerals in the April issue of 'Mining in California.'

The dissemination of data on the consumption of mineral products in California, figures for which are rarely obtainable, is a new feature to be forthcoming. This state can easily supply its own needs in many lines, if the consumer will only realize the extent of the natural resources within our own borders. Much material is shipped in here from points outside of California that could be supplied from local sources, and in many cases of equal quality.

Museum.

Each issue of the Monthly Chapter will contain a brief account of current museum activities. This will include a list of new acquisitions received with names of donors, a report of the number of visitors registered, and other items tending to keep the public advised of the advantages, from an educational standpoint, afforded by the exceptionally fine collection of rocks and minerals of both economic and academic value, comprising the 16,000 specimens on exhibit. The Museum contains not only one or more samples of most of the known minerals found in California, but hundreds of specimens from other states and foreign countries as well. An account of the arrangement and classification of specimens in this collection will be given in an early issue of 'Mining in California.'

Aside from its purely educational features, the Museum daily attracts throngs of tourists and travelers, and furnishes visual evidence of the immense mineral resources of California. The State Mining Bureau supplies a collection of forty typical minerals and ores, appropriately labeled, to any public school in the state upon request.

Mineral specimens suitable for exhibit purposes are solicited and their donation will be appreciated by the State Mining Bureau, as well as those who utilize the facilities of the collection.

Among the specimens received recently, and catalogued, for the Museum are the following:

19541. *Cadmium* (metallic). Recovered at copper smelter by electrolytic treatment of bag-house fume for zinc and cadmium. From Mammoth Plant, Shasta County, Cal., by U. S. Smelting, Refining and Mining Co., San Francisco, Cal.

19542 to 19550 Inclusive. *Cerrusite* (lead carbonate), *Galena* (lead sulphide) and *Pyrrhotite* (magnetic pyrites), *Anglesite* (lead sulphate) and *Galena* (lead sulphide), *Anglesite* and *Cerrusite* (lead sulphate and carbonate respectively), *Anglesite* (lead sulphate), *Pyrrhotite* (magnetic iron sulphide, with *Galena* and *Sphalerite*), *Smithsonite* (zinc carbonate), *Pyrargyrite* (silver antimonial sulphide, dark 'ruby silver ore'). From El Potosi mine, Santa Eulalia District, Chihuahua, Mexico, by W. B. Tucker, Redding, Cal.

19551. *Sphalerite* (zinc sulphide). From Calera mine, Guerrero District, Chihuahua, Mexico, by W. B. Tucker, Redding, Cal.

19552 to 19555 Inclusive. *Patronite* (vanadium sulphide), *Hewettite* (hydrous calcium vanadate; an oxidation product from Patronite), Ferro-Vanadium alloy stated to contain 60% V, smelted from ores of American Vanadium Co. mine; *Quisqucite* (mainly C and S, with a small per cent of V) associated with *Patronite*. From American Vanadium Company mine, Peru, by R. A. Grigsby, San Francisco, California.

19556. *Gold* ore, carrying *Tellurides* and Sulphides in Quartz. From Liberty Bond mine, near Confidence, Tuolumne County, Cal., by Chas. G. Dowd, Tuolumne, California.

19557. *Cinnabar* (mercuric sulphide, massive, high-grade). From Almaden mine, Spain, by Henry W. Gould, San Francisco, Cal.

19558. *Cinnabar* (mercuric sulphide, with calcite). From Abadia San Salvatore, Monte Amiata, Tuscany, Italy, by Henry W. Gould, San Francisco, Cal.

19559. Cinnabar (*Mercuric Sulphide*), From Idria, Carniola, Italy (formerly Austria), by Henry W. Gould, San Francisco, Cal.

19560. *Diatomaceous Earth* (fine quality, white). From Shasta County, by Read McCraney, Oakland, Cal.

19561. *Cinnabar* (mercuric sulphide). From Goose Lake Quicksilver mine, Modoc County, Cal., by Goose Lake Mining Co., Willow Ranch, Cal.

19562. *Diatomaceous Earth*. From near Hazen, northern Churchill County, Nevada, by Alice M. Southworth, San Francisco, Cal.

19563 and 19564. *Thenardite* (anhydrous sodium sulphate; crystals including one especially-fine, large twin). *Potash*-bearing salt, from solid bed in Service Well No. 2. From Deep Springs Valley, Inyo County, Cal. (Inyo Chemical Co.), by C. E. Dolbear, San Francisco, Cal.

19565. *Tungstenite* (tungsten sulphide). From Emma mine, Cottonwood District, Utah. Loaned by Walter W. Bradley, San Francisco, Cal.

19566. *Orthoclase Feldspar* (potassium-alumimum silicate, high-grade). From Elder mine, near Campo, San Diego County, Cal., by George W. Elder, San Francisco, Cal.

19567. *Magnesite* (magnesium carbonate). From Quaker Group, near Cima, San Bernardino County, Cal., by George W. Elder, San Francisco, Cal.

19568. *Sulphur* (native) (with occasional specks of Cinnabar). From Full Moon Group, Imperial County, Cal., by A. G. Tingman, Encinitas, Cal.

19569. *Chloropal* (hydrated iron silicate). From near Alturas, Modoc County, Cal., by Kelley Bros., Alturas, Cal.

19570. *Colemanite* (calcium borate). From Great Western Chemical Company property, Clark County, Nevada (new F. M. Smith discovery), by Joseph L. Joseph, San Francisco, Cal.

19571 and 19572. *Dendritic Opal*, and *Magnesium Silicate*. From San Francisco County, Cal., by C. Mareau, San Francisco, Cal.

19573. *Scheelite* (calcium tungstate). From near Jamestown, Tuolumne County, Cal., by Peter Mackay, Jamestown, Cal.

19574. *Calcium Carbonate* (minute hollow tubes, replacement of some form of grass or small reeds.) From near Pyramid Lake, Nevada, by Tom Massey, Susanville, Cal.

19575. *Magnesite* (magnesium carbonate). A natural 'ferro-magnesite', containing iron oxide, and utilized (after being dead burned) for refractory furnace lining. From White Rock mine, Napa County, Cal., by Frank R. Sweasey, San Francisco, California.

19576. Free *Gold* in Hematite. From Apache mine, El Fuerte District, Sinaloa, Mexico, by E. L. Vander Naillen, Oakland, Cal.

19577. Free *Gold* in Hematite. From Bishop mine, El Fuerte District, Sinaloa, Mexico, by E. L. Vander Naillen, Oakland, Cal.

19578. *Chalcocite* (cuprous sulphide, copper glance) with high silver values. From Calabacias mine, Batopilas, Chihuahua, Mexico, by E. L. Vander Naillen, Oakland, Cal.

19579. *Chalcocite* (cuprous sulphide, copper glance) with high silver values. From Morcios mine, Morelos District, Chihuahua, Mexico, by E. L. Vander Naillen, Oakland, Cal.

19580. *Galena* (lead sulphide, argentiferous, silver-bearing). From Dura mine, Morelos District, Chihuahua, Mexico, by E. L. Vander Naillen, Oakland, Cal.

During the month a total of 385 visitors signed their names on the Museum register, and in addition there are many others daily who fail to take note of our request for their signatures.

LABORATORY.

FRANK SANBORN, Petrologist.

The question arising as to the important constituents of an unusual or interesting-looking rock and as to its possible commercial value are usually quickly answered for the prospector and those who are interested in the subject.

The prospector should realize that the importance of the non-metallic minerals is continually increasing and that it is possible to find over fifty minerals of commercial value in the state. For this reason care should be taken to have any rock identified that appears to be different than the ordinary country rock.

Ordinarily a small sample weighing not over a pound is required in making a determination; but it should be in the unground, lump form. When the precious metals, gold, silver, platinum, etc., are suspected, larger samples should be submitted. The size of the deposit is often of importance in determining the commercial value of a mineral and when possible, a statement regarding the extent of the orebody should be made. For instance, a good grade of limestone free from magnesia would probably mean little if the deposit was small, but if the deposit should be extremely large and not far from transportation it is possible that it could be used in the making of cement.

The importance to the miner and prospector in being able to identify platinum was recently brought to light in this laboratory. It was suggested to the operator of a placer mine in Placer County that he bring in some of the concentrates after all the gold had been removed and that an examination be made for platinum. The sample submitted was

found to contain considerable platinum. Previously the presence of platinum in the channel was not known by the present operators.

There are no convenient field tests for determining the presence of platinum. The prospector or miner should attempt to gain some actual experience in panning platinum-bearing sand. At the San Francisco laboratory assistance will be given in the identification of platinum, by panning, to any prospector.

During the thirty-day period covered by this report climatic conditions throughout the state were not generally favorable for prospecting; however, 203 samples were received for identification and assistance was given to 6 visitors who had some special problem they wished to have worked out in the laboratory.

Of the minerals interesting in an academic way in addition to the possible commercial value, a sample of troilite from near Crescent City, Del Norte County, was received. Troilite is a simple sulphide of iron (FeS) resembling the artificial sulphide of iron used for technical purposes. Troilite is soluble in sulphuric acid, differing in this respect from both pyrite (FeS_2) and pyrrhotite (Fe_nS) which are insoluble in that acid. Troilite has previously been identified only in meteorites. In this Del Norte County occurrence, some magentite is associated.

A list of the minerals of possible value, judged from the sample submitted only is appended.

The Bureau will supply the name and address of the party who sent in any sample listed, upon request, if the reference number is given.

05- 78 Talc—schist.
05- 79 Hematite—paint pigment.
05- 80 Lepidolite; also sulphur.
05- 81 Copper.
05- 82 Troilite—contains some magnetite.
05- 83 Gypsum; also clay.
05- 84 Asbestos—amphibole variety.
05- 85 Galena—some silver and gold present.
05- 86 Lead Carbonate—contains some silver.
05- 87 Aluminum phosphate (turquoise).
05- 88 Platinum and platinum group metals.
05- 89 Gold quartz.
05- 90 Gypsum; also impure sodium sulphate.
05- 91 Molybdenite; in granitic rock.
05- 92 Limestone (possibly lithographic).
05- 93 Sodium carbonate.
05- 94 Asbestos—short fiber crysotile.
05- 95 Nitrate of sodium and potassium.
05- 96 Mica—biotite variety.
05- 97 Clay.
05- 98 Lime carbonate, very pure.
05- 99 Lignite, good grade.
05-100 Fluorite.
05-101 Copper ore—azurite and malachite; also sphalerite.
05-102 Platinum and platinum group metals.
05-103 Sulphur—contains some cinnabar.
05-104 Galena—some silver and gold present.

LIBRARY.

E. Cooney, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received during the month, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the State are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geological Survey Bulletin No. 726-G; The Lacasa Area, Ranger District, North Central Texas, by Clarence S. Ross.

U. S. Geological Survey Bulletin No. 735-B; Colemanite in Clark County, Nevada, by L. F. Noble; Salt, Bromine and Calcium Chloride in 1920, by Ralph W. Stone.

U. S. Bureau of Mines, Reports of Investigation:

Serial No. 2306; Momentary Heating of Inflammable Coal Dusts, by Guy B. Taylor (Chemist), Horace C. Porter (Chemist), and E. C. White (Junior Physical Chemist).

Serial No. 2307; Silica, by Raymond B. Ladoo (Mineral Technologist, Bureau of Mines).

Serial No. 2308; Safety of Mine-Type Telephones, by L. C. Lisley (Electrical Engineer, Bureau of Mines).

Serial No. 2309; Compressed-Air Blowers as an Aid to Metal-Mine Ventilation, by Richard V. Ageton (Metal-mining engineer, U. S. B. M.).

Serial No. 2310; Growing Need for Preservation of Mine Timber, by H. R. Hornor, (Mining Engineer U. S. B. M.).

Serial No. 2311; Conditions in the Feldspar Industry, by Raymond B. Ladoo (Mineral Technologist, U. S. B. M.).

Serial No. 2312; Low Temperature Distillation of Amalgams of Bituminous Non-Coking Coal and Asphaltic Oils, by Joseph D. Davis (Asst. Supervising Chemist, Pittsburgh Experiment Station, B. M.), and C. E. Coleman (Junior Chemist, Pittsburgh Experiment Station, B. M.).

OFFICIAL PUBLICATIONS RECEIVED, *Governmental*—Continued.

Serial No. 2313; Solubility of Oil Shales in Solvents for Petroleum, by Martin J. Gavin (Oil-shale Technologist, U. S. B. M.) and John T. Aydelotte (Organic Chemist, Colorado Cooperative Oil-Shale Investigation.)
Serial No. 2314; Milling Methods in the Tri-State Zinc District, by Will H. Coghill (Metallurgist, U. S. B. M.), and C. O. Anderson (Metallurgist, U. S. B. M.).
Serial No. 2315; Placer Mining Methods.
Serial No. 2316; Subject List of Reports of Investigation.
Serial No. 2317; Recent Articles on Petroleum and Allied Substances, by E. H. Burroughs (Bibliographer, B. M.).

U. S. Department of Commerce Reports; A Weekly Survey of Foreign Trade.
Kentucky Geological Survey; Series VI, Vol. VI, by Willard Rouse Jillson.
North Carolina Geological and Economic Survey; Economic Paper No. 51, Forest Fires of North Carolina During 1918–1920.
Bureau of Topographic and Geological Survey, Commonwealth of Pennsylvania:
Bulletin No. 1; Effect of the War on the Price of Coal in Pennsylvania, by George H. Ashley.
Bulletin No. 2; Oil and Gas in Southeast Pennsylvania, by George H. Ashley.
Bulletin No. 3; Development and Probable Life of Gas Pool at McKee's Port, Pennsylvania, by George H. Ashley.
Bulletin No. 4; Decline of McKee's Port Gas Pool, by George H. Ashley.
Bulletin No. 7; A High-Grade Building Stone in Greene County, by George H. Ashley.
Bulletin No. 14; Future Sources of Power, by George H. Ashley.
Bulletin No. 16; Geology of Oil and Gas in Relation to Coal, by George H. Ashley.
Bulletin No. 23; Coal Beds in Cambria County, Pennsylvania, by J. D. Sisler.
Bulletin No. 24; Coal Beds in Greene County, Pennsylvania, by J. D. Sisler.
Bulletin No. 25; Coal Reserves in Greene County, Pennsylvania, by John F. Reese.
Washington Geological Survey:
Bulletin No. 21; Mineral Resources of Washington with Statistics for 1919, by Ernest N. Patty, and Sheldon L. Glover.
Bulletin No. 23; The Metal Mines of Washington, by Ernest N. Patty.
Bulletin No. 25; The Magnesite Deposits of Washington, Their Occurrence and Technology, by George E. Whitwell and Ernest N. Patty.
Geological Survey of Canada; Memoir No. 127, Beauceville Map Area, Quebec, by B. R. MacKay.
Geological Survey of Canada; Memoir No. 128, Winnipegosis and Upper Whitemouth River Areas, Manitoba Pleistocene and Recent Deposits, by W. A. Johnston.
Report of the Department of Mines for the Fiscal Year Ending March 31, 1921; Ottawa, Canada.
Preliminary Statement on the Mineral Production, Province of Quebec; Feb. 1922.
Mineral Production of Ontario in 1920.
Director of Mines and Government Geologist, Adelaide, South Australia; Annua Report for 1920.
Anales Del Congreso Nacional de la Industria Minera; Lima, Peru.
Boletin Minero; Organo Del Departamento de Minas, Mexico, Tomo XII, Numeros IV and V.

Societies and educational institutions.

American Mining Congress Journal, March, 1922.
Mining and Metallurgy, January and February, 1922.
Journal of Geology, January and February, 1922.
Economic Geology, January and February, 1922.
Bulletin of the Institution of Mining and Metallurgy, February, 1922.
American Mineralogist, January, 1922.
Proceedings of the Engineers' Society of Western Pennsylvania.
Bulletin of the Canadian Institute of Mining and Metallurgy, March, 1922.
Del Cuerpo de Ingenieros de Minas Del Peru; Boletin No. 101, Lima, Peru.
Colorado School of Mines; Quarterly Catalog Edition.

OFFICIAL PUBLICATIONS RECEIVED.

Societies and Educational Institutions—Continued.

Colorado College Publication; General Series No. 109, Juan Ramon Molina, by J. William Chaney, A. M.

General Series No. 110, Syllabus on American History and the Natural Sciences, by Archer Butler Hulbert.

Books.

The Mineral Industry, 1920.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

Architect and Engineer, San Francisco.
Arizona Mining Journal, Phoenix, Arizona.
Asbestos, Philadelphia, Pennsylvania.
American Petroleum Institute, New York.
Chemical Engineering and Mining Review, London, England.
Cement, Mill and Quarry, Chicago, Illinois.
Engineering and Mining Journal, New York.
Financial Insurance News, Los Angeles, California.
Journal of Electricity and Western Industry, San Francisco.
Metallurgical and Chemical Engineering, New York.
Mining and Scientific Press, San Francisco.
Mining and Oil Bulletin, Los Angeles.
Mining and Engineering Record, Vancouver, B. C.
Oil Weekly, Houston, Texas.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil Paint and Drug Reporter, New York.
Oil Trade Journal, New York.
Oil Age, Los Angeles.
Oil News, Galesburg, Illinois.
Petroleum Record, Los Angeles.
Petroleum Refiner, Kansas City, Missouri.
Petroleum Age, New York.
Petroleum World, Los Angeles.
Queensland Government Mining Journal, Brisbane, Australia.
Rock Products, Chicago, Illinois.
Southwest Builder and Contractor, Los Angeles.
Stone, New York.
Salt Lake Mining Review, Salt Lake City, Utah.
Standard Oil Bulletin, San Francisco.
Safety News, Industrial Accident Commission, San Francisco.
The Record, Associated Oil Company, San Francisco.

PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of consumers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

Sufficient publicity has not heretofore been given to this feature of the Bureau's work, but in 'Mining in California' a suitable medium is provided for current inquiries of this nature, and therefore, written or verbal inquiries that come to the attention of the Bureau are summarized in each issue.

The name of the product wanted or offered, only, is published; the name of the owner of the deposit, or buyer, and other details being supplied upon request.

In writing, the reference number of the item should be given.

Mineral products or deposits for which a market is sought.

02-47 Turquoise.
02-48 Diatomaceous earth deposit—or party who will develop.
02-49 Gold mine—8 patented claims in Riverside County.
02-50 Silica deposit—8 patented claims in Riverside County.
02-51 Silver mine—80 acres, in Orange County.
02-52 Feldspar deposit—approximately 200 acres, Riverside County.
02-53 Oil Shale.
02-54 Fuller's Earth.
02-55 Clay—suitable for pottery, brick, tile, etc., 40 acres.
02-56 Limestone deposits—in Imperial, Orange, San Bernardino and Kern Counties.
02-57 Feldspar deposits—high potash content, in San Diego and Imperial Counties.
02-58 Gold prospect—South Fork Feather River, Butte County; or capital assistance.
02-59 Gold mine—Cargo Muchacho district, Imperial County.
02-60 Gypsum deposit—high grade. 80 acres, Imperial County.
02-61 Gold mine—Production 1895 to 1900, $75,000.
02-62 Limestone deposit—Inyo County.
02-63 Plastic clay—Sec. 3, T. 6 S., R. 7 W.
02-64 Soda deposits—San Luis Obispo County.

Mineral products or deposits wanted.

03-37 Small gold property—to lease, or lease and bond.
03-38 Bentonite.
03-39 Limestone—near Los Angeles, suitable for structural purposes.
03-40 Sandy loam—without iron, vicinity of San Francisco Bay Counties.
03-41 Scheelite—minimum 65% W O_3, free from tin and copper. Want 25 to 30 tons monthly for one year, beginning in July.
03-42 Feldspar—also white-burning clay.
03-43 Placer property.
03-44 Soapstone—that can be cut into 4-inch blocks, and has some crushing strength.
03-45 Kaolin—or white-burning or white-grinding clay.
03-46 Clay—white-burning.
03-47 Magnesite—tonnage.
03-48 Iron ore (for paint); chalk and white barytes.
03-49 Gold property, small—lease or bond; can handle refractory ore.

EMPLOYMENT SERVICE.

Following close upon the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

The Bureau contemplates registering technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

A list of applicants for positions and 'positions open,' received by the Bureau during each 30-day period preceding the date of publication of the Monthly Chapter is carried in each issue.

Each notice is designated by a key number, and communications sent to the Bureau in reply to any notice will be forwarded to the proper party without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau to avoid possible loss.

Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

01–6 Metallurgist. One year operator experimental plant; six years as metallurgist with large companies. Age 29. Married. References.

01–7 Mine or mill superintendent or foreman. Fourteen years experience mine and mill operation. Age 36. Married. References.

01–8 Assayer or analytical chemist. Six years experience as assayer and chemist, copper company. One year analytical chemist, U. S. Navy. Age 29. Single. Salary wanted, $125. References.

APRIL, 1922

REPORT XVIII OF THE STATE MINERALOGIST

10—17105

DISTRICT REPORTS OF MINING ENGINEERS.

In 1919–1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each division working out from a local branch office.

This move brought the Bureau into close personal contact with operators, but did not materially shorten the time between the gathering of data in the field and their publication in the Report of the State Mineralogist at the end of an annual or biennial period.

Mining activities and development noted by district engineers in their respective fields are now embodied in monthly reports published in each issue of 'Mining in California,' thus making these data available within a maximum period of thirty days, and the Monthly Chapter as far as possible a compendium of current mining progress throughout the State.

The counties included in each field division and the location of the local offices are shown on the accompanying outline map of the State. (Frontispiece.)

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the State's oil fields is included under this heading.

REDDING FIELD DIVISION.

W. B. Tucker, Mining Engineer.

Shasta County.

The *Double Header Mine*, situated near Tower House, has been relocated by Charles Garrett of Tower House. A 400-foot tunnel has been cleaned out and retimbered. A vein of heavy sulphide ore is reported to have been discovered in the tunnel, and is stated to carry high values in gold.

The *Shasta Hills Mining Company*, who are operating the *Sybel Mine* in the French Gulch district, have five stamps running on excellent ore, and recent development work has opened up new ground yielding good results.

The *Washington Development Company* of Oakland, California, who are operating the *Washington Mine* in the French Gulch district, have developed some very good ore in the upper workings of this property. On April 8th the five-stamp mill was placed in operation, and sufficient ore has been broken in the stopes to keep the mill under continuous operation. The different tunnel levels have been cleaned out and retimbered, and an active prospecting campaign is under way by the company in the hope of developing some new ore bodies. Fifteen men are employed. G. T. Salisbury, general manager.

The *Balaklala Mine* at Coram is reported to have been leased by the *United States Smelting, Refining and Mining Company*, owners of the Mammoth smelter.

A number of men have been placed on development work at the *Little Nellie Mine,* which is situated southeast of Iron Mountain. The property is owned by the *Pittsburgh and Mount Shasta Mining Company* of Pittsburgh, Pennsylvania. T. V. Scott is managing director of the company.

Siskiyou County.

The *Spring Mine,* situated on Humbug Mountain, near Hawkinsville, is being reopened by Clyde and Ben Fairchild of Yreka. They purpose to drive a lower tunnel, about fifty feet below the present workings, to cut the vein at a greater depth.

The *Keynote Mine,* recently discovered by Horace Howe of Yreka, is located 6 miles north of Yreka. The property has been recently bonded to N. R. Randall of Seattle, who has a force of men developing the property.

The *Cub Bear Mine,* southeast of Etna Mills, is being operated by the Siskiyou Syndicate. An active campaign of development work is under way under the supervision of J. W. Applegram, superintendent.

Trinity County.

The *Lewiston Gold Dredging Company* has purchased the Martin placer ground, on the Trinity River above Lewiston. This company has bought the *Valdor Dredging Company's* dredge, which is being dismantled, and the material and machinery will be transported to the holdings of the Lewiston Gold Dredging Company. It is expected that the new dredge will be in operation late this fall.

There is considerable stir in the mining of platinum on Hayfork Creek in the neighborhood of Wildwood. It is reported that a large number of claims have been located in this region.

AUBURN FIELD DIVISION.

C. A. Logan, Mining Engineer.

Nevada County.

Alcalde Mine. This property is about four miles southwest of Grass Valley and has been variously known in the past as the Bowery, Seven Thirty or Kenosha. Since our last report, underground work has continued with a small crew. At present five men are employed.

The south drift on the 400 level is being driven ahead and is now 960 feet long. (April 7.) For a length of 125 feet on this level the vein is reported 2 to 3 inches wide, carrying free gold, and this is thought to be on the McCook shoot; the Bowery shoot is looked for 100 feet ahead. Present plans contemplate raising for a new shaft soon after cutting the latter shoot, as the shoots are pitching away to the south from the present shaft. A winze has been put down 56 feet from the 400 level at a point 400 feet south of the shaft. The mill was last run for 20 hours on Oct. 9, 1921. Since the last report a little ore in small bunches has been stoped by lessees on the 300 level.

Alta California Gravel Mine, I. Haas, 2299 Sacramento St., San Francisco, and I. Stein, owners. This mine, on a branch of the Alta Hill channel between Grass Valley and Rough and Ready, has been

worked lately under lease and bond by Chas. Gurden, with three men employed; but Gurden quit work about the end of March and has taken out the rails and other equipment.

Alta Combination Mine. This ground continues in process of prospecting with only a few men employed. It takes its name from the fact that the operators hope to develop both quartz veins and gravel. To date no important developments have been made. H. L. Ostrander is manager. The property is near Rough and Ready.

Dull Mine is a new development near Newtown. On April 8 it was reported that work had been temporarily suspended pending additional financing by Duil, of Los Angeles, who is in charge.

Empire Mine continues as one of the two principal producers of the Grass Valley Camp.

Idaho Maryland Mines Co., J. A. Fulton, general manager. This company is continuing exploratory work with a crew of about 100 men. At the time they took the property it was reported that some of the old stopes in the Eureka were filled with ore worth about $10 a ton, and during the first year a lot of time was spent in reopening these old workings; but the manager states that the results of this work were disappointing.

To the end of 1921 there was open and accessible 25,448 feet of underground work in the mines, including 16,368 feet of drifts, of which 1478 feet was new drifting. The old Canyon Shaft (winze), which was sunk 350 feet from the Idaho Shaft, is 2109 feet vertically below the collar of the Idaho Shaft at 2000 level. Since Jan. 1, 1922, this Canyon Shaft has been put down and the 2100 level is being opened. For the first 300 or 400 feet this winze is in serpentine, but the rest of it is in hard rock and was found to be in much better condition than had been expected. On No. 16 level, 2000 feet east of shaft, the Dorsey winze goes down 500 feet. Work eastward on the vein is going on from the bottom of this winze. When the bottom of the winze was reached it was found to contain a little good ore, as had been stated by witnesses who had visited the mine just prior to the last shut-down, but Mr. Fulton reports that this was not in important quantity. Going eastward from there, the diabase becomes more massive and the vein, instead of being on the footwall of it, has been found to enter the diabase. The mineralization here has not been so positive, and so far as opened, for a distance of about 300 feet, the vein has not proven of good grade, according to Mr. Fulton. If ore is developed in this region, the management plans tentatively on the extension of the 2000 level from the Canyon Shaft to connect the Dorsey Winze with the Idaho Shaft, which is the present working entry.

North Star Mines Co. That gold mining conditions are still far from normal is shown by the report of this company for the year 1921. The North Star Mine maintained its former record of a gross output of about $1,000,000 a year, in spite of the fact that during the first half of the year operations were at only one-half capacity. This was done by mining and milling during the first half year selected ore of much higher than the average grade, and at an advance in cost of $3 or more a ton, due to overhead and fixed costs. This practice of taking out selected ore could not have been continued, according to A. B. Foote, general superintendent, without ruining the mine.

In July, operations were suspended for several weeks, pending an agreement on a reduced wage scale, without which it is understood the company would have been forced to close the mine entirely. Work at full capacity was not resumed until the end of October. The figures for average value of ore treated and average costs under such conditions would of course be entirely misleading, and are therefore not quoted.

It does not appear to be practicable to work the property on a reduced scale. During the last half of 1920, while running only 20 stamps, the cost of operation and development is said to have reached $13.38 a ton. During the first half of 1921 work at one-half capacity cost $11.60 a ton. Mining ore of such average grade as this mine has turned out for several years past, there would have been a substantial loss with the above costs. Operation at full capacity seems the best policy. This results in the plant and mine being kept in shape, the organization is held intact, and employment is given to a large crew at a time of general depression. At the same time, by spreading fixed charges over the largest possible tonnage, a small return on the investment is possible. However, development work is said to have been lagging at this mine in the past few years, as at many other gold quartz mines, on account of adverse conditions.

During 1921 there were 99,945 tons hoisted from various levels between the 3100 and 6000. Of this amount, 23,945 tons were sorted out as waste and 76,000 tons were milled. Of the total recovery, 86.08 per cent was saved by amalgamation and there was a tailing loss of 26 cents a ton. Reduction of cost amounting to about $1.10 a ton mined is attributed to decreases during the last half of 1921 in the cost of labor and explosives. Pumping is said to cost about 36 cents a ton and hoisting about the same. Some striking figures are cited in regard to taxes paid. The company paid last year a total tax of $25,542 on an assessed valuation of $551,835. With the mine working at full capacity, Mr. Foote estimates that the total of all taxes paid is equal to 38 cents per ton of ore treated, as compared with 25 cents in 1914. With the mine and mill in full operation he estimates present cost at about $8 a ton, as compared with a total cost of $7.20 a ton estimated for the year 1918 and $4.94 per ton for 1914.

Normandy Mining Co. (formerly called *Normandie Dulmaine*). This prospect is 4¾ miles from Grass Valley and near the Alcalde Mine. A. B. Greenwald, secretary, Grass Valley. The shaft had reached a depth of 250 feet on April 7, and it is planned to continue sinking to 500 feet. About 80 feet of drifting has been done at a depth of 130 feet.

The vein stands nearly vertical in amphibolite schist walls. The fissure is about the width of the shaft, and the quartz veir runs from a foot to a foot and a half wide, having the latter width in the bottom of the shaft. The width of the formation varies with the rolling of the hanging wall. The quartz is white, showing good-looking sulphides in small amount as a rule. It is said to assay well all the way down the shaft.

A crew of 14 men are employed three shifts in shaft sinking. The plant consists of a 5-stamp mill, 10-inch by 10-inch compressor, 25 h. p. motor, single drum hoist good for about 500 feet depth, and 15 h. p. motor.

The *Osceola Mine* is near Rough and Ready and has been described in our previous reports. Allen and Joseph Archibald have been doing some work lately on the property, and efforts are now being made to finance further operations.

Penn-California Mining Co., Arthur Hoge, manager, Nevada City. This company's prospect adit on their claims near Willow Valley is now (April 15) 2800 feet long. Five raises, including one now going up near the face, have been driven in search of the main Harmony Channel, which the operators think crosses the property. One raise about 1100 feet in, broke into old workings on a small channel which was mined years ago by other owners. The present company has done considerable work on this channel; their main adit is about 20 feet below it, which will permit of going quite a distance downstream on it before running out of grade.

At present the main adit is 510 feet under the surface at the face and is said to be under the crest of the ridge. Raises have been 300 feet or more apart, beginning at 1100 feet in. Of the main adit, 2200 feet is in granodiorite and 660 feet in slate. Hoge states the total cost per foot, including overhead, taxes, pipe, rails, etc., has been $18.

Nearly parallel to the course of the adit are the Lone Star and Buckeye quartz veins, which outcrop on claims held by the same company. Farther downstream, quartz boulders carrying gold were common in the gravel mines on the Harmony Channel, and Mr. Hoge and others believe that these boulders were brought down by the ancient stream from its crossing with the veins named.

Randolph Consolidated Gold Mining Co., H. L. Ostrander, manager. This company has been shut down about a month pending the raising of funds for further work. There is a shaft on the vein about 100 feet deep, dipping 35 degrees west. It is on the Wm. Grant ranch, beside the Grass Valley road, near Rough and Ready. For the last 40 feet in the shaft, which was full of water when visited, the vein is said to be about 2 feet wide, according to Grant, the owner. A drift was just started at 100 feet when they quit work.

The equipment consists of 6 h. p. gas engine, hoist, ½-ton skip, and jack-head pump operated by 2½ h. p. gas engine.

Sultana Mine, Albert Crase, superintendent. Comparatively little work has been done in this mine since the Bureau's last detailed report. At present practically nothing but pumping is going on. The property has been examined by a number of engineers during the past two years.

The claims cover about two miles on the strike of the vein system, and the shaft in use at present is near the north end and not far from the Empire line. This shaft is 800 feet deep; thence a drift was run north 400 feet and a cross-cut driven 322 feet into the hanging-wall, then a winze was sunk to 2100 level. This work is all in diabase, but Crase is of the opinion that the 2100 level shows indications of being near the contact with the granodiorite.

Ore is reported on levels 3, 5, 12, 14, 15 and 19, the vein varying in width from a few inches to three feet. Several levels have been driven to the Empire line on the north, which is about 200 feet from the winze. The 21 level has been run south about 1000 feet; 15 level south 900 feet; 14 level 500 feet south, and 12 level 850 feet south. In this direction water is increasing and Mr. Crase reports they are now pumping about

300 gallons per minute. The property in general and the surface plant were described in our last county report.

In the Nevada City district the only activity noted in quartz mining is the reopening of the *Constitution* and *Cheyenne* mines.

Sierra County.

Due to snow conditions in the mountains, and the difficulties of traveling, most of the mining news coming out of Sierra County now is hearsay, which can not be substantiated until later in the season, but some of it is interesting.

Alleghany is coming back as a gold producer. The *Sixteen to One Mine* and the *Tightner Mine* are said to be producing a profit from good ore. It has been stated recently that operations at the Tightner have been so satisfactory that the operating company has been able to pay a small dividend after making payment to the owners of a large part of the purchase price of $400,000. A large shaft is being sunk at the Tightner.

Preparations are being rushed with the idea of unwatering the well-known *Plumbago Mine*, which has been the best producer of the Alleghany district in the past but has lain idle for about five years. Griffith and Ray are planning to get supplies to the mine and start a crew at work as soon as possible.

The *Mugwump Mine* has been producing considerable coarse gold, but the average return from a total of 6000 yards of gravel is said to have been only $1.70 a yard, which is a surprise to those who have claimed the gravel would sample $6 a yard.

The *Rainbow Mine* is opened to an additional depth of 300 feet, and drifts are being run both ways on the 300 level. This is new work in addition to the old tunnels that were driven years ago.

SAN FRANCISCO FIELD DIVISION.

C. McK. Laizure, Mining Engineer.

Alameda County.

Hoff Magnesite Company: Home office, 333 Monadnock Building, San Francisco; J. M. Hoff, president. Plant at foot of 22d Avenue, Oakland, California., R. Roderick, superintendent. This company manufactures an asbestos magnesite flooring known under the trade name of 'Hoffite,' also stucco, asbestos plaster and a high-heat cement for use inside of furnaces. The company uses calcined magnesite, asbestos, talc, silica and various dry colors in their mixes. Much of the raw material is mined by the company from their own deposits, but some is purchased.

The plant is situated on a Southern Pacific spur track, and the crude materials are unloaded direct from cars to hopper, feeding a jaw-crusher with 8″x 10″ opening, crushing to one-inch size. The crushed material is elevated to a bin by a bucket-belt elevator equipped with magnetic pulley to remove stray iron and steel. From the bin the material passes to a Williams beater mill equipped with air suction system which removes 100-mesh and finer, the oversize going to French burr-stone mills, also equipped with air suction system, which deliver the pulverized product to the packer or finished product bin. When asbestos rock is being used it goes to the Williams beater mill alone to separate the

fiber. The fiber is drawn off by air suction and is graded by the pneumatic principle. The barren rock is transferred by worm conveyor to a burr mill and pulverized. For making the various mixes there is a one-ton Broughton dry mixer to which the desired ingredients are fed.

Electric power is used, about 100 h. p. being required, and four men employed. The plant is equipped with a physical testing laboratory and every mix is tested, and the raw materials are analyzed when necessary for control of the product. Practically any color and surface finish is possible. The finished product is shipped in sacks and barrels. A shipment of thirty tons was recently made to China.

Contra Costa County.

Luning Mineral Products Company, L. E. Browne, president and manager; Charles D. Olney, secretary; executive office, 265–268 Russ Building, San Francisco. Plant at 21st and Chanslor Streets, Richmond, California.

This company manufactures water-ground and water-floated pigments and is the only wet-grinding plant of the kind west of St. Louis, Mo. Operations began in an experimental way one and one-half years ago. The company now has a complete plant covering 50 x 210 feet, equipped with machinery which makes the handling of the material from the crude state to the finished product practically automatic. Raw material comes mainly from the mine of the Luning Consolidated Silver Mining Company in Nevada, but this is blended with other ores from various California deposits.

The ore from the Nevada property carries gold and silver values. A cyanide system is incorporated in the flow-sheet of the plant, and the precious metals are recovered, after which a high-grade metallic pigment is made from this tailing.

A third unit has just been completed and this is in an experimental stage, but indications are that several new colors and products will soon be added to the present output. Besides the regular wet-grinding and conveying machinery, the plant is equipped with stationary and rotary kilns, acid tanks, vacuum filters, drying furnaces, air separating system, etc.

Electric power is used throughout. The plant is operating twenty-four hours per day, the product finding a ready market locally among the large consumers.

Mariposa County.

White Oak Mine: John P. Carrol, owner, 2206 E. 16th Street, Oakland, California. Property is about three miles from Bagby and one-half mile from Merced River. Consists of three claims developed by shaft 140 feet deep with north and south drifts at the 110-foot level. According to the owner, the vein is three to four feet wide on contact of diorite and porphyry. A short drift from the 70-foot level in the shaft revealed ore carrying good values in gold. Thirty tons from bottom of shaft milled $21. Average values said to run from $6 to $10 per ton. Three top sets in the shaft are caved, although otherwise everything is in shape to start operations. All necessary machinery is set up, including hoist, compressor and power line. Boarding houses

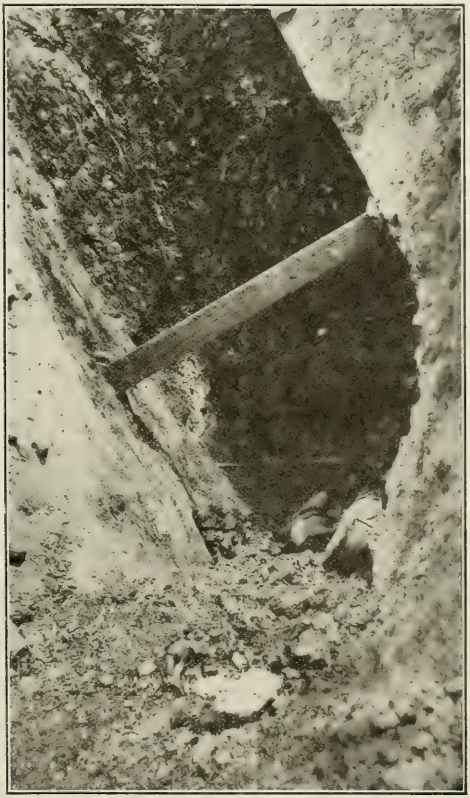
and other buildings are in order, and equipment for a 5-stamp mill is on the ground.

Property is idle at present.

San Benito County.

San Benito Coal Mining Company: Home office, Bank of Italy Building, Oakland, California; John J. Shoo, president, 542 Lakeshore Boulevard; Earl D. White, secretary and treasurer, Bank of Italy Building, Oakland.

This company has recently started development of its coal deposit in San Benito County. The deposit was discovered about fifteen years



Coal vein exposed on property of San Benito Coal Mining Company, San Benito County.

ago and some coal was mined and sold to the New Idria Quicksilver Mining Co., since which time it has been idle and the workings flooded. It was taken over by the present company in August, 1921. The holdings are near the Ashurst ranch on Larious Creek, in the New Idria district. Mendota, the nearest railroad point, is thirty-three miles distant. Llanada is the mine post office.

The coal so far exposed is sub-bituminous in character and occurs in veins from 2½ to 6 feet in width between sandstone walls. Three veins are known and have been traced for several miles on the surface. A tunnel two hundred feet in length cuts a vein five feet to six feet wide at a depth of seventy feet from the surface, and another tunnel six hundred to seven hundred feet in length, one mile distant, has cut the first vein. The veins dip at an angle of sixty to seventy degrees. The property comprises two hundred eighty acres of patented land and other holdings. The mine is equipped with gas engine and blower, track, cars and hand tools. Three men are employed. It is intended to double this force at once and also to put a diamond drill on the property in the near future.

Reported analysis:

	Per cent
Moisture	8.6
Volatiles (including Sulphur 2.58%)	49.5
Fixed Carbon	36.6
Ash	5.3

B. T. U. 10750.

A sample from a shallow depth, analyzed by Smith Emery & Co., August 16, 1921, gave:

	As rec'd, per cent	Dry, per cent
Moisture	9.45	----
Volatile and combustible matter	43.96	48.55
Fixed Carbon	36.39	40.51
Ash	9.90	10.94
Sulphur 2.90%.		
Calories	5514	6089
B. T. U.	9925	10961

San Francisco County.

Bear Barytes Co., Geo. I. Gleason, superintendent, 310 Irwin Street, is operating a custom grinding plant for industrial minerals such as barite, limestone and so forth. Quartz and silica will not be accepted, and ochres and similar material which stain or color the mill will only be handled if in large enough quantities to justify the work of cleaning all the machinery after the contract is finished.

The plant is situated on a spur track of the Southern Pacific Company and has a receiving-bin capacity of eight carloads. It is equipped with a rock crusher and Raymond two-roller mill with air separation. Final product can be made any degree of fineness up to 400-mesh.

LOS ANGELES FIELD DIVISION.

M. A. Newman, Mining Engineer.

Kern County.

Cove Mining District: *The North Sumner Gold Mines* has been granted a permit from the Commissioner of Corporations to sell 400,000 shares of its treasury stock, at $10 a share, the money to be expended in

the development of mining claims in the Cove Mining District, about one mile north of Kernville. Kernville is 42 miles north from Caliente, the nearest railroad point, and is to be connected by a highway from Bakersfield, which is 45 miles distant.

The company has 33.48 acres of patented land, besides three mining locations, making a total of 93 acres. In addition, the company has a ten-year bond and lease on the Beauregard Mine and North Extension Sumner Mine, as well as a ten-year lease on the Urbana and Frank mines. These holdings will give it a large area of mineralized ground for development purposes.

The company contemplates cleaning out and retimbering the Beauregard shaft, making available the ore developed in these workings, and to extend the northeast drift on the 200-foot level, to further explore the vein at this depth with the ultimate purpose of crosscutting the main lode in the Northeast Sumner. It also proposes to retimber the shaft to the 300-foot level and extend the drifts on that level to get into condition for ore extraction. All this work will be above the present water level of the mines, as the tunnel of the Sumner has drained all of these workings.

By drifting to the main lode on the 200-foot level of the Beauregard shaft, an equal depth will be attained at the intersection with the main lode, and an additional depth of at least 250 feet will be gained by drifting north on the main lode.

With the opening up of the 200 and 300 foot levels in the Beauregard, the property should be ready for a milling plant commensurate with the amount of ore developed.

The property has all the necessary factors for low cost operations, such as electric power, plenty of water and ore bodies of good, stoping widths.

Percy V. Long and Robert L. Long are, respectively, president and manager of this company.

These mines are described in Report XIV of the State Mineralogist.

Randsburg District: *The Yellow Aster Mining and Milling Company*, the largest gold producer in the southern part of the state, is now selling a large block of its treasury stock, to provide funds for an intensive campaign of development, so that its present hundred-stamp mill may run at full capacity.

During its sixteen years of active operation it had a bullion production in excess of $10,000,000, from which substantial dividends were paid.

The management claims that ore running as low as $2.50 a ton will net a profit of $0.75 to $1 if the mill be run to full capacity.

In the new east drift on the Rand level, which is entirely in virgin ground, the company claims to have cut sulphide ore assaying $7 to $8 a ton. This is a matter of considerable significance, not only that the ore is of such good grade, but also that the sulphide zone has been penetrated.

Mr. Albert Anker is president and Geo. W. Nicholson superintendent of the company.

Radamaker District: *The Silver Bar Mining and Reduction Company* has been formed to develop a group of seven mining claims in the Rada-

maker Mining District, about fourteen miles north of Randsburg and three miles northwest of Searles Junction of the S. P. Railroad.

The present workings on these claims consist of an incline shaft sunk to a depth of approximately 300 feet, at an angle of 45 degrees, with some 750 feet of drifting on the 50-foot, 100-foot, 150-foot, 200-foot and 300-foot levels. The ore occurs in quartz stringers assaying from $1 to $32 gold per ton.

San Bernardino County.

The AAA Rock Salt and Chemicals Company controls saline deposits of salt and calcium chloride, situated at Brystol Dry Lake, about five miles south of Saltus Station on the A., T. & S. F. Railroad. These deposits are held under ten placer locations.

The company will soon be ready to market both its salt and calcium chloride.

Barstow Mining and Milling Company will develop its mining claims, 4½ miles northwest of Barstow. These were located by John Kennedy and are near the famous old 'Waterman' Mine, worked years ago by Gov. Waterman of California.

The present workings on the property consist of a 100-foot shaft sunk on the dip of the vein approximately 35 degrees. From the bottom of this a drift 28 feet long has been run, showing five feet of ore, assaying 10 to 12 ounces silver, for its entire length.

The Mountain Lime Company will operate under lease the limestone quarry in Lone Pine Canyon. This is about seven miles from the railroad. The company proposes to commence operations on a basis of fifty tons per day, and later increase this to a hundred tons. Its comparative closeness to Los Angeles should make it a factor of importance in the limestone business.

Mojave Rand Silver Corporation: This company has several claims north of the North Rand Mining Company, six miles north of Johannesburg.

Development consists of a 75-foot vertical shaft. It is claimed that surface assays showed values of $4 to $18 a ton in gold and silver. Also, that at a depth of 50 feet in the shaft, a selected sample assayed $185 in gold and silver.

An interesting feature of this immediate section is that the ratio of gold to silver is much larger here than at the California Rand Silver and immediate vicinity.

Dr. E. E. Sherrard and J. L. Martin, president and superintendent, respectively, of this company.

The Randsburg Silver Mining Company, locally known as the 'Coyote,' has acquired several groups of valuable mining claims near its original locations. These comprise the Sanderson Group No. 1, consisting of the following claims:

Gap No. 1, Gap No. 2, Trail, Velvet Joe, Dixie Queen, Silver Sceptre, Ryolite No. 3.

Sanderson Group No. 2, as follows: Lookout View No. 1, Top Notch, Velvet, New, Spider and Spider Fraction.

Foster Group as follows: Ryolite No. 1, Ryolite No. 2, Randsburg No. 2, Kelly No. 1 and Kelly No. 2.

Flynn Group as follows: Silver Reef No. 1 and Silver Reef No. 2. With these increased holdings this company materially strengthens its position in this district, and next to the California Rand Silver, Inc., will become the most important factor in the development of the camp.

On Silver Reef No. 1 and Silver Reef No. 2, two diamond drill holes were put down several hundred feet and it is claimed that the cores showed values at a depth of several hundred feet below the surface.

On the Foster Group, the Foster shaft was sunk 265 feet deep and it is reported cut stringers of ore-bearing material.

To develop its group with least possible delay, the company has decided to cut the Foster Group into 17 parcels, 200 feet x 300 feet, and these will be turned over to leasers on a royalty basis. In order to avoid the trouble that resulted in the Grady Lease of the California Rand Silver, Inc., from allowing the Grady Lease to exercise the extra-lateral rights on all veins apexing within its boundaries, the leases on the Foster Group will be limited in exploration to vertical planes through the boundaries.

Mr. John W. Kelly is president and John C. Wray secretary of the Randsburg Silver Mining Company.

San Diego County.

The Descanso Mining Syndicate has taken over what is known as the Dr. McDougall Mine, one-half mile west of Descanso. This property consists of fourteen claims and development work consists of a tunnel and a 220-foot shaft. This shaft will be unwatered; a vigorous plan of development work has been decided on. It is stated that good values in gold and silver were found in the shaft prior to the suspension of operations.

Capt. J. A. Tregelles is superintendent.

OIL FIELD DEVELOPMENT OPERATIONS.

R. E. Collom, State Oil and Gas Supervisor.

From March 4, 1922, to and including April 8, 1922, the following new wells were reported as ready to drill:

Company	Section	Twshp.	Range	Well	Field
FRESNO COUNTY:					
Paragon Oil Company	17	19	15	14-P	Coalinga
Union Oil Company	9	16	13	2	----------
IMPERIAL COUNTY:					
104 Oil and Drilling Company	11	14	16	3	----------
KERN COUNTY:					
Totem Oil Company	19	25	19	1	Devils Den
Pacific Oil Company	35	30	24	13	Elk Hills
Pacific Oil Company	35	30	24	11	Elk Hills
Pacific Oil Company	35	30	24	15	Elk Hills
Pan American Petroleum	1	31	24	7-F	Elk Hills
Pan American Petroleum	2	31	24	1-F	Elk Hills
Pan American Petroleum	1	31	24	10-E	Elk Hills
Pan American Petroleum	2	31	24	4-F	Elk Hills
Pan American Petroleum	2	31	24	2-F	Elk Hills
Pan American Petroleum	2	31	24	10-F	Elk Hills
Pan American Petroleum	2	31	24	5-F	Elk Hills
Union Oil Company	26	30	24	7	Elk Hills
Coalinga-Kern Oil Co	21	28	28	6	Kern River
Gray Heirs	3	28	28	39	Kern River
Gray Heirs	3	29	28	39	Kern River
Hibbard Petroleum Company	25	28	27	4	Kern River
Huntington and Northern Pet. Co	2	29	28	7	Kern River
Union Oil Company	11	28	27	4	Kern River
Universal Oil Company	32	26	21	43	Lost Hills
Boston Pacific Oil Company	32	31	24	6-B	Midway
C. C. M. O. Company	29	31	22	22	Midway
Edwards Petroleum Company	31	32	24	1	Midway
General Petroleum Corp	32	31	24	5	Midway
Honolulu Consolidated Oil Co	6	32	24	19	Midway
Honolulu Consolidated Oil Co	6	32	24	49	Midway
Midland Oilfields Company	24	31	23	1	Midway
Midway-McKittrick Oil Company	4	31	22	1	Midway
Murvale Oil Company	12	32	23	M-12	Midway
Pacific Oil Company	31	31	24	19	Midway
Pacific Oil Company	31	31	24	15	Midway
Pacific Oil Company	31	31	24	13	Midway
Pacific Oil Company	15	32	24	15	Midway
Pacific Oil Company	5	32	24	40	Midway
Pacific Oil Company	5	32	24	38	Midway
Pacific Oil Company	1	32	23	31	Midway
Pacific Oil Company	1	32	23	28	Midway
Pacific Oil Company	1	32	23	22	Midway
Pacific Oil Company	31	31	24	22	Midway
Surprise Oil Company	36	32	23	2	Midway
Union Oil Company	34	31	23	11	Midway
Union Oil Company	23	31	22	1	Midway
B. B. and O. Oil Company	28	12	24	24	Sunset
C. J. Berry	34	12	24	10	Sunset
La Plata Oil Company	20	11	23	1	Sunset
Midway Northern Oil Company	32	12	23	9	Sunset
Obispo Oil Company	32	12	23	8	Sunset
The Fremont Oil Syndicate	22	31	38	1	----------
KINGS COUNTY:					
California Natural Gas and Dev. Co.	12	23	22	4	----------
Sagebrush Gas and Oil Company	18	22	19	1	----------
LOS ANGELES COUNTY:					
General Petroleum Corp	19	4	12	1	Long Beach
General Petroleum Corp	19	4	12	Black & Signal 1	Long Beach
General Petroleum Corp	19	4	12	Secco 1	Long Beach
Henderson Petroleum Syndicate	29	4	12	1	Long Beach
Pelham & McKinnie	29	4	12	2	Long Beach
San Martinez Oil Company	29	4	12	1	Long Beach
Shell Company	29	4	12	1	Long Beach
Shell Company	19	4	12	1	Long Beach
Shell Company	29	4	12	2	Long Beach
Union Oil Company	30	4	12	1	Long Beach

Company	Section	Twshp.	Range	Well	Field
United Oil Company	29	4	12	3	Long Beach
Western Star Oil Company	29	4	12	Griswold 1	Long Beach
Western Star Oil Company	29	4	12	Croswell 1	Long Beach
Standard Oil Company	10	4	14	1	Redondo
Amalgamated Oil Company	21	1	14	416	Salt Lake
Amalgamated Oil Company	31	2	11	2	Santa Fe Springs
Amalgamated Oil Company	31	2	11	3	Santa Fe Springs
Bandini Petroleum Company	5	3	11	1	Santa Fe Springs
Bellview Oil Company	6	3	11	1	Santa Fe Springs
General Petroleum Corp.	6	3	11	85	Santa Fe Springs
General Petroleum Corp.	6	3	11	91	Santa Fe Springs
General Petroleum Corp.	5	3	11	5	Santa Fe Springs
General Petroleum Corp.	6	3	11	87	Santa Fe Springs
Machris Bros. No. 1 Syndicate	5	3	11	1	Santa Fe Springs
Machris Bros. No. 1 Syndicate	5	3	11	Babonet 1	Santa Fe Springs
F. A. Parkford	6	3	11	1	Santa Fe Springs
Shell Company	31	2	11	2	Santa Fe Springs
Union Oil Company	6	3	11	fi	Santa Fe Springs
Union Oil Company	31	2	11	2	Santa Fe Springs
Universal Oil Company	6	3	11	1	Santa Fe Springs
Ferguson-Francisco Petroleum Co.	31	1	17	1	----------
O'Donnell & Wilde	24	1	13	1	----------
Chas. E. Foster	18	4	12	1	----------
ORANGE COUNTY:					
Amalgamated Oil Company	34	5	11	5	Huntington Beach
Argonaut Oil Company	2	6	11	1	Huntington Beach
Argonaut Oil Company	11	6	11	2	Huntington Beach
Bell of Montebello Oil Company	2	6	11	2	Huntington Beach
Catalina View Oil Company	2	6	11	1	Huntington Beach
Gypsy Oil Syndicate	11	6	11	4	Huntington Beach
Hamilton Well No. 3	11	6	11	3	Huntington Beach
McIntyre Bros.	11	6	11	2	Huntington Beach
M. H. Mosier, Special	35	5	11	1	Huntington Beach
O'Donnell Syndicate	34	5	11	2	Huntington Beach
Pacific Petroleum Company	2	6	11	7	Huntington Beach
Reliance Oil Company	34	5	11	3	Huntington Beach
Rio Bravo Oil Company	35	5	11	4	Huntington Beach
Standard Oil Company	34	5	11	7	Huntington Beach
Standard Oil Company	34	5	11	8	Huntington Beach
Standard Oil Company	11	6	11	6	Huntington Beach
Standard Oil Company	11	6	11	1	Huntington Beach
Union Oil Company	34	5	11	8	Huntington Beach
Union Oil Company	35	5	11	12	Huntington Beach
Union Oil Company	34	5	11	7	Huntington Beach
Walker Western Oil Company	2	6	11	2	Huntington Beach
Western Star Oil Company	35	5	11	1	Huntington Beach
Fairview Oil Company	4	6	10	1	Newport
Amalgamated Oil Company	28	3	9	2-A	Richfield
Amalgamated Oil Company	28	3	9	4	Richfield
Petroleum Midway Company, Ltd.	33	3	9	3	Richfield
Union Oil Company	33	3	9	5	Richfield
RIVERSIDE COUNTY:					
Beaumont Midway Oil Company	16	2	2	1	----------
SANTA BARBARA COUNTY:					
Rice Ranch Oil Company	19	9	33	15	Santa Maria
Carpinteria Oil and Gas Company	R. W. Hill Tract			1	----------
VENTURA COUNTY:					
Camarillo Refining and Pet. Co.	27	2	20	2	Conejo
Cooper Petroleum Company	33	2	20	41	Conejo
Cooper Petroleum Company	33	2	20	42	Conejo
Logsdon and Sloan Syndicate, No. 1	4	1	20	1	Conejo
Logsdon and Sloan Syndicate No. 1	4	1	20	2	Conejo
Logsdon and Sloan Syndicate, No. 1	4	1	20	3	Conejo
Logsdon and Sloan Syndicate, No. 1	4	1	20	4	Conejo
Logsdon and Sloan Syndicate, No. 1	4	1	20	5	Conejo
Logsdon and Sloan Syndicate, No. 1	4	1	20	6	Conejo
Mabel King Fallis	33	2	20	1	Conejo
Klatawa Oil Company	12	4	19	12	Piru
Santa Fe Petroleum Company	17	4	18	5	Piru
Oak Ridge Oil Company	18	3	20	12	South Mountain
Globe Petroleum Corp.	34	4	23	7	Ventura
Shell Company	28	3	23	4	----------

SPECIAL ARTICLES.

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the Bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff containing much information that will add to the permanent value of the Monthly Chapter are included in each number of 'Mining in California.'

It is anticipated that these special articles will cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations, as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the text of new laws and official regulations and notices affecting the mineral industry.

BIBLIOGRAPHY OF COAL IN CALIFORNIA.

By E. S. Boalich.

The records of the State Mining Bureau show that coal exists in forty-three counties of California. Many deposits with extensive surface showings have never had a pick driven into them. From their first discovery small commercial importance was attached to a majority of these deposits because the coal is usually low grade, of lignite or subbituminous variety, and better fuel has been readily available. The exploitation or development of a lignite bed in California offered no particular inducement to capital in the past, and discoveries of new coal deposits in localities where transportation facilities were not of the best have aroused little interest.

Petroleum has been so cheap and abundant here that the habit of thinking that all fuel needs would be taken care of automatically has become general.

Within the past few months, however, these ideas have received considerable revision. Without quoting statistics, it is a fact easily proved that consumption of oil is outstripping production. The average price of crude petroleum from the San Joaquin Valley fields in July, 1914, was 40¢ per bbl. for 21° Baumé; in July, 1920, 21 gravity oil was selling for $1.70, and 31 gravity was worth $2.55, with an increase in price for higher grades.

So vitally important is oil for many purposes, that the ordinary consumer not only faces continually increasing prices but it is not beyond the range of possibilities that many demands for oil, or its derivatives, may some day be refused regardless of the price offered. That day is surely approaching, and scientific as well as commercial organizations are beginning to look about for means of relieving the situation.

One means of relief will assuredly be the utilization of low-grade coals and lignites, which are widely distributed throughout the United States.

Experiments which give great promise of success are being made to purify lignites and cheap coals of similar character by some process

such as the Trent method, which consists of agitating together powdered coal, water and oil. This produces a partly de-ashed plastic fuel called amalgam, the oil selecting the coal particles and largely excluding the water and ash.

In one experiment on a California lignite, carried on by the United States Bureau of Mines at Washington, D. C., the ash reduction amounted to 26.8 per cent, the combustible recovery was 95 per cent and the sulphur reduction was 12 per cent after treatment.

Other investigative work has been undertaken with the idea of showing how these coals may be utilized in powdered form, either alone or with oil in colloidal fuels; to make them into briquets, without the use of an expensive 'binder'; to manufacture gas from them; to obtain for commercial use their other constituents, including ammonia, benzol, toluol, solvents, drugs, oils, and coal tar products too numerous to mention. It has even been shown that an internal combustion engine can be operated with powdered coal, in the place of distillate or gasoline.

The earliest recorded discovery of coal in this State was in 1847, near the town of San Luis Obispo. Croppings of lignite were known in San Diego County at an early date. Also R. C. Taylor, in a book called 'Statistics of Coal,' published in 1885, but written before 1851, mentions the occurrence of coal on the sea coast twelve miles north of San Diego.

The date of the original discovery of coal in Alameda County is not known, but Goodyear, writing in Vol. 2, Geological Survey of California, states that it was some time previous to 1857, as during that year a shaft one hundred feet deep existed at a point near the present town of Tesla, where a coal bed forty inches thick was exposed.

Coal production was a factor in the mineral industry of California from about 1860 to the early years of the present century, when competition with crude oil almost forced it off the market. As mentioned above, however, it will probably not be long before serious attention will again be given to the coal deposits, both developed and undeveloped.

The amount of coal remaining unmined is of course not absolutely known, but the U. S. Geological Survey has estimated[1] that the total workable area in California is about 500 square miles and the original contents of all fields 1,000,000,000 short tons.

Total coal production to January 1, 1921, has been 5,164,658 tons,[2] equivalent to an exhaustion of approximately 7,000,000 tons, or 0.7 per cent of the original supply.

The principal developed coal mines have been those north of Mt. Diablo, Contra Costa County; Corral Hollow, which lies on both sides of the divide between the Livermore Valley and the San Joaquin Valley, mostly in Alameda County; Ione field in the Sierra Nevada foothills, Amador County; Stone Canyon, Monterey County; and near Elsinore, at the eastern base of the Sierra de Santa Ana, Riverside County.

Coal seams have been discovered and prospected to some extent in Butte, Del Norte, Orange, Fresno, Siskiyou, Humboldt, San Benito, Mendocino, Shasta, Trinity, Sonoma, Placer, San Luis Obispo, and twenty-five other counties.

[1]U. S. G. S. Bull. 394, 'Papers on the Conservation of Mineral Resources,' 1909, p. 18.
[2]Cal. State Min. Bur. Bull. 90, 'California Mineral Production for 1920.'

Many of these deposits may some day be valuable as a source of local supply, even though economic conditions and quality of the product prevent a large output being placed on the general market.

The Stone Canyon coal has been classed as a bituminous variety,[1] but as far as known most of the others are lignite, being soft and friable, with relatively poor burning and heating qualities.

All known coal deposits in the State are of the Tertiary age,[2] those of Alameda and Contra Costa being earlier Tertiary, or Eocene (Tejon). The others are believed to be later Tertiary, or Miocene.

The areas of coal-bearing rocks were in most instances folded, faulted and eroded after the coal was deposited, so that a careful investigation of geologic relations is more necessary here than in states where the coal measures are more regular and of wider extent.

A great deal of data on the coal deposits of California are in existence, but they are so widely scattered through many publications that they have been of little value to the casual investigator.

As a means of offering an entering wedge to those who may be interested in looking into the coal resources of this State, the following bibliography is presented. Most of the publications mentioned will be found available for reference in the library of the State Mining Bureau, Ferry Building, San Francisco; in the Bureau's branch offices at Redding, Auburn and Pacific Finance Building, Los Angeles; and in the libraries of the various government departments such as the U. S. Geological Survey, as well as in the industrial division of many public libraries and educational institutions throughout the United States.

KEY TO ABBREVIATIONS USED IN BIBLIOGRAPHY.

St. Min. Rept.——California State Mining Bureau, State Mineralogist's Report.
Mines & Min. Res.——California State Mining Bureau, Mines and Mineral Resources, various counties.
Bull.——California State Mining Bureau Bulletin.
Pre. Rept.——California State Mining Bureau Preliminary Report.
Geol. Sur. Cal.——Geological Survey of California.
U. S. G. S. Ann. Rept.——United States Geological Survey Annual Report.
U. S. G. S. Bull.——United States Geological Survey Bulletin.
Geol. Atlas——United States Geological Survey Geological Atlas.
Min. Res.——United States Geological Survey Mineral Resources of United States.
W. S. P.——United States Geological Survey Water Supply Paper.
U. S. B. M. Bull.——United States Bureau of Mines Bulletin.
R. W. Raymond——Mineral Resources West of the Rocky Mountains, by R. W. Raymond and Ross Brown.
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E. & M. J.——Engineering and Mining Journal.
M. & S. P.——Mining and Scientific Press.
Mines & Min.——Mines and Mining.
Jour. of Elec.——Journal of Electricity.

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THE METALLURGY OF PLATINUM.

Translation by ALLEN C. REDDING,[1] D. Sc., and GEO. M. NELSON,[2] C. E., from 'Le Platine du Monde,' by Louis Duparc.

INTRODUCTION.

By FRANK SANBORN, Petrologist.

Information concerning the metallurgy and mining of the platinum metals is very frequently sought at the laboratory of the State Mining Bureau.

Most of the literature published in English has been on the estimation of platinum in an ore; but the methods usually considered best also have some disadvantages. Crude platinum does not readily go into solution, and when once in is not easily precipitated completely. The several manipulations necessary, the difficulty in handling very small amounts of the separated platinum metals, and the loss of osmium, ruthenium and iridium during cupellation—the latter by spreading over the cupel—all tend to give erratic results in the estimation of platinum.

It is possible that the rather obsolete method of estimating small amounts of platinum by 'difference' could be improved upon and used to advantage in cases where small amounts of platinum are known to exist. Silver and gold are rather easily removed from a platinum solution. Platinum metals can be precipitated with zinc from a very dilute hydrochloric acid solution. Evaporation could be resorted to instead of filtering, and a known amount of gold added to the residue to hold the platinum during fusion and cupellation. The loss of osmium, iridium and ruthenium could probably be lessened by using the method of combining the lead buttons (if more than one fusion is made), scorifying and treating the greatly reduced amount of lead with dilute nitric acid (1 to 8), and treating the residue with dilute aqua regia to obtain insolubles consisting largely of osmium and iridium.

In separating the platinum from sand concentrates there is often left a certain amount of platinum which is probably associated with chromite. One such sample from Beegum Creek, Tehama County, California, contained about four ounces of platinum per ton, but no platinum could be seen in panning the sample. A large part of this platinum was saved by grinding very fine and concentrating carefully.

The data following herewith is a translation of Chapter XV in 'Le Platine du Monde,' by Louis Duparc, Geneva, 1920. This translation has been made especially for this bulletin through the courtesy and cooperation of Dr. Allen C. Redding and Mr. George M. Nelson.

As the literature published in English on the subject of the metallurgy of platinum is rather limited, we have deemed it advisable to reproduce this chapter practically in its entirety, as it is the most recent and one of the most detailed in any language.

Chapter XV, 'LE PLATINE DU MONDE,' par LOUIS DUPARC.

SECTION 1. GENERAL CONSIDERATIONS ON THE SUCCESSIVE OPERATIONS USED IN THE METALLURGY OF PLATINUM.

The mineral as it comes from the mines is a complex alloy of the precious metals with iron and often with copper and nickel. The sep-

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aration and purification of these different metals is a long and difficult operation which requires a certain amount of practice.

The methods which are actually in use in most platinum refineries were partly devised by Wollaston, Klaus, Saint-Claire Deville, Debray and Staas. Their descriptions are scattered throughout the different publications of these authors, and their study is necessary for everyone who desires to undertake the refining of platinum.

First, we shall consider only the extraction of platinum. The accessory metals of this group being of only secondary importance, often the residues have not been separated and these have accumulated during many years and constitute a source of unappreciated wealth. After platinum the iridium is the most important, its increasing usefulness requires its extraction from the 'osmiures.' Then comes palladium and rhodium, which find a use, and then osmium and ruthenium, the last with but little use at present.

The metallurgy of platinum is mostly carried on by the wet process. It requires several manipulations, which are:

First.—The dissolution of the mineral in aqua regia with the separation of the insoluble 'osmiures.'

Second.—The precipitation of the platinum in the form of ammonium chloroplatinate, and the transformation of this into platinum 'moss,' which is condensed in a furnace.

Third.—The reduction with iron, or with zinc, of the 'mother liquors' obtained and the precipitation of the platinum as the chloroplatinate, and for the extraction of the metals other than platinum, which are called 'first blacks,' and their treatment.

Fourth.—The treatment of the 'osmiures' for the extraction of iridium and osmium, and other accessory minerals.

Fifth.—The fusion of the metals obtained in these several operations, the preparation of alloys and their uses.

It is not until we recognize the different operations which are necessary in the refining that we can understand the general disposition of serviceable methods of this kind of work.

Section 2. Dissolution of the Mineral and the Separation of the 'Osmiures.'

The mineral is previously rendered as pure as possible by eliminating the last traces of chromite, with which it occurs, and the separation of the gold which accompanies the platinum. The gold is generally taken up by the use of heated mercury, which dissolves it; then extracted from the amalgam by the volatilization of the mercury in an appropriate apparatus. This separation is generally made at the mine. The mineral is generally sent to the refinery without other preliminary preparation.

The dissolution of the mineral is made by aqua regia at a temperature of about 80° C. The mixture of acid used is composed of 3 volumes of hydrochloric acid of 20° Bé. and 1 volume of nitric acid at 35° Bé. For 1 kg. of mineral 4 litres of the mixture of acids is generally used.

The apparatus used for this work varies in the different refineries. Certain refineries take simply the mineral, put it in a glass flask with a narrow neck that will hold 6 or 8 litres and heat it on a sand bath or an air bath, or over an open fire, like a gas stove, according to Wiesnegg's system.

This method of operation is not to be recommended because of the fragile nature of the glass flasks, and the small quantity of mineral which can be treated in each container. During the process, and especially at the beginning of the action, there is discharged large volumes of nitrous fumes, which are very obnoxious. The flasks in which the dissolution is made are generally arranged in batteries and under a hood with a good draft.

In certain English and French refineries the dissolution is made in cylindrical porcelain or earthenware jars. They are made to hold about 30 litres, provided with a ground-on cover containing three holes; one to introduce the acid, another the mineral, and the third, the one in the center, for the escape of the vapors evolved during the chemical reaction. This last hole is provided with a short tube which passes through the porcelain cover. A number of these units of apparatus are arranged in a battery in a long sand bath, heated ordinarily with gas and placed under a hood. The discharge tubes run up into the hood, and enter a main earthenware canal through which is produced a strong draft by making connection with the chimney and utilizing the ventilator. The chemical action is easily produced with this apparatus and no annoyance is experienced by the vapors that arise during the action.

In other refineries, notably in Russia, they use porcelain appliances, otherwise little changed. They are cylindrical and are provided with porcelain covers ground on, and provided with four circular openings; the center one for the introduction of a 'stirrer'; the others near the 'perifery' serve for the escape of the vapors, the introduction of a thermometer and of the acid. The apparatus measures 55 cm. in height and 36 cm. in diameter. It is heated on an air bath, the flame of which strikes directly on a plate of asbestos placed about 15 cm. under the bottom of the jars. Between this and the disk is an air bath which is kept at a temperature that can be regulated by the burner cocks.

In the English type of apparatus for treating 3 kg. of mineral at one operation there is required 12 litres of aqua regia. In the Russian type they treat at one time 5 or 6 kg. of mineral. It is customary to complete one lot in 24 hours, then decant the acid liquors and refill with other mineral and allow the 'osmiures' to accumulate.

The first treatment does not render all the platinum soluble. Generally the residue of two or three dissolutions is submitted to repeated weak treatments which yield a small amount of platinum and much iridium.

The solution obtained by the dissolution of the mineral is transferred to a larger hemispherical porcelain vessel holding 8 to 9 litres of liquid.

The liquid is evaporated on an earthenware plate in a good draft. The vessels are placed in series and held in place by a sheet-iron form, or on a truncated cone, with an opening for the escape of the stove gases. The flame is regulated until a tranquil evaporation is secured. The liquid is often stirred with a glass rod. In some refineries this evaporation is made on a sand bath. During the evaporation about a litre of chemically pure hydrochloric acid must be added, one litre for every 6 or 7 litres of the first solution. This operation is to completely remove all of the nitric acid and to transform all the salts into chlorides. Ordinarily the evaporation is pushed on to dryness, or to a pasty consistence. The temperature of the mass at this time must be between 140° and 150° C. This is indispensable in order to reduce the salts of

iridium to a minimum. In most refineries they do not measure the temperature and the operator must be the judge when to stop the evaporation. In other refineries they operate at a determined temperature, and the evaporation is conducted on a sand bath or an air bath and pushed to dryness. It is indispensable that all the nitrogen products be thoroughly eliminated and the temperature toward the end not too low, or it would precipitate the iridium with the platinum.

The mass is then redissolved in boiling water, and after it is all dissolved the solution is transferred to a larger porcelain vessel—large enough to receive the solution of several runs. It is left to stand for a few hours, and usually forms a small deposit of gold, if there be any with the mineral, and a little platinum chloride. The clear liquid is siphoned off and the residue filtered and washed. The residue is calcined, redissolved in aqua regia and the solution treated with bisulphite of soda after evaporation of the hydrochloric acid. The gold precipitate is washed, dried and calcined; the filtered liquid added to the mother liquor of platinum.

Section 3. Precipitation of the Platinum and the Preparation of the 'Moss.'

The siphoned liquid is generally too dense. It is brought to 30° Bé. and to it is added a saturated solution of ammonium chloride, prepared by dissolving crystallized ammonium chloride to make a 30% solution.

The density must be 10° Baumé. About two litres of the ammonia solution is required for each litre of platinum in order to precipitate all the platinum.

This operation is performed in a large cylindrical porcelain jar holding about sixty litres.

The ammonia solution is added in small quantities with energetic stirring, and allowed to stand for 3 or 4 hours to permit the precipitate to settle. It must not stand too long, in order to avoid a partial precipitation of iridium.

The precipitate of chloroplatinate of ammonia must be canary yellow. The clear liquid must be separated from the precipitate by decantation. This decanted liquid is often highly colored.

The precipitate is repeatedly washed with a saturated solution of ammonium chloride. It will require about 30 litres of the ammonia solution to wash the precipitate produced. The precipitate is passed through a filter and washed until the filtrate does not show any color with potassium ferro-cyanide. The method of filtering varies at different works. In some the precipitate is washed entirely by decantation, then transferred to filter presses.

The yellow precipitate, well dried, is introduced into earthenware pots 30 cm. in height and 20 cm. in diameter, provided with a well-fitting cover. It is far better to use crucibles of fused quartz. These crucibles with their contents are moderately calcined in a reverberatory furnace. The flame must be projected on top of the crucibles and must be a reducing flame. The temperature must be between 700° and 800° C. and the heat must be raised gradually. Earthen crucibles are not recommended for this operation, as it is well known that the 1% of iron in the clay used to make these crucibles passes into the platinum.

The time required for this calcination is about 8 hours. After cooling, the 'moss' is crushed in a mortar, screened and put into a vessel with boiling dilute hydrochloric acid—one to five—to remove any trace of iron which it may retain, and washed with boiling water.

The spongy 'moss' thus obtained is often used as it is; for example, if it is to be used in the manufacture of alloys or to be redissolved. If, on the contrary, it is to be made into an agglomerated mass, it must be again charged into a crucible and given a dead calcination in a coke oven with a good draft. The crucibles are covered and placed under the coke. The agglomerated mass is obtained in one block and can be forged directly. If the platinum is to be melted, this block is not well suited. In that case, there is placed in the crucibles some pieces of the spongy 'moss,' separated from each other by disks of filter paper, and the charge calcined as before. Then, instead of one block of platinum, as many little patties are obtained as there were layers.

The purity of the first quality of platinum naturally depends on the purity of the chloroplatinates. In certain cases a purity of 99.8% is obtained, but often the platinum contains as much as 1% of iridium, or more.

Certain processes are proposed for the rapid determination of the purity of this platinum.

In certain refineries, notably in Russia, they mix solutions of the platinates containing an increasing amount of iridium from $\frac{1}{10}$% to 1%. These are standard solutions. The different solutions (standard) are poured into sampling dishes and precipitated with ammonium chloride solution, all under the same conditions, and precipitates obtained with colors varying from canary yellow to orange, in proportion to the amount of iridium present. The platinum solution also is precipitated and by comparing the color of the precipitate with the standard solution precipitate an estimate of the percentage of iridium contained in the original solution is arrived at.

This method is not very accurate, as experience shows that with a solution of pure platinum the color of the precipitate will vary with the conditions under which the precipitation was made.

In other refineries they take a small piece of mossy platinum and test it as follows: It is melted and drawn into one of the elements of a thermo-electric couple with platinum and 10% of rhodium. The purity of the platinum can be estimated by the electromotive force produced at a given temperature. This method is one of very great sensibility. It does not indicate the total of the strange metals contained in the platinum, like iridium, rhodium, palladium, etc. Only iridium can be found in appreciable amounts after the formation of the chloro-iridiate of ammonia. The other metals can not be found except by the absorption phenomena.

The method of measuring the electromotive force is very valuable in testing the platinum to be used in the manufacture of thermo-electric couples, required for the graduation of electric apparatus.

The spectroscopic method offers another method remarkably accurate and rapid for the verification of the purity of platinum. This method gives at once the qualitative and the quantitative composition by comparison of the intensity and number of lines of the different impurities contained in the platinum.

The liquid filtrate of chloroplatinate of ammonia is very clear. It is left standing for several days in a porcelain crucible, when it deposits a reddish crystalline precipitate which is principally chloro-iridiate of ammonia. This is filtered, washed, dried and calcined like the preceding. Thus is obtained what is called 'moss salt,' which contains much iridium and a little platinum. This moss is generally re-treated in a porcelain crucible with aqua regia to which has been added three times its weight of water. The platinum is easily dissolved and the iridium remains insoluble. The solution containing the platinum is precipitated as before in the form of 'moss salt.'

Section 4. Treatment of the 'Blacks.'

The liquid filtrate, after the precipitation of the platinum, is poured into earthenware jars holding about 200 litres, and to it is added 2 or 3 litres of sulphuric acid, so that the solution is slightly acid; then a few bars of soft iron are immersed, or bars of zinc if it is desirable to hasten the reduction. The soft iron bars will answer, but under no condition must steel or cast iron be used. The solution is progressively reduced and acquires a pale green tint due to the presence of ferrous sulphate. That the operation is complete can be judged by acidulating some of the solution and testing with a piece of zinc. If it does not form a black deposit, the reduction is complete. If a black deposit forms, it is examined to see if it contains any of the other precious metals, and in that case the reduction is kept going.

Deposits are formed in the bottom of the jar (and sometimes on the iron bars, which must be removed) of a black and pulverulent mass called 'first blacks.' This black mass is filtered in a vacuum filter, washed with boiling water, and after drying is charged into a cupel made of refractory earth (bone ash) and roasted in a muffle. The product from the cupel is put into a porcelain crucible, cleaned with hot dilute sulphuric acid —1 to 5—which removes all the copper which was in the form of an oxide and associated with the black mass. The liquid is decanted, washed several times with hot water, and platinum black is obtained, which is only the cleaned 'black.' This 'black' is dissolved in the same crucible and heated with aqua regia diluted with three times its weight of water until it ceases to react. We then obtain:

A. An insoluble residue which contains rhodium and iridium, and which is called 'insoluble blacks.'

B. A solution containing a little platinum, which has escaped precipitation by ammonium chloride (the cause being the partial solubility of the chloroplatinate, or the defective preparation of the precipitating solution), then palladium and traces of rhodium and iridium, notwithstanding their insolubility in the aqua regia.

The amount of platinum that may be thus extracted from the mother liquors depends on the way they have been treated. It may be great enough in the event the evaporation to dryness has been carried on at a sufficiently high temperature, which carries a partial reduction of chloroplatinates in the acid chloroplatinates.

This condition is recognized by the fact that the filtrate will reprecipitate new quantities of yellow platinum. The same phenomenon is produced if the nitrates have not been completely recovered. The liquid may sometimes retain as much as 3% of platinum in the form of

nitrates. Introduce a piece of zinc and the chloroplatinate is immediately precipitated. In this case the reduction of the mother liquor must be pushed as far as possible to avoid the presence of the yellow platinum precipitate, which would be annoying when washing and drying. The solution 'B' is separated from the 'blacks' 'A' by filtration and washing with boiling water.

SECTION 5. EXTRACTION OF THE PLATINUM AND THE PALLADIUM.

The filtrate solution 'B' is treated the same as previously stated in the dissolution of the minerals, and after the separation of the 'osmiures' ammonia chloride is added and the platinum precipitated as chloroplatinate of ammonium. This is filtered, washed and calcined. The product is called 'black platinum.'

We now have three products which in total weight represent all the platinum contained in the mineral:

First.—The 'moss' of the first precipitation;

Second.—The 'moss' of the platinum 'salts';

Third.—The platinum black.

This weight should represent 100% of the platinum content of the mineral, as shown by analysis, by the method previously indicated. Certain refineries are content with the purity (99.8%) indicated. The platinum first obtained is considered pure enough for the market as it is. Others redissolve the mosses and reprecipitate a second time.

The 'moss' may be purified by treatment with aqua regia, which dissolves the platinum and leaves the iridium insoluble.

The filtered solution is concentrated, then precipitated with ammonium chloride, as before indicated. The subsequent manipulations are the same as have been previously described. The solution filtered from the platinum black contains all the palladium. It is acidulated with sulphuric acid, treated in jars of porcelain with bars of soft iron, as has been indicated previously in reference to the first 'black'; a precipitate called the 'second blacks' is apparent now by the palladium. This has taken down with it traces of rhodium and iridium.

These 'blacks' are cleaned with dilute—1 to 3—solution of hydrochloric acid, which removes the iron. They are then filtered, washed and dried and then dissolved in aqua regia. The clear liquid obtained is decanted, if it contains any sediment due to separated traces of rhodium and iridium, then evaporated in porcelain dishes till it attains a spongy consistency, without heating it too hot. The spongy mass is dissolved in ammonium hydroxide (NH_4OH) in the same vessel in which the evaporation took place. The resultant liquid is colorless and is an ammoniacal solution of palladium chloride. To the clear solution containing the palladium chloride, hydrochloric acid is added to aid reaction. This operation is done in a large earthenware jar. The palladium precipitate is yellow, and is in the form of chloropalladiate. The clear liquid, after the precipitation has subsided, is siphoned off, the residue filtered, washed and the filter and precipitate calcined in a muffle furnace, using a retainer of refractory earth. To render the palladium most pure, the operation is repeated by redissolving and evaporating, and dissolving in ammonia and precipitating with hydrochloric acid. The filtrate from the palladium still contains traces of

rhodium and iridium. It is added to the last wash water from the platinum.

SECTION 6. EXTRACTION OF IRIDIUM AND RHODIUM.

The insoluble 'blacks' are mixed with three times their weight of powdered barium dioxide (BaO_2), intimately mixed, put into a crucible and strongly calcined in a coke oven for five or six hours. The 'moss' is taken from the crucible, after cooling, ground to powder and dissolved in acid compound of 15 litres of hydrochloric acid and 2 litres of nitric acid. All should dissolve, but if by chance there remains a residue, the liquid is carefully decanted, the residue washed in hot water, and after drying re-treated with barium dioxide as before.

It requires about 4 litres of the mixed acids for each kilogram of the mixture of 'blacks' and barium dioxide. The solution obtained is feebly colored red. It is evaporated to dryness in a porcelain dish on a sand bath, then silica is added with hot water to which has been added some of the aqua regia of the composition as above, the whole thoroughly washed, allowed to settle, and the clear liquid decanted. The residue is washed with boiling water and transferred to a cloth filter. The residue is allowed to remain in the silica which has been washed with hot water until the filtrate becomes colorless.

The filtered solution is added to the wash water, reconcentrated and the barium precipitated with sulphuric acid. The liquid is filtered and the precipitated barium sulphate thoroughly washed with hot water. The precipitate should be pure white. The liquid, which is free from barium, is poured together with the wash water, previously concentrated, into a porcelain dish, heated on a sand bath and from time to time small amounts of ammonium chloride crystals are added until the solution is saturated. It generally requires in the neighborhood of 300 grams of the salt to each litre of liquid. The temperature is maintained for 3 or 4 hours, and purplish-black precipitate of choloro-iridiate obtained. The last wash water should be feebly colored. The precipitate will contain the iridium and the filtrate the rhodium. The precipitate, after drying, is calcined in a silica crucible in a reverberatory furnace at a temperature a little lower than that used for the platinum. The temperature should be raised very gradually to prevent losses. The product of the calcination is iridium oxide (IrO_2). It is not necessary to clean it. It is introduced into a graphite crucible and given a dead roast; the result is an agglomerated mass.

The solution separated from the iridium is transferred to a vitrified earthenware jar, acidulated with sulphuric acid and reduced with bars of soft iron. The deposit (blacks) that is formed is cleaned with dilute hydrochloric acid—1 to 3—washed and dried. This is crude rhodium.

In some refineries the process as given above is modified as follows:

The 'blacks' are heated for two hours with three times their weight of barium dioxide at a temperature between 700° and 800° C. The 'moss,' which can be easily separated from the crucible, is placed in a crucible, without pulverizing, and treated directly with boiling water. The 'moss' disintegrates instantly and falls to a powder. The excess of barium dioxide which has not reacted is dissolved in the water and easily eliminated by decantation. The residue, after washing, is treated with the mixture of acids previously indicated. Without evaporating

precipitate the excess of barium with sulphuric acid, after filtering out the barium sulphate, transfer the filtrate to a porcelain jar, and precipitate the iridium with ammonium chloride. From this point the treatment is as has been indicated above.

This method is much more rapid as well as more economical. It requires only 2 litres of the mixed acid for each kg. of 'blacks.' This method also eliminates the evaporation, and the silica is discharged as barium silicate ($BaSiO_2$) by washing with hot water.

SECTION 7. TREATMENT OF THE 'OSMIURES' OF IRIDIUM.

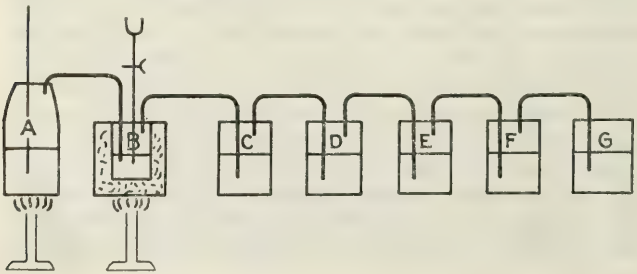
The 'osmiure' must be reduced to as fine a condition as is possible. If this is not done it must be melted with 4 or 5 times its weight of pure zinc. This compound must be heated to a very high temperature in order to volatilize the zinc and effect a decomposition of the 'osmiure.' The temperature must be raised very gradually until it reaches a white heat and this temperature maintained until the zinc vapors cease to be evolved.

For this purpose use a graphite crucible with cover luted on tight; a small hole is drilled in the cover, through which the zinc vapors can escape. When the zinc has been evaporated there is left in the crucible a moss of osmiure sponge which may easily be reduced to a fine powder.

The first part of the treatment is the same as has been indicated in the treatment of 'blacks.' The osmiure is mixed with three times its weight of barium dioxide and introduced into a covered crucible and heated to a red heat for 2 or 3 hours. The crucible is emptied and the moss pulverized. The pulverized moss is washed by any convenient method and introduced into a distilling apparatus. This procedure omits the evaporation to dryness, which saves not only a great deal of expense but is a great saving in time, and distillation is reduced to about one-third. At the same time as great a quantity of osmiures can be treated as by the old method.

The following is a general description of the apparatus employed by Deville, except the furnace and the size of the vessels used. The apparatus permits the distillation of the osmiures with facility and without being discommoded by the disengagement of the osmic vapors, which are always very obnoxious.

The black mass resulting from the washing with hot water, the product of the treatment of the osmiures by barium dioxide (BaO_2), is washed and dried.



Ten kilos are poured into the inner vessel 'B.'

Vessel 'B' is of earthenware, and cover is provided with three openings, and has a capacity of about 40 litres. This vessel is immersed in a large enameled iron basin filled with hot water and heated by means of a gas burner.

Through the first opening pass a glass tube, the end of which is closed and which at about 10 cm. is perforated with little holes. This is to permit the escape of the watery vapor coming from the copper vessel 'A,' which is provided with a safety tube. Through the second opening is poured the material, and also the acids necessary for the reaction. Through the third opening pass a glass tube to permit the passage of the mixed acid vapors of the peroxide of osmium which are condensed in the Woulff bottle 'C.'

This bottle collects the larger part of the condensed vapors, but is again connected with a second bottle, 'D,' the same as 'C,' which likewise connects with a similar bottle, 'E,' half full of water, in which collect the vapors that were not condensed in the previous bottles. This bottle communicates with bottles 'F' and 'G,' which contain caustic soda and sodium sulphate. These two last bottles absorb the entire balance of the vapors of the osmiures which may have escaped condensation in the previous bottles.

The starting of this chain of apparatus is quite simple. Place a gas burner under each of 'A' and 'B.' Pour into 'B' successively 10 kilos of the material to be treated, together with 15 litres of hydrochloric acid and 2 litres of nitric acid. Pass the water vapor from 'A' to 'B' and the reaction commences immediately. The displaced air-bubbles are up in the bottle for a time, but soon all the gases are entirely condensed and absorbed. The water in the first Woulff bottle is rapidly saturated with hydrochloric acid. The solution of hydrochloric acid must be replaced, at each new operation, with pure water.

The operation is completed in 5 or 6 hours. The osmic acid must then be completely removed from the iridic liquor in 'B.'

The apparatus can be again recharged, and in this way treat 20 kilos of osmiure per day, corresponding to 7 or 8 kilos of pure osmium.

The iridate liquor is poured into a porcelain vessel and precipitated hot with crystals of ammonium chloride, as before described in the treatment of the 'blacks.' The temperature is maintained for about 2 hours and too great a concentration must be avoided. The clear liquid is decanted and the precipitate of ammonium chloro-iridate is washed, filtered and washed again, as usual. When dried it is calcined in a refractory crucible in a reverberatory furnace, an impure moss is obtained that is cleaned by aqua regia to which has been added three times its weight of water. The platinum and palladium dissolve and the ruthenium and iridium remain insoluble. The insoluble moss is given a dead roast in a graphite crucible.

The platinum is precipitated from the filtrate as usual.

Section 8. Treatment of the 'Osmiures.'

The Woulff bottles 'C,' 'D,' 'E' and 'F' of the apparatus used in the distillation of the osmiures contain osmic acid in solution. The contents are poured into a porcelain vessel and ammonium chloride added and the whole heated for one and a half hours to convert the osmic acid

into osmianide. It is then filtered and washed with hot water, dried and given a dead roast in a graphite crucible to obtain metallic osmium.

This process is disagreeable on account of the formation of noxious vapors during the transformation and even during the conversion of the osmic acid to the osmianide.

The following method partially obviates this disagreeable feature: The contents of bottles 'C' and 'D' are siphoned over into a jar containing a mixture of sodium hydroxide and sodium sulphate. Then the contents of 'E' and 'F' are added and all the 'osmiures' precipitated. This precipitate is filtered, washed, dried and given a dead roast in a graphite crucible.

The treatment of osmium and its compounds is always a disagreeable operation because the osmuim vapors are very obnoxious. All operations, whether dissolution or distillation, must be done under a hood with a good draft.

Section 9. Separation of Iridium and Ruthenium.

Often these two metals are not separated, and the whole sold under the name of iridium, although it does contain more or less ruthenium. This causes great inconvenience, and notably when the supposedly pure iridium is used to make alloys with platinum. The ruthenium introduces to the alloy properties that are very prejudicial. To effect a separation of the two metals the procedure is as follows:

The moss, consisting of iridium with a little ruthenium, is melted in a silver crucible provided with a cover—a gold one would be preferable —with a mixture of three parts of potassium hydroxide and one part of potassium nitrate. The mixture of potassium hydroxide and the nitrate is brought to a quiet fusion, then the moss added and the cover left so the action can be examined from time to time.

The operation is done in a muffle furnace at a dark red heat. It will require from one and a half to two hours to complete the action. It is often well to stir the fused mass with a silver rod. After cooling, the mass is dissolved in cold water. The ruthenate of potash (K_2RuO_4 H_2O) is dissolved, giving a light-red colored solution due to a trace of iridiate of potash, while the iridium remains insoluble. The clear liquid is decanted and the residue washed with a dilute solution of sodium hypochlorite until it shows no more red coloration. The residue is sometimes not pure iridium but contains small particles of ruthenium. The residue is then dried and cleaned with water acidulated with hydrochloric acid to remove the last traces of potash, and then calcined in a refractory crucible in a muffle furnace. This decomposes the iridiate of potassium into iridium and potassium. The residue that is left after eliminating the potassium is put into a porcelain crucible with hot water and a very dilute solution of hydrochloric acid in order to remove the last trace of potassium. The acid must not be too strong, or the entire mass will pass into solution. The iridium which remains on the filter is washed, dried and given a dead roast in a graphite crucible. The result is an iridium agglomerate.

The solution which contains the ruthenium (with a trace of iridium) is reduced with zinc after acidulating the solution with sulphuric acid. After complete reduction a black powder is obtained. The clear liquid is decanted and the residue washed and dried, and an impure ruthenium 'black' obtained.

SECTION 10. TREATMENT OF THE MOTHER LIQUORS AFTER THE REMOVAL OF THE PLATINUM, IRIDIUM AND RUTHENIUM.

The mother liquors are acidulated with sulphuric acid and reduced with soft iron. The 'blacks' which have been deposited contain the rhodium, a trace of platinum and gold. These blacks are thoroughly washed and slightly calcined, then treated with aqua regia diluted with three times its volume of water. The rhodium remains insoluble (together with traces of iridium, if there be any), and the platinum, palladium and gold pass into solution. This solution is evaporated in a porcelain dish to the consistency of syrup, and the nitric acid expelled. It is then dissolved in water and a current of sulphurous acid gas passed through the solution. The gold is precipitated, filtered, washed and calcined in an annealing cup. To the filtrate is added sulphuric acid and reduced by means of zinc. The result is palladium 'black.' This is cleaned with dilute hydrochloric acid, filtered, washed, dried and calcined (metallic palladium).

SECTION 11. MELTING THE PLATINUM.

In the beginning of the platinum industry the platinum was not melted, but simply agglomerated. The agglomerated mass was calcined until it was white in a refractory crucible, then put into a hydraulic press. The block obtained was heated time and time again and forged by hammering. Platinum melts easily in the flame of an oxyhydrogen blowpipe, and can be cast like other metals. The fusion is always made in quicklime (CaO), which must be as pure as possible and of particular texture. To secure such a mass of quicklime, take a block of pure limestone ($CaCO_3$) of the necessary dimensions, and carefully calcine until it is reduced to quicklime (CaO). The block of quicklime is sawed into two unequal pieces; the larger one is to be used as the furnace and the smaller one for the cover. The blocks thus produced are carefully bound with pure iron wire and fitted into an iron frame made for the purpose. The bottom of the furnace is the crucible. It should be sufficiently thick and the center scooped out to make the crucible. The walls should be at least 3 or 4 centimeters in thickness. The cover is slightly scooped out so as to form an arch, and should tightly fit the furnace. A small hole is provided as an outlet for the flame of the blowpipe to escape. In the center, or near it, a conical hole is made, through which enters the blowpipe. The blowpipe should have a platinum tip about 4 cm. in length. An ordinary oxyhydrogen blowpipe will do; or an acetylene outfit will probably give the sufficiently high temperature required (about 1800° C.).

To start the fusion put on the cover, open the hydrogen cock slightly in order to get a small current of the combustible gas, then open the oxygen cock. After regulating the flow of gases to reach the proper mixture to secure the maximum temperature, introduce the flow into the hole in the cover designed for the flame. Be careful to adjust the blowpipe tubes so as to get the proper flame of gases in order to secure the highest temperature possible, which must be about 1800° C.

The pressure on the oxygen tank should be from 40 to 50 mm. of mercury. The platinum then rapidly melts, forming an incandescent mass at the bottom of the crucible.

It must not be forgotten that melted platinum, like silver, occludes oxygen, and likewise gives it out on cooling, causing 'spitting.' When the fusion is complete allow the temperature to diminish very gradually. The oxygen dissolved (occluded) is burned off. This is accomplished by diminishing the quantity of oxygen and allowing an excess of hydrogen to enter the furnace. This action produces a sort of ebullition in the mass of molten platinum. Should the metal be desired as it occurs in the oven, extinguish the flame of the blowpipe and allow the furnace to cool. However, on the point of solidification small bits of the metal are thrown (spitting) against the cover or sides of the furnace, caused by the escape of the occluded oxygen which was not thoroughly burned off, as indicated above. This action does not cause any inconvenience.

Should it be desired to cast the metal, the cover is removed, together with the burner, and the molten metal quickly poured into the ingot mould, which has been previously heated.

On account of the intensity of the light of the incandescent molten platinum, which sometimes seriously affects the eyes, it is advisable to wear colored glasses (violet).

The fusion of the platinum in caustic lime is the best way to secure the metal in a solid form. The crude platinum before melting always contains a trace of osmium and a varying amount of silicon. The osmium is oxidized to osmic acid (H_2OsO_4) or to osmiamic acid ($H_2N_2Os_2O_5$) and is thrown off, while the silicon forms a silicate of lime ($CaSiO_3$) and forms a globular mass analogous to a borax head, which is rapidly absorbed by the walls or cover of the crucible. The platinum is then in the form of a metal as soft as copper and with a density of 21.15.

The apparatus above described is sufficient to fuse, at one time, from 2 to 3 kg. of platinum.

When it is desired to make a larger fusion (15 or 20 kg.) and to cast the metal, it will require a somewhat different and, of course, larger furnace, which may be easily tipped, to effect the casting of the metal. To hold the furnace with a pair of tongs is a risky operation. The larger furnace may be made as follows:

Make a cylinder of heavy sheet iron of any computed size, with one end closed. By means of lugs and bolts the cylinder is attached to a swinging frame of iron whereby the cylinder may be partly or wholly inverted. Into this cylindrical form of sheet iron is carefully placed pieces of quicklime so as to make a complete lining around the sides and over the bottom. The sides of the lining should extend about 2 cm. above the sheet iron frame. The pieces on the side from which it is intended to pour the melted metal, should extend about 3 cm. above the metal form, and in this should be constructed a pouring spout. This must be of sufficient size and so constructed that when pouring the melted platinum none of it should come in contact with the sheet iron frame; or fill the entire cylinder with pieces of quicklime, carefully adjusted and firmly packed in, allowing it to project 2 or 3 cm. above the frame. Then scoop out the interior into a basin or crucible shape to form the cavity to hold the platinum. Be careful to construct the pouring spout so none of the molten platinum shall come in contact with the sheet iron frame.

The cover of this furnace is constructed similarly with pieces of caustic lime solidly fixed in the form made for it—although the projection below the metal form need not be so great. The pieces need not project more than 1 or 2 cm. below the rim of the metallic frame, and should be firmly secured in place. The cover should fit perfectly and evenly over the upper surface of the crucible. Scrape out some of the lime of the cover, forming a slight arch.

Two holes should be made in the cover; one for the introduction of the blowpipe (or two holes, if there is to be two blowpipes used), and one for the escape of the blowpipe gases. The blowpipe should penetrate the lime but slightly, and be so constructed that its position can be easily regulated and adjusted at will.

To get the oven to work, light the blowpipe and introduce it into the opening through the cover provided for the purpose. Regulate the flame and its position, and heat the furnace gradually. Introduce the platinum through an opening between the oven and the cover provided for that purpose, and so arranged that it may be closed. The platinum is cut into small pieces, which will melt almost instantly.

When the oven is full maintain the temperature, but slowly diminish the quantity of oxygen in order to overcome the 'spitting.'

To cast the platinum into ingots permit the temperature to be reduced just to the fusion point of the metal (1753° C.), or if the ingot mould is heated no lowering of the temperature is necessary. If too high a temperature is maintained before casting, there is some danger of melting the mould.

Once the oven is hot, a second fusion can proceed, which is always more rapid than the first. It will require from 60 to 70 litres of oxygen for each kg. of platinum, under a pressure of 12 to 15 cm. of mercury.

The large type of furnace may be made by dressing a block of limestone to the desired size and form and burning it, as previously indicated. Or adjust a block of limestone of the exact size and shape of the crucible desired into the sheet iron form and burn it to a caustic lime by means of the oxyhydrogen blowpipe. This method of burning will necessarily form cracks in cooling, due to contraction. These must be carefully filled with powdered quicklime.

To preserve the oven for future use, cover it thoroughly with powdered quicklime and put it in an air-tight compartment free from moisture. In this way it may be preserved indefinitely.

The casting of platinum is an operation which presents certain difficulties and which requires a great deal of practice. Generally the platinum is cast into ingots which can be easily flattened, being about as soft as copper. But to succeed in the operation it is indispensable to terminate the fusion in an atmosphere that is slightly reducing; that is, in an atmosphere slightly lacking in oxygen. This is for the purpose of removing the oxygen which the platinum has occluded, or dissolved. On the contrary, if the termination of the fusion has been done in an oxidizing atmosphere (where there is an excess of oxygen) the ingot blisters, or spits, and must be remelted.

In using an iron ingot mould let it oxidize on the inner surface. Rub it thoroughly with graphite, to successfully prevent the moulded metal from adhering. These moulds are so constructed that they may be stood

up perpendicularly and held in place in such a way that they may, during the casting, be moved back and forth so that the metal is equally spread, and to also prevent any adhering of the metal to the side of the mould.

An ingot mould can be made by filling a sheet iron frame with pieces of quicklime carefully and properly adjusted, in which is scooped out a cavity of the proper size, which forms the mould. Again, an ingot mould may be made of graphite, or of cast iron lined with platinum and so constructed that the size and shape of the mould may be varied at will.

If the fusion is good, there will appear on the surface of the casting a slight depression; if, however, the casting is bad, a swelling on the surface is observed. In this case the metal is always blistered.

If, in place of platinum, it is wanted to melt iridium, it is indispensable to employ a lime furnace scooped in a block of pure caustic lime, and operated at a correspondingly high temperature (2300° C.). The fusion should be done as rapidly as possible to prevent losses, as certain oxides of iridium are formed which are relatively volatile. Sometimes during the fusion fumes are produced. These indicate the presence of ruthenium, due to previously faulty treatment.

SECRETARY'S OFFICE.

W. W. THAYER, Secretary.

The California State Mining Bureau was created April 16, 1880, by legislative act. In March, 1893, the original act was repealed and an amended act approved and passed by the legislative body. Again on June 16, 1913, a new Mining Bureau Act was approved which became effective August 10, 1913, repealing all former acts, and forming the basic law under which the Bureau now functions.

It is doubtless true that both the mining and lay public have not in the past always recognized the part played by the Bureau in the development of the state's mineral resources. Innumerable inquiries regarding them, originating within and without its borders and in foreign countries, have been answered with ultimate results reflected by a consistent growth in the value of the state's mineral output since the records of production were first compiled by the Bureau in 1887.

It is believed that a better understanding of the economic position occupied by the Bureau will be imparted to the public, whose funds support it, by embodying in the Monthly Chapter a review of the executive activities.

The responsibility for the coördination of effort of each department, to the end that the utmost efficiency may be maintained with the limited and variable appropriations accorded the Bureau by successive legislatures, rests upon the office of secretary.

Activities referable to that office, such as reports of new maps and publications issued, amount of mail handled, changes and enlargements in offices, changes in personnel of the staff, property and equipment, financial statements, etc., are therefore included herein.

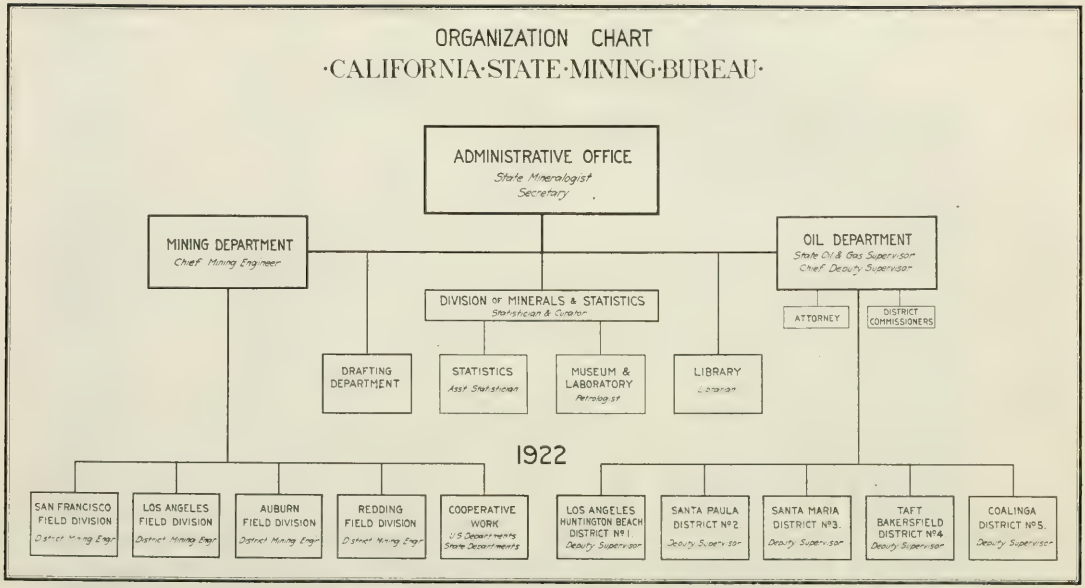
As a means of illustrating the organization of the Bureau, the accompanying chart is presented on page 174:

The Bureau headquarters are located in the third floor of the Ferry Building, San Francisco. Here are the offices of the State Mineralogist, executive offices of the mining and oil departments, statistical division, library, museum, laboratory, and drafting room.

The business management of the Bureau and the direction of all its work are conducted at the San Francisco office. This office is also a general information bureau open to the public at all times. A large proportion of the time of the State Mineralogist and all the technical staff is taken up answering inquiries, both written and personal, received from people who are interested in every conceivable phase of the mineral industry, many of whom live in other states and foreign countries.

Mining Department.

Branch offices of the mining department are located in Redding, Shasta County; Auburn, Placer County, and Los Angeles. Each office is in charge of a graduate mining engineer of practical experience, and each district engineer has a definite field to cover. Including the Central California district, which is handled from the San Francisco office, the state is thus divided into four distinct fields, in each of which there


ORGANIZATION CHART
·CALIFORNIA·STATE·MINING·BUREAU·
ADMINISTRATIVE OFFICE
State Mineralogist
Secretary
MINING DEPARTMENT
Chief Mining Engineer
OIL DEPARTMENT
State Oil & Gas Supervisor
Chief Deputy Supervisor
DIVISION OF MINERALS & STATISTICS
Statistician & Curator
ATTORNEY
DISTRICT COMMISSIONERS
DRAFTING DEPARTMENT
STATISTICS
Asst Statistician
MUSEUM & LABORATORY
Petrologist
LIBRARY
Librarian
1922
SAN FRANCISCO FIELD DIVISION
District Mining Engr
LOS ANGELES FIELD DIVISION
District Mining Engr
AUBURN FIELD DIVISION
District Mining Engr
REDDING FIELD DIVISION
District Mining Engr
COOPERATIVE WORK
U S Departments
State Departments
LOS ANGELES HUNTINGTON BEACH DISTRICT Nº1
Deputy Supervisor
SANTA PAULA DISTRICT Nº2
Deputy Supervisor
SANTA MARIA DISTRICT Nº3.
Deputy Supervisor
TAFT BAKERSFIELD DISTRICT Nº4
Deputy Supervisor
COALINGA DISTRICT Nº5.
Deputy Supervisor

is a representative of the Bureau readily accessible to the local mining public. This representative has his home in his district, and his interests are not those of a traveling investigator, but a citizen of the section in which he lives. He becomes personally acquainted with the miner and the prospector, a class of men who are often reticent and diffident, and after gaining their confidence his value to them and to the Bureau is greatly enhanced. Remote mines are brought into closer touch with the Bureau through the medium of the district engineer. His knowledge of routes of travel and familiarity with local conditions saves time and prevents lost motion, and the perspective he gains permits him to evaluate more correctly what he sees and hears. The district engineer has a working program somewhat as follows:

1. He is assigned the duty of preparing formal bulletins upon special subjects which are usually peculiar to some branch of mining in his district. The completion of a report of this kind may require months or even years. It demands exhaustive investigation and often research work.

2. Interwoven with and overlapping the work mentioned under number one comes the careful constant survey of the field to which the engineer has been assigned. He keeps advised as regards new discoveries, development of all mining properties, and all other details of the industry as far as it is possible to do so.

3. The district engineer is the servant of his local mining public, just as the State Mineralogist is the servant of all the people of the state. This has been mentioned last, but as a matter of fact a call for any assistance that a Bureau representative is authorized to render takes precedence over all else. Other work is set aside until such a call has been responded to and cared for to the best of his ability.

Petroleum Department.

Conservation of the oil and gas resources of California has for over six years been provided for by State supervision. The most obvious and serious cause of waste in California oil fields has been due to waters which flood productive formations, consequently legislation has been aimed directly at that feature.

The department of petroleum and gas was established by law August 9, 1915. Under this law the State Mineralogist is authorized to appoint as oil and gas supervisor an engineer or geologist experienced in the development of petroleum. This office has supervision over the drilling, operation, maintenance and abandonment of oil and gas wells. The staff of the petroleum department is composed entirely of men technically trained as mining engineers, civil engineers or geologists.

For administrative purposes branch offices of the petroleum department, each in charge of a deputy oil and gas supervisor, are maintained in Coalinga, Bakersfield, Taft, Santa Maria, Santa Paula, Los Angeles and Huntington Beach.

The business of the department concerning oil operations is transacted in the branch offices, between the field representatives of the companies and the deputy supervisor in charge of the district. At each field office there are models, maps, cross-sections, and all the various data used in determining the specifications to be applied to any well.

The department of petroleum and gas is supported financially by assessment levied directly upon oil land and oil and gas produced, and is independent in this regard of the varying appropriations which support the other activities of the Bureau. Up to date the amount expended has been less than one mill per barrel of oil produced. The cost of State supervision, looked at from another angle, has averaged about $40 per well which has come under the Bureau's supervision. When it is remembered that the average cost of drilling an oil well in California is not less than $40,000, the insignificance of this tax is emphasized.

A detailed description of the operation of the oil and gas law would occupy the space of a small pamphlet, but the records are available for the inspection of any one interested, and it is confidently stated that the general plan of supervision, based upon scientific and technical methods, has unquestionably demonstrated its usefulness and will undoubtedly be retained in California.

Division of Minerals and Statistics.

The statistical section keeps an up to date list of all owners and operators of mineral deposits and mines in the state. By correspondence and personal visits, production data are obtained and published annually. Not only is such information of well-recognized value, but buyers and consumers are continually referred to producers through the medium of the Bureau's records, in a direct and satisfactory manner. By means of an addressograph and other modern office equipment, the vast amount of detailed work required to make a recurring statistical inquiry dependable and authentic is efficiently carried on.

In the laboratory free determination is made of specimens sent in from any point in the state. This service is widely used and is of particular value to the man of limited means who may have discovered minerals with which he is not familiar. Instead of being forced to pay to have a sample analyzed, which may very possibly be valueless from a commercial standpoint, he may first be advised by the Bureau as to what the possibilities are in this regard.

The museum, which has gradually been built up during the past forty years, contains approximately 20,000 specimens of ores, wall rocks and minerals, mostly from California, but in part from many other states and foreign countries. Situated as it is in the Ferry Building, which is a union depot and gateway to San Francisco for hundreds of thousands of persons daily, the museum attracts a great deal of attention and undoubtedly is a direct aid in developing the mineral industry of the state.

For example: When the call came for chromium and manganese—in 1917—the museum was thronged with men who came to scrutinize the minerals containing those metals, so that they would be able to prospect with greater intelligence.

Library.

The library, which is freely available to all for reference, contains approximately five thousand books, most of which relate to mining and engineering, and it also contains a file of local newspapers from

most of the mining towns of California, as well as a file of the principal technical magazines published throughout the United States.

New Publications.

During the month the following Bureau publications have been made available for distribution:

Oil Field Map No. 2, Santa Maria, Including Casmalia and Lompoc. Revised to April 1, 1922.

Oil Field Map No. 3, Santa Maria, Including Olinda, Brea Canyon, Puente Hills, East Coyote and Richfield. Revised to April 1, 1922.

Oil Field Map No. 22, Portion District No. 3, Showing Boundaries of Oil Field. Santa Barbara County. Revised to April, 1922.

Colored Map of State, Showing the Generalized Classification of Land with Regard to Oil Possibilities. (Issued also with Bulletin No. 89, 'Petroleum Resources of California.')

Summary of Operations—California Oil Fields, January, 1922, Vol. 7, No 7.

Mining in California, March, 1922 (monthly), Vol. 18, No. 3.

Distribution of Publications.

The Bureau's publications are constantly in demand, requests for copies coming from all over the United States and foreign countries.

Publications distributed during the month of March, 1922:

Publications	Number Distributed
Report XIV State Mineralogist	3
Report XVII State Mineralogist	10
Mines and Mineral Resources of Del Norte, etc.	2
Mines and Mineral Resources of Fresno, etc.	3
Mines and Mineral Resources of Imperial, etc.	4
Mines and Mineral Resources of Alpine, etc.	3
Mines and Mineral Resources of Butte, etc.	4
Mines and Mineral Resources of El Dorado, etc.	1
Mines and Mineral Resources of Los Angeles, etc.	3
Mines and Mineral Resources of San Bernardino, etc.	4
Mines and Mineral Resources of Nevada County	2
Mines and Mineral Resources of Plumas County	8
Mines and Mineral Resources of Sierra County	9
Mines and Mineral Resources of Shasta, etc.	1
Bulletin No. 6, California Gold Mill Practices	4
Bulletin No. 23, Copper Resources of California	2
Bulletin No. 37, Gems, Jewelers' Materials and Ornamental Stones of California	8
Bulletin No. 46, General Index to Publications of the State Mining Bureau	1
Bulletin No. 50, Copper Resources of California	2
Bulletin No. 72, Geologic Formations of California	13
Bulletin No. 75, Mining Laws, United States and California	70
Bulletin No. 76, Manganese and Chromium in California	3
Bulletin No. 77, Catalogue of Publications of the California State Mining Bureau, 1880–1917	3
Bulletin No. 78, Quicksilver Resources of California	11
Bulletin No. 85, Platinum Resources of California	9
Bulletin No. 89, Petroleum Resources of California, with Special Reference to Unproved Area	717
Bulletin No. 90, California Mineral Production for 1920	100
County Maps and Registers of Mines	25
Geological Map of California, mounted	19

Publications.	Number Distributed
Preliminary Report No. 8, Review of Mining in California During 1921	200
Mining in California (Monthly) Vol. 18, No. 1	210
Mining in California (Monthly) Vol. 18, No. 2	2140
Mining in California (Monthly) Vol. 18, No. 3	2360
Colored Map Accompanying Bulletin 89, Showing Generalized Classification of Land with Regard to Oil Possibilities	20
Oil Field Maps	479

Mails and Files.

The Bureau maintains in addition to its correspondence file a mine report file, which includes reports on some 7500 mines and mineral properties in California. Also, there is available to the public a file of the permits granted to mining and oil corporations by the State Commissioner of Corporations.

During the month 976 letters were received and answered. They are practically all requests for information, and the inquiries cover all phases of prospecting, mining and developing mineral deposits, reduction of crude minerals and marketing of refined products.

Drafting Room.

This is purely and simply a work shop, and is the only branch of the Bureau that is not primarily at the service of the public. In the drafting room well logs, maps, sketches, etc., are prepared for the many publications and reports which are under way at all times.

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Statistician and Curator.

STATISTICS.

California produces commercially at least fifty different mineral substances, with a total annual value of nearly $250,000,000. There are several thousand operating properties, including mines, quarries, oil and gas wells, mineral springs, gravel pits, mills and smelters; hence, the task of compiling accurate and dependable statistics covering their activities is not a simple one.

Blank report forms for the 1921 data were mailed to the operators, in January, 1922, followed by a 'second request' in March to those who had not by that time responded. At present writing (April 15), the majority of the reports are in hand, and a 'third request' is being made to the few remaining delinquents. Data for several substances are now complete and have been compiled, being presented herewith.

The data at hand indicate that there was no production in California in 1921 of the following substances, which have at one time or another in the past been on the active list here: Antimony, bismuth, cadmium, mica, molybdenum, nickel, nitrates, serpentine, sulphur, tungsten, tin, vanadium.

ASBESTOS.

Bibliography: State Mineralogist Reports, XII, XIII, XIV, XV, XVI, XVII. Bulletin 38. Canadian Dept. of M., Mines Branch Bulletin 69. Min. & Sci. Press, April 10, 1920, pp. 531–533. Eng. & Min. Jour.-Press, Vol. 113, pp. 617–625; 670–677.

In 1921 a total of 410 tons of asbestos fibre, valued at $19,275, was shipped from Fresno, Monterey, Nevada, San Benito, Shasta and Siskiyou counties, by a single operator in each. This was a considerable increase over the 66 tons, worth $2740, produced in 1920; though, as yet, California's asbestos industry is small as compared to some other North American localities. The above shipments were all of chrysotile asbestos, except the small tonnage from Shasta County, which was of the amphibole variety.

The Monterey County product was of spinning-grade fibre, as was also a portion of that from Nevada County. The bulk of the yield was of short-fibre mill grade, and was utilized mainly in magnesite-cement stucco, steam-pipe covering, flooring, composition shingles and roofing paper. The outlook for asbestos becoming an important industry in California is promising. There are extensive serpentine areas in the Coast ranges, in the Klamath Mountains, and in several sections of the Sierra Nevada, which localities came to the fore in yielding chromite during the war period. As chrysotile asbestos is a fibrous form of serpentine, these areas are all within the range of possible asbestos producers. In addition to the above-mentioned producing counties, chrysotile of good-quality fibre, though short, has also been found in Calaveras,

Lake, Napa and Trinity counties. Reports of the U. S. Geological Survey also confirm the promising quality of the California fibre. Milling plants are now being built on at least three asbestos deposits here, which expect soon to be in commercial operation: Pacific Asbestos Corporation, near Copperopolis, Calaveras County; Liberty Asbestos Company, near Coalinga, Fresno County; California Asbestos Mining Company, near Hernandez, San Benito County. The mill of the Sierra Asbestos Company at Washington, Nevada County, built several years ago, continues in operation except during the winter months.

Classification and Characteristics.

The word asbestos (derived from the Greek, meaning incombustible) as used here includes several minerals, from a strictly mineralogical standpoint. There are two main divisions, however: Amphibole and chrysotile. The fibrous varieties of several of the amphiboles (silicates chiefly of lime, magnesia and iron), notably tremolite and actinolite, are called asbestos. Their fibres usually lie parallel to the fissures containing them. Amphibole asbestos possesses high refractory properties, but lacks strength of fibre, and is applicable principally for covering steam pipes and boilers. Chrysotile, a hydrous silicate of magnesia, is a fibrous form of serpentine, and often of silky fineness. Its fibres are formed at right angles to the direction of the fissures containing them. Chrysotile fibres, though short, have considerable strength and elasticity, and may be spun into threads and woven into cloth. To bring the highest market price asbestos must needs have a combination of properties, *i. e.*, length and fineness of fibre, tensile strength and flexibility—all combined with infusibility; and determination of the same can only be made by practical tests or in the laboratory. In the two years prior to 1914, chrysotile asbestos was sold at prices ranging from $10 to $250, according to length of fibre and quality. Almost fabulous figures were reached for extra-long spinning fibre in 1918, and proportionate levels for other grades. Prices have since receded somewhat from those high levels; but statements issued by some of the important marketing concerns indicate that the unprofitable low prices of 1912–1914 will not again obtain. The extreme high values quoted for extra long-fibre material are misleading to one looking for average values in the industry. In Canada the shorter, 'mill-stock' grades constitute over 95% of the merchantable asbestos, and are quoted at present at approximately $15 to $150 per ton.

The poorer grades which are unsuitable for weaving are used in the manufacture of steam packing, furnace linings, asbestos brick, wall plasters, paints, tiling, asbestos board, shingles, insulating material, magnesite-stucco, etc. The better grades are utilized in the manufacture of tapestries of various kinds, fireproof theater curtains, cloth, rope, etc.

A very important development of the asbestos industry is the rapidly increasing demand for the lower-grade material, on account of the numerous diversified uses to which asbestos products are being put, in almost every branch of manufacture. This fact means that many deposits of asbestos will become commercially important even though of the shortest fibre.

It has been found that not only does an asbestos wall-plaster render the wall so covered impervious to heat, but that in rooms which have given forth an undesirable echo this evil has been absolutely removed. Asbestos pulp mixed with magnesite-cement has been experimented with; and roofing, flooring and other building material of the most satisfactory sort are now being manufactured therefrom.

Asbestos Grading.

On account of the large numbers of inquiries which have recently been received by the Bureau relative to the marketing of asbestos it has been deemed advisable to reprint the following statement, which appeared in the Engineering and Mining Journal of March 25, 1922:

"The length of asbestos fiber of different grades as sold in America varies with the mine producing the crude. No two mines produce exactly the same grades, although they use the same marks at times, which is also misleading and causes confusion.

"No general agreement regarding the classification of asbestos exists among producers which specifies what every grade of asbestos shall include and designate. Physical tests are relied upon to a much greater extent than chemical, because in the use of the mineral its physical properties are the more important. Such simple characteristics as length of fiber, color and tensile strength are of paramount importance and control the price for which asbestos can be sold. The Canadian mines generally employ a screen test to determine the grade of an asbestos product, and use a set of shaking-screens consisting of four separate trays about 16 x 26 x 5 in. The No. 1, or top screen, sizes to ¾-in. mesh; the No. 2, or second screen from the top, is screened to ¼-in. mesh; No. 3, the third tray, is screened to 1/10-in. mesh, and No. 4, the bottom tray, receives the product falling through the first three screens. A suitable mechanical device shakes the set of screens 300 times per minute with a small throw—1¼ in.

"In the ordinary test one pound of asbestos fiber is placed on the top tray and the screen mechanically shaken for two minutes, during which time the mineral naturally distributes itself on the various screens according to size. At the end of the test the amount of fiber remaining upon each screen is carefully weighed, and the result is expressed in a formula that always contains four terms with a hyphen between each. Thus the designation 0-9-5-2 shows that no fiber remained upon the top or coarsest screen, 9 oz. on No. 2 screen, 5 oz. on No. 3 and 2 oz. on the bottom tray. Of course the sum of the four should add to 16 oz.

"The principal grades of asbestos are No. 1 Crude, No. 2 Crude, long spinning fiber, medium spinning fiber, magnesia and compressed sheet fiber, shingle stock, paper stock, cement stock and floats, which are the grades used in our market quotations. Crude No. 1 is asbestos greater than one-half inch in length. It should be silky and of sufficient tensile strength to permit its use for making asbestos yarn, tape, cloth, carded fiber and other asbestos textiles. Owing to the different characteristics of asbestos produced by the several centers in Quebec, a variation will exist among the grades ordinarily sold in this class.

"Crude No. 2 asbestos is generally referred to as mineral that has not been milled and which is less than ¼ in. long. It must be of good tensile strength. Frequently it is mixed with Crude No. 1 in the manufacture of asbestos textiles. Color is also a consideration in determining the price at which it can be sold. Although some companies produce what they term a No. 3 Crude, this classification is not generally recognized by the trade as standard.

"Long spinning fiber used in asbestos textile manufacturing tests anywhere from 4-7-4-1 down to 1-9-4-2, but the standard tests may be taken as 4-7-4-1 and 2-8-4-2.

"Medium spinning fibers are generally required to test 0-8-6-2, and may be mixed with the better grades for textile manufacture.

"Magnesia and compressed sheet fiber averages 0-5-8-3. These fibers are used in the manufacture of magnesia pipe covering and compressed sheet packing.

"There are various grades of shingle stocks, each mine having a different method of determining what constitutes a shingle fiber. The best-known material, however, tests 0-1½-9½-5. Some mines make 0-2-9-4; 0-2-10-4; 1-11½-3½, although the standard shingle stock calls for a test of 0-1½-9½-5. This material, as its name implies, is used in the manufacture of asbestos shingles, corrugated asbestos lumber, and switchboard panels, and is used in conjunction with portland cement.

"Paper stock tests are the nearest standardized tests among the miners. They test either 0-0-10-6 or 0-0-11-5. The common designation for paper stock is 'X.X.' fiber. This material is used for making asbestos paper and millboard and is sometimes mixed with the longer grades of shingle stock.

"Paper stock tests on the average 0-0-10-6 and is used in making asbestos paper or mixing with shingle stock.

"Cement stock, a cheap grade of merchantable asbestos, may test 0-0-5-11 or 0-0-6½-9½. It is used in the manufacture of asbestos boiler and roofing cements and for making millboard.

"Floats or shorts are sold on color and used in the manufacture of flooring. The grade is usually pulpy or sandy in nature.

"No notice is taken of chemical analysis. Iron in asbestos is detrimental, especially if for electrical purposes. The analysis of asbestos depends on the district in Canada from which the material comes, and varies to a considerable extent. There is no special use for asbestos with an iron alumina basis; in fact, this is a detriment to the material.

"Canadian asbestos is not washed before being bagged and sold, so far as we can ascertain. In early issues of Engineering and Mining Journal-Press we shall publish two articles with a more extended description of the occurrence, mining and preparation of asbestos and the marketing of the product.

"We are indebted to B. Marcuse, president of the Asbestos Crude & Fibre Corporation, and of the Asbestos Crude & Fibre Mining Corporation, Ltd., for valuable aid in preparing the above statement."

Quotations according to the same authority were:

Crude No. 1	$800	to	$1000
Crude No. 2	500	to	750
Spinning fibres	200	to	300
Magnesia and compressed sheet fibres	100	to	175
Shingle stock	70	to	120
Paper stock	40	to	50
Cement stock	12.50	to	17.50
Floats	6	to	10

All per short ton f. o. b. mines, Quebec, Canada.

The bulk of the world's supply of asbestos has, for many years, come from Canada. More recently, shipments from South Africa are becoming important. In the United States, long-fibre chrysotile is being obtained in Arizona which is the equal, if not superior, in quality to the Canadian.

Value and Production in California.

Total amount and value of asbestos production in California since 1887, as given in the records of this Bureau, are as follows:

Year	Tons	Value	Year	Tons	Value
1887	30	$1,800	1906	70	$3,500
1888	30	1,800	1907	70	3,500
1889	30	1,800	1908	70	6,100
1890	71	4,260	1909	65	6,500
1891	66	3,960	1910	200	20,000
1892	30	1,830	1911	125	500
1893	50	2,500	1912	90	2,700
1894	50	2,250	1913	47	1,175
1895	25	1,000	1914	51	1,530
1896			1915	143	2,860
1897			1916	145	2,380
1898	10	200	1917	136	10,225
1899	30	750	1918	229	9,903
1900	50	1,250	1919		
1901	110	4,400	1920 *	131	6,240
1902			1921	410	19,275
1903					
1904	10	162	Totals	2,686	$126,975
1905	112	2,625			

*Under Unapportioned.

BARYTES.

Bibliography: State Mineralogist Reports XII, XIV, XV, XVII. Bulletin 38.

The output of crude barytes during 1921 was 901 tons, valued at $4809, as compared with the 1920 production of 3029 tons, worth $20,795. The principal use for barytes is in the paint industry; also in certain rubber articles. For the former purpose, the material should show pure white after grinding. Lithophone is a chemically prepared white pigment containing about 70% barium sulphate and 30% zinc sulphide, and is one of the principal constituents of 'flat' wall paints now so extensively used in office buildings and hospitals, replacing both paper and calcimine wall finishes. Minor uses are in tanning of leather, manufacture of linoleum, paper and rope, and sugar refining. Most of the output of California is utilized in the manufacture of lithophone and blanc fixe.

Known occurrences of this mineral in California are located in Inyo, Los Angeles, Mariposa, Monterey, Nevada, San Bernardino, Shasta and Santa Barbara counties. The deposit at El Portal, in Mariposa County, has given the largest commercial production to date, in part witherite (barium carbonate, $BaCO_3$). The 1915 output was the first commercial production of the carbonate in the United States of which we have record. In 1916–1920, some tonnage of barytes came from a deposit opened up on Fremont's Peak, Monterey County, near the line of San Benito County; in 1919–1921, shipments were made from Nevada County. Shasta County is in the list for 1921.

The first recorded production of barytes in California, according to the statistical reports of the State Mining Bureau, was in 1910. The annual figures are as follows:

Year	Tons	Value	Year	Tons	Value
1910	860	$5,640	1917	4,420	$25,633
1911	309	2,207	1918	100	1,500
1912	564	2,812	1919	1,501	18,065
1913	1,600	3,680	1920	3,029	20,795
1914	2,000	3,000	1921	901	4,809
1915	410	620			
1916	1,606	5,516	Totals	17,300	$94,277

BITUMINOUS ROCK.

Bibliography: State Mineralogist Reports XII, XIII, XV.

The manufacture of asphalt at the oil refineries has almost eliminated the industry of mining bituminous rock, but small amounts of the latter are still used occasionally for road dressing. The production during 1921 from quarries in Santa Cruz and Santa Barbara counties was 8298 tons, valued at $43,192, compared with 5450 tons and $27,825 in 1920.

The following tabulation shows the total amount and value of bituminous rock quarried and sold in California, from the records compiled by the State Mining Bureau, annually since 1887:

Year	Tons	Value	Year	Tons	Value
1887	36,000	$160,000	1906	16,077	$45,204
1888	50,000	257,000	1907	24,122	72,835
1889	40,000	170,000	1908	30,718	109,818
1890	40,000	170,000	1909	34,123	116,436
1891	39,962	154,164	1910	87,547	165,711
1892	24,000	72,000	1911	75,125	117,279
1893	32,000	192,036	1912	44,073	87,467
1894	31,214	115,193	1913	37,541	78,479
1895	38,921	121,586	1914	66,119	166,618
1896	49,456	122,500	1915	17,789	61,468
1897	45,470	128,173	1916	19,449	66,561
1898	46,836	137,575	1917	5,590	18,580
1899	40,321	116,097	1918	2,561	9,067
1900	25,306	71,495	1919	4,614	18,537
1901	24,052	66,354	1920	5,450	27,825
1902	33,490	43,411	1921	8,298	43,192
1903	21,944	53,106			
1904	45,280	175,680	Totals	1,168,201	$3,591,883
1905	24,753	60,436			

COAL.

Bibliography: State Mineralogist Reports VII, XII, XIII, XIV, XV, XVII. U. S. G. S., Bulletins 285, 316, 431, 471, 581; An. Rep. 22, Pt. III. See pp. 152–157 *ante*, for detailed list.

Coal has been produced in California since as early as 1860, and until the development of crude oil was an important factor in the mineral industry of the state. As most of it is lignite, the quality is generally poor as compared with other coals on the Pacific Coast markets. However, in competition with fuel oil, coal of all grades has had to take second place. Besides the counties noted below as showing a commercial production, workable bodies of coal are also known in several others, including Alameda, Amador, Contra Costa, Mendocino, Shasta and Siskiyou. Some coal has also been produced, in the past, in Fresno and Orange counties.

During 1921, production was reported from Monterey and Riverside counties totaling 12,467 tons, valued at $63,578. The increase over the 1920 figures is due to the reopening of the Stone Canyon Mine in Monterey County, a portion of the tonnage there having been utilized in the reopening before commercial shipments were resumed in the latter part of the year. The Riverside County output was utilized only for camp purposes at the mine.

Tests have been made by the U. S. Geological Survey[1] on some of the Ione, Amador County, lignite (because of its resemblance to some oil shales), to determine if it will yield oil on destructive distillation. Up to 62 gallons of oil per ton was obtained and also 18 pounds of ammonium sulphate as a by-product. The latter is valuable as a fertilizer.

[1]U. S. Geol. Surv., Press Bulletin No. 402, March, 1919.

Analyses showed: 16% fixed carbon, 31% volatile matter, 46% moisture, 7% ash; and the heating value is 6060 British thermal units.

The very considerable output of coal in the years previous to 1883 was almost entirely from the Mount Diablo district, Contra Costa County. Later, the Tesla Mine in Corral Hollow, Alameda County, was an important producer for a few years. The following tabulation gives the annual tonnages and values, according to available records:

Coal Output and Value by Years.

Year	Tons	Value	Year	Tons	Value
1861	6,620	$38,065	1893	72,603	$167,555
1862	23,400	134,550	1894	59,887	139,862
1863	43,200	248,400	1895	79,858	193,790
1864	50,700	291,525	1896	70,649	161,335
1865	60,530	348,048	1897	87,449	196,255
1866	84,020	483,115	1898	143,045	337,475
1867	124,690	716,968	1899	160,941	420,109
1868	143,676	826,137	1900	176,956	535,531
1869	157,234	904,096	1901	150,724	401,772
1870	141,890	815,868	1902	88,460	248,622
1871	152,493	876,835	1903	93,026	265,383
1872	190,859	1,097,439	1904	79,062	376,494
1873	186,611	1,073,013	1905	46,500	144,500
1874	215,352	1,238,274	1906	24,850	61,600
1875	166,638	958,169	1907	23,734	55,849
1876	128,049	736,282	1908	18,496	55,503
1877	107,789	619,787	1909	49,389	216,913
1878	134,237	771,863	1910	11,033	23,484
1879	147,879	850,304	1911	11,047	18,297
1880	236,950	1,362,463	1912	14,484	39,092
1881	140,000	805,000	1913	25,198	85,809
1882	112,592	647,404	1914	11,859	28,806
1883	76,162	380,810	1915	10,299	26,662
1884	77,485	309,950	1916	4,037	7,030
1885	71,615	286,460	1917	3,527	7,691
1886	100,000	300,000	1918	6,343	16,149
1887	50,000	150,000	1919	2,983	8,203
1888	95,000	380,000	1920	2,078	5,450
1889	121,280	288,232	1921	12,467	63,578
1890	110,711	283,019			
1891	93,301	264,902	Totals	5,177,125	$22,945,488
1892	85,178	209,711			

The tonnages in the above table for the years 1861–1886 (incl.) are taken from the U. S. Geological Survey, "Mineral Resources of the U. S., 1910," p. 107. The values assigned for the years previous to 1883 are those given by W. A. Goodyear (Mineral Res., 1882, pp. 93–94), being an average of $5.75 per ton. From 1887 to date the figures are those of the California State Mining Bureau.

FLUORSPAR.

Bibliography: Report XVII, Bulletin 67.

Fluorspar is used as a flux in steel and iron smelting, and in the production of aluminum. It is also utilized in the manufacture of hydrofluoric acid, glass, porcelain, enamels and sanitary ware.

[1] "The market for the bulk of the fluorspar sold in the United States depends on the steel industry, and the demand fluctuates with the rise and fall in the production of steel. Gravel spar is consumed as a flux in basic open-hearth steel furnaces and to a smaller extent in other metallurgical operations. In both 1914 and 1915 the sales of gravel spar constituted between 83 and 84 per cent of the total marketed output of domestic fluorspar, and in 1916 it was nearly 86 per cent. Fluorspar is used also as a flux in iron blast furnaces, iron foundries, and in gold, silver, copper and lead smelters; in the manufacture of fluorides of iron and manganese for steel fluxing and of sodium fluoride for wood preservation[2]; in the manufacture of glass, enameled and sanitary ware, and of hydrofluoric acid; in the electrolytic refining of

[1] Burchard, E. F., Fluorspar and cryolite in 1916: U. S. Geol. Surv., Min. Res. of U. S., 1916, Part II, p. 315, 1917.

[2] Teesdale, C. H., Use of fluorides in wood preservation: Wood Preserving, vol. 3, No. 4; vol. 4, No. 1. (Reprint, 9 pp.)

antimony and lead, and in the production of aluminum. Other miscellaneous uses of fluorspar that have been reported are as a bonding for constituents of emery wheels, for carbon electrodes, in the extraction of potash from feldspar, and in the recovery of potash in Portland cement manufacture. The last use depends on the suitability of calcium fluoride as a reagent for increasing the volatilization of potassium salts from the clinker and the regeneration of the reagent from the dust collected.[1]"

In California, deposits have been reported in Los Angeles, Mono, Riverside and San Bernardino counties, but up to 1917 no commercial production had resulted.

In 1917–1918, a total of 79 tons valued at $991 was shipped from Riverside County, but none since. In 1921, at the King Mine under development near Afton, San Bernardino County, some fluorspar was mined but not shipped before the close of the year. Field examinations have indicated a considerable deposit there of merchantable spar.

Present quotations (Engineering and Mining Journal-Press, New York, April 8, 1922) are: Lump, 85% calcium fluoride, and not over 6% silica, @ $20 per ton; gravel, $17.50. Lump, $12.50–$13.50, f. o. b. New Mexico.

GRAPHITE.

Bibliography: State Mineralogist Reports XIII, XIV, XV, XVII. Bulletin 67. U. S. G. S., Min. Res., 1914, Pt. II.

Graphite has been produced from time to time in the State, coming principally from Sonoma and Los Angeles counties. It is difficult for these deposits, which are not high grade, to compete with foreign supplies, which go on the market almost directly as they come from the deposit. Low-grade ores are concentrated with considerable difficulty, and the electric process of manufacturing artificial graphite from coal has been perfected to such a degree that only deposits of natural graphite of a superior quality can be exploited with any certainty of success.

According to the U. S. Geological Survey, operators in this country who are working disseminated flake deposits must depend on their No. 1 and 2 flake for their profit. Graphite dust is merely a by-product and is salable only at a low price. Improved methods of graphite milling adopted promise to increase largely the production of flake of better grade.

The principal value of graphite is on account of its infusibility and resistance to the action of molten metals. It is also largely used in the manufacture of electrical appliances, of 'lead' pencils, as a lubricant, as stove polish, paints, and in many other ways. Amorphous graphite, commonly carrying many impurities, brings a much lower price. For some purposes, such as foundry facings, etc., the low-grade material is satisfactory.

Among the newer uses for graphite is the prevention of formation of scale in boilers. The action is a mechanical one. Being soft and slippery, the graphite prevents the particles of scale from adhering to one another or to the boiler and they are thus easily removed.

The price increases with the grade of material until the best quality crystalline variety ordinarily ranges as high as $200 per ton. The

[1]Treanor, John, Potash from cement at the Riverside Portland Cement Co.: Met. and Chem. Eng., June 15, 1917, pp. 701–703.

coarser flakes are necessary for crucibles, as they help to bind the clay together in addition to their refractory service. Since the close of hostilities in Europe, prices have declined to nearly the pre-war level; and imports have been resumed from Ceylon, Canada, Madagascar, Mexico and Korea, of a total of 7496 tons valued at $452,076 in 1921.

Occurrence of graphite has been reported at various times from Calaveras, Fresno, Imperial, Los Angeles, Mendocino, San Bernardino, San Diego, Siskiyou, Sonoma and Tuolumne counties.

During 1921 a slightly decreased production was reported from Los Angeles County. It was concentrated from a disseminated ore, and was used for paint, foundry facing, and lubricants. As there was but a single operator, the figures are concealed under the 'Unapportioned' item. For 1922 a second plant is expected to join the producing list, also in Los Angeles County. The production, by years, has been as follows:

Year	Pounds	Value
1901	128,000	$4,480
1902	84,000	1,680
1903		
1913	2,500	25
1914		
1915		
1916	29,190	2,335
1917		
1918		
1919	*770,000	37,225
1920		
1921	*	*
Totals	1,013,690	$45,745

*Concealed under 'Unapportioned,' on account of a single producer.

IRON ORE.

Bibliography: State Mineralogist Reports II, IV, V, X, XII, XIII, XIV, XV, XVII, XVIII. Bulletins 38, 67. Am. Inst. Min. Eng., Trans. LIII. Min. & Sci. Press, Vol. 115, pp. 112, 117–122; Vol. 123, pp. 94–96, 113–114.

Iron ore to the amount of 1970 tons, valued at $12,030, was produced in California during the year 1921, and utilized for foundry flux and in steel refining at open-hearth plants. This is a decrease from the 5975 tons and $40,889 of 1920, which was the largest amount for a single year since 1883.

There are considerable deposits of iron ore known in California, notably in Shasta, Madera, Placer, Riverside and San Bernardino counties, but production has so far been limited on account of our having no economic supply of coking coal. Some pig-iron has been made, utilizing charcoal for fuel, both in blast furnaces and by electrical reduction. Further developments along the line of electrical smelting, or discoveries making available our petroleum fuel, for iron reduction, would lead to considerable increase of iron mining in California. For the present, at least, the most feasible possibilities would seem to lie in utilizing our iron resources in the preparation of the various alloys such

as ferro-chrome, ferro-manganese, ferro-molybdenum, ferro-silicon and ferro-tungsten, by means of the electric furnace. California possesses commercial deposits of ores of all the metals just enumerated.

The subject of establishing an iron industry on the Pacific Coast has been under discussion at various times, as indicated by the bibliography given above. We quote herewith portions of two contributions that appeared in 1921, containing data of particular interest to California, especially on cost and consumption figures:

[1] "COKE. The vital factor in successful blast-furnace smelting is coke. Iron ore can be brought from great distances cheaply, but it is costly to transport coke. Coke represents one-third of the weight and one-half of the volume of the ordinary blast-furnace charge. Normally from 20 to 30 per cent of the cost of production is due to coke. There are two outstanding characteristics that the coke must have. First, it must be cheap, and, second, it must have the mechanical strength to support the weight of the charge and sufficient hardness to resist too rapid solution by the ascending gases.

"* * * Coke should not be moved great distances, and Utah coke should not be shipped to California. The smelting center should be near the coke supply in British Columbia or Washington.

"IRON ORE. The presence of iron ore near the smelting locality is not so important as is the presence of coke. Iron ore can be shipped as ballast cheaply from great distances. * * *

"There is a vast supply of high-grade hematite ore in southern California in the Eagle Mountains, of Riverside County, and in the Cave Canyon district and in the Providence Mountains of San Bernardino County. These ores are rather far inland, but fortunately not far from a railroad. It is probable that other ores nearer tidewater can be obtained at less expense.

"LIMESTONE. * * * Sufficient limestone to maintain a plant in southern California may be obtained in San Bernardino County.

"REFRACTORIES. Clay for refractory purposes is available * * *.

MARKET. Much difference of opinion exists as to the scope of the market for iron and steel on the Pacific Coast. It is difficult to obtain reliable data. The customers are scattered over such an extensive area, and their purchases are so variable in amount and kind, that it is almost impossible to obtain information from them. * * * However, in this discussion the important factor is not so much what the present consumption is, but what the consumption would be if cheaper iron and steel were available.

"No pig-iron is produced on the Pacific Coast. Most of that used comes by rail from the East. Small amounts arrive from time to time from China and occasionally from Great Britain and elsewhere. Two hundred tons of pig-iron is consumed daily, practically all of it being used for making gray-iron castings. With cheaper pig-iron the present output of castings will be increased, and thus the market for foundry iron will become larger.

"The production of steel in California, Oregon, Washington and Utah is 1000 tons per day. Scrap-iron and scrap-steel are used almost entirely because they are cheaper than pig-iron. Cheap pig-iron would replace a large portion of this scrap. The steel-makers would like to use part pig-iron in the charges to the furnaces because at times scrap is hard to get, its cost increases with the demand, and a mixture of part scrap and part pig-iron is more desirable from the standpoint of melting.

"Although the total consumption of steel on the coast is large, it consists of many different sizes and shapes, without a large continuous consumption of any one. Steel rolling-mills are complex and expensive, and to be operated profitably must have a large production. It would be impossible to construct and operate a mill to produce so large an assortment of sizes and shapes on the small scale necessary to prevent flooding the Pacific Coast market. Those products must be made for which there is a large steady demand or which can be made by the same machinery. An example of a product for which there is sufficient demand to take the output of a modern rolling-mill is tin-plate. The consumption of tin-plate and tin cans in California, Oregon, Washington, British Columbia and Alaska amounts to 150 tons daily, and the amount exported through Pacific ports to 100 tons. Hence, a market exists for 250 tons daily, and it is reasonable to suppose that a portion of this market could be absorbed by a producer on this coast. * * *

"Much has been said in the past regarding the importation to this country of cheap Chinese pig-iron. It is true, Chinese pig-iron has been laid down on the Pacific Coast for less than pig-iron from eastern United States could be. But there is no danger of any great competition from this source. The so-called cheap Chinese labor is not cheap when reduced to terms of output per dollar. Coke is available in China, but it is expensive. Considering all things, the cost of producing pig-iron in China is comparatively high; and China, rather than engaging in the production and exportation of iron, will become an active consumer, particularly of steel products.

* * * * * * *

"SMELTING PROCESS. The size and type of smelting operation depends upon the size and the nature of the market. If there is a large enough outlet for pig-iron, the blast-furnace process will be used, because it is the standard and, of course, the cheapest. The high cost of coke and the fact that the market for pig-iron extends

[1] Williams, C. E., Factors in the production of iron and steel on the Pacific Coast: Min. & Sci. Press, Vol. 123, pp. 94–96, July 16, 1921.

over the vast area of the Pacific Coast states may make the cost of production of iron so large that the present margin due to the high cost of transportation will be eliminated.

* * * * * * *

"Electric smelting has been suggested as a substitute for the blast-furnace for the following reasons: (1) Good coke is not essential and the quantity of fuel needed amounts to only one-third that needed in the blast-furnace; (2) small-scale production is possible; (3) there is cheap power, or at least cheap potential power, along the coast. Were all these reasons facts, electric smelting would be a possible substitute. But power is not cheap, at least from the standpoint of electric pig-iron, and will not be cheap for many years to come."

"Another process has been proposed, a substitute for both the blast-furnace and the electric-furnace processes and a sort of combination of the two. It is the preparation and melting of sponge-iron. Briefly, the process consists of grinding and purifying the ore by magnetic concentration, mixing it with a low-grade fuel, heating for two or three hours at a temperature of about 950° C., cooling and passing the mixture through a magnetic separator. Metallic iron in a very finely divided condition, free from impurities, is obtained in the concentrate. This product is called sponge-iron. It is then melted in the presence of carbon in an electric furnace, by which means various grades of iron and steel can be made at will. From a theoretical standpoint this process has some promise. It will utilize fuel of poor quality and can be used with impure ores. The fact that various grades of iron and steel can be made makes it adaptable to the conditions existing on the Pacific Coast. For example, to large centers that have near them deposits of iron ore and cheap fuel and that consume both foundry iron and steel ingots, this process would be peculiarly adapted. Sufficient experimentation has not been done to point to either success or failure."

In discussion of the foregoing, the following was contributed:

[1] "The establishment of an iron and steel plant on the coast has become an absolute necessity, especially a blast-furnace plant for the manufacture of pig-iron. Quite recently I was commissioned by British and American interests to make a personal investigation of the market for pig-iron on the coast. I interviewed practically every user of pig-iron, also the shipbuilding and engineering works from Vancouver to Los Angeles, and I am satisfied there is a market on the coast for at least a thousand tons of pig-iron per day, and probably considerably more. The foundries in Oregon alone use 300 tons per day.

"In discussing the question of pig-iron with the scrapmill owners of San Francisco and Los Angeles, they assured me that the five mills would undertake to enter into a firm contract to take 500 tons per day. They are operating entirely on steel and iron scrap, but would prefer at least 40 per cent pig-iron if they could secure it anywhere near the price of scrap, which was then $32 per ton in San Francisco. The price of pig-iron was then $62 to $80 per ton. The prevailing price of pig-iron before the war was from $27.50 to $32.50 for Scotch pig, known as Eggleton No. 2, and during my thirty years' residence in British Columbia I have only once seen pig-iron under $25 per ton.

"Regarding the cost of producing pig-iron on the coast from our native magnetic ores: In 1910 the Canadian federal government sent out to British Columbia Mr. Lindeman, an eminent Norwegian mining engineer and metallurgical expert, to look into the cost of producing pig-iron by the blast-furnace method, and he estimated that notwithstanding the higher wages and cost of other material prevailing at the time, pig-iron could be produced from British Columbian ores at a cost not exceeding $16 per ton. Siever also reported from $12.50 to $15. The high iron-content of our ores and their lack of impurities reduces the cost of producing pig-iron.

* * * * * * *

"Regarding competition from pig-iron made in China, I agree with Mr. Williams that we have nothing to fear from this source. They have not yet made a foundry pig-iron suitable for our market. Moreover, China will not only absorb all she can make herself, but will be a large importer of the products of iron and steel for the next fifty years at least.

"Dealing with Mr. Williams' remarks regarding the total consumption of steel on the coast, it is true that it consists of many different sizes and shapes without perhaps a large continuous consumption of any particular size, and I fully agree with him that it would be impracticable to construct and operate a single mill to produce all this assortment of sizes and shapes, and that those products must be made for which there is a steady demand. He mentions tin-plate as a product for which there is sufficient demand to take the output of a modern rolling-mill, and states that the consumption of tin-plate on the coast amounts to 150 tons per day. He is more than conservative in his estimate here, as the consumption of tin-plate on the coast is approximately 200,000 tons per year, and, in addition to this, approximately 100,000 tons per annum is exported to the Orient through Pacific Coast ports; but what we want first on the coast is a blast-furnace plant whereby we can prove that we can manufacture the various grades of pig-iron from our native ores at a cost that will compete with the East and Europe. When this is accomplished, subsidiary companies will soon take up the manufacture of the various products of iron and steel. There already exists on the coast open-hearth and rolling-mill equipment sufficient to take care of the merchant-bar market. What we lack is a mill large enough to roll shipplates and large shapes and angles, and also rails up to, say, 56-lb. For the latter there is an ever-growing market.

[1] Thompson, N., Iron and Steel on the Pacific Coast: Min. & Sci. Press, Vol. 123, pp. 113–114, July 23, 1921.

"Regarding the smelting processes that Mr. Williams mentioned: As I have already stated, a blast-furnace plant is what we want. In my opinion, there is a market on the coast to justify the building of two 400-ton furnaces, one for the production of pig-iron, the other to be used in conjunction with an open-hearth furance in turning out steel billets by the continuous process. An electric furnace could also be considered in conjunction with the latter unit, for the purpose of further refining and, if necessary, making high-grade tool-steel and other high-grade steel castings. The other processes he refers to are more or less visionary.

"One reason perhaps why an iron and steel industry has not been established on the coast has been the scarcity of hematite ore, the iron deposits being largely magnetite. It has been maintained that these ores can not be economically smelted in a blast-furnace without a large percentage of hematite to act as a flux and cheapen the cost of reduction. It is quite true that magnetites carry an extra atom of oxygen and therefore cost more to reduce to metallic iron, but I contend that the higher iron-content of our magnetites, and their low sulphur and phosphorus content, more than compensates for an extra amount of fuel necessary to melt and reduce them. The magnetic ores of the Pacific Coast run from 55 to 68 per cent metallic iron, with sulphur and phosphorus well within the bessemer limit, whereas the hematite ores of the Mesabi Range and Lake Superior rarely run 50 per cent and are as low as 37 per cent metallic iron. In reply to those who maintain that magnetites can not be smelted without at least 25 per cent of hematite, we know that in New York blast-furnaces have been operating for thirty years on 100 per cent magnetite and on ores that are so low-grade and impure that they have to be concentrated by magnetic concentration, which also means crushing and sintering or briquetting before they can be used in the blast-furnace, so if it pays to smelt magnetic ores of this class in the East, surely it will more than pay to smelt our coast ores, which do not require concentration and are practically free from all impurities, including titanium."

Total Iron Ore Production of California.

Total iron ore production in California, with annual amounts and values, is as follows:

Year	Tons	Value	Year	Tons	Value
1881*	9,273	$79,452	1911	558	$558
1882	2,073	17,766	1912	2,508	2,508
1883	11,191	106,540	1913	2,343	4,485
1884	4,532	40,983	1914	1,436	5,128
1885			1915	724	2,584
1886	3,676	19,250	1916	3,000	6,000
1887			1917	2,874	11,496
1893	250	2,000	1918	3,108	15,947
1894	200	1,500	1919	2,300	13,796
1895			1920	5,975	40,889
1907	400	400	1921	1,970	12,030
1908					
1909	108	174	Totals	59,058	$484,386
1910	579	900			

*Productions for the years 1881-1886 (inc.) were reported as "tons of pig iron," (U. S. G. S., Min. Res. 1885), and for the table herewith are calculated to "tons of ore" on the basis of 47.6% Fe as shown by an average of analysis of the ores (State Mineralogist's Report IV, p. 242). This early production of pig iron was from the blast furnaces then in operation at Hotaling in Placer County. Charcoal was used in lieu of coke. Though producing a superior grade of metal, they were obliged finally to close down, as they could not compete with the cheaper English and eastern United States iron brought in by sea to San Francisco.

MAGNESITE.

Bibliography: State Mineralogist Reports XII, XIII, XIV, XV, XVII; Bulletin 38. U. S. G. S., Bulletins 355, 540; Min. Res. 1913, Pt. II, pp. 450–453. Min. & Sci. Press, Vol. 114, p. 237. "Magnesite"—Hearings before the Comm. on Ways and Means, House of Repr., on H. R. 5218, June 16, 17 and July 17, 1919. Eng. Soc. W. Penn., Proc. 1913, Vol. 29, pp. 305–388, 418–444.

Occurrence.

Magnesite is a natural carbonate of magnesium, and when pure contains 52.4% CO_2 (carbon dioxide) and 47.6% MgO (magnesia). It has a hardness of 3.5 to 4.5, and specific gravity of 3 to 3.12. It is both

harder and heavier than calcite (calcium carbonate), and also contains a higher percentage of CO_2, as calcite has but 44%.

Most of the California magnesite is comparatively pure, and is ordinarily a beautiful, white, fine-grained rock with a conchoidal fracture resembling a break in porcelain. The Grecian magnesite is largely of this character; while the Austrian varieties usually contain iron, so that they become brown after calcining. The Washington magnesite resembles dolomite and some crystalline limestones in physical appearance. Its color varies through light to dark gray, and pink.

In California the known deposits are mostly in the metamorphic rocks of the Coast Ranges and Sierra Nevada Mountains, being associated with serpentine areas. The notable exceptions are the sedimentary deposits, at Bissell in Kern County and at Afton in San Bernardino County. Several thousand tons have been shipped from the Bissell deposit; and small shipments have been made from the Afton property.

The Washington deposits are associated with extensive strata of dolomitic limestone. The magnesite there appears to contain more iron than most of the California mineral, which makes it desirable for the steel operators. However, the experience of the past four years has proven that several California localities have sufficient iron in their magnesite to be serviceable in the steel furnaces. This is particularly true of the Refractory Magnesite Company's mine near Preston in Sonoma County, and the White Rock Mine at Pope Valley, Napa County.

Uses.

The principal uses include: Refractory linings for basic open-hearth steel furnaces, copper reverberatories and converters, bullion and other metallurgical furnaces; in the manufacture of paper from wood pulp; and in structural work, for exterior stucco, for flooring, wainscoting, tiling, sanitary kitchen and hospital finishing, etc. In connection with building work it has proven particularly efficient as a flooring for steel railroad coaches, on account of having greater elasticity and resilience than 'Portland' cement. For refractory purposes the magnesite is 'dead burned'—*i. e.*, all or practically all of the CO_2 is expelled from it. For cement purposes it is left 'caustic'—*i. e.*, from 2% to 10% of CO_2 is retained. When dry caustic magnesite is mixed with a solution of magnesium chloride ($MgCl_2$) in proper proportions, a very strong cement is produced, known as oxychloride or Sorel cement. It is applied in a plastic form, which sets in a few hours as a tough, seamless surface. It has also a very strong bonding power, and will hold firmly to wood, metal, or concrete as a base. It may be finished with a very smooth, even surface, which will take a good wax or oil polish. As ordinarily mixed there is added a certain proportion of wood flour, cork, asbestos, or other filler, thereby adding to the elastic properties of the finished product. Its surface is described as 'warm' and 'quiet' as a result of the elastic and nonconducting character of the composite material. The cement is frequently colored by the addition of some mineral pigment to the materials before mixing as cement.

The desirable qualities of any flooring material (cost not considered) are listed for purposes of analysis or comparison under eighteen heads, as follows: Cleanliness (sanitary qualities), quietness, immunity from

abrasion (surface wear), resilience, immunity from slipperiness, appearance, waterproof character, plasticity, warmth (thermal insulation), life (immunity from deterioration with age), acid-proof character, alkali-proof character, fire resistance, elasticity, crushing strength, structural strength (rupture), immunity from expansion and contraction, and lightness. The importance of these several qualities varies with the varying requirements to be met; for instance, in some places, as in hospitals, cleanliness is one of the prime considerations; in other places immunity from abrasion might be one of the principal requisites. As to most of these qualities the conclusion is reached that the magnesia cement affords one of the most satisfactory flooring materials for many purposes, such as in kitchen, laundry, toilet and bathrooms, corridors large rooms or halls in public or other buildings, including hospitals, factories, shops and restaurants.

There is no doubt that the material is steadily coming into more general recognition and favor for these uses. For a few special uses it is more or less disqualified; as an instance, it is not suited for construction of swimming tanks or for conditions of permanent wetness, since under constant immersion it gradually softens, although it is said to withstand intermittent wetting and drying and is recommended for shower baths. Naturally it is not acid-proof and not wholly alkali-proof, which might be a disadvantage in use for laboratory floors and tables; but these are rather special requirements. Its cost per square foot is given (in 1913) as 25 to 33 cents, depending on area, which is estimated to be lower than marble, cork, rubber, clay or mosaic tile, slate or terrazzo, although more expensive than wood, asphalt, linoleum or Portland cement.

In the discussion of the subject (see Bibliography) the causes of failure are ascribed to uncertain climatic changes, lack of uniformity in the mixtures used, lack of care on the part of those handling the materials, possible deterioration of materials used through exposure (either before or after mixing), lack of proper preparation of foundations on which the material is to be laid, and, as a very important factor, experience or nonexperience in the manipulation or actual laying and troweling of the material. Data concerning the percentages of magnesium chloride and of ground calcined magnesia and data concerning the character and quantity of filler and color added to the commercial preparations are naturally guarded as trade secrets by the firms already in the business. The examination and standardization of the raw materials used, and of acceptable filler materials, and the establishment of standard proportions for the mixtures would seem to be about the only satisfactory way of attacking the problem.

The condition of the calcination of magnesite for cement uses is important, as the same material may undoubtedly be greatly varied in its reacting properties by differing treatment in the kiln. It is generally agreed that the magnesite for cement use must be comparatively free from lime, as lime has a greater tendency to reabsorb water and carbon dioxide than the magnesia, thereby causing swelling, and is therefore not so permanent in the completed cement as a pure magnesia material. The fillers used may constitute 10% to 40% of the whole cement, and commonly consist of ground marble, sand, sawdust, cork, asbestos

or other materials. As an example of the formulas used in mixing such cements the following are quoted:[1]

Mixtures for the underlying or coarser layer.

[Parts by weight.]

1. 15 parts magnesia.
   10 parts magnesium chloride solution, 20° Baumé.
   10 parts moist sawdust.
   (Sets in 36 hours.)
2. 10 parts magnesia.
   10 parts magnesium chloride solution, 28° Baumé.
   5 parts sawdust.
   (Sets in 16 hours.)
3. 20 parts magnesia.
   15 parts magnesium chloride solution, 20° Baumé.
   4 parts ground cork.
   (Sets in 24 hours.)
4. 5 parts magnesia.
   3 parts magnesium chloride solution, 20° Baumé.
   5 parts ashes.
   (Sets in 24 hours.)

Mixtures for overlying or surface layers.

[Parts by weight.]

1. 40 parts magnesia.
   33 parts magnesium chloride solution, 19° Baumé.
   10 parts asbestos powder.
   5 parts wood flour.
   1 part red ocher.
   (Sets in 24 hours.)
2. 25 parts magnesia.
   25 parts magnesium chloride, 21° Baumé.
   4¾ parts wood flour, impregnated with 4½ parts Terpentinharzlösung.
   15 parts yellow ocher.
   (Sets in 30 hours.)

The magnesite used is the fine-ground calcined (not dead-burned) of certain specified kinds or place of derivation regularly sold for the plastic purposes. This material commonly comes in paper-lined casks, barrels or boxes, in which form it is fairly permanent, but it deteriorates by exposure, absorbing carbonic acid and moisture from the air. If carefully handled it can probably be kept unopened a year or more, but it should be used within a few weeks after being opened, even under most favorable conditions.

The use of magnesia cement has been suggested as a protecting coating for mine timbers, particularly against the fire hazard. The necessary qualities for any substance for such purpose have been summarized as follows: It should be resistant to abrasion, and to impact and structural stresses. It should be durable when subjected to the action of the elements, and stable to any minor derangements of the base on which it is placed. It must be relatively unaffected by changes in temperature, by the action of water, and should adhere to the material on which it is placed, and it should also be free from shrinkage cracks due to setting up the material, and have the ability to resist fire. Magnesite cement appears to fulfill the various conditions thus outlined.

[1] Scherer, Robert—Der Magnesit, sein Vorkommen, seine Gewinnung und technische Verwertung, pp. 216–217, A. Hartleben's Bibliothek, Wien und Leipzig, 1908.

It is stated that some metallic magnesium has been prepared electrolytically at Niagara Falls from magnesite.

For refractory purposes the calcined magnesite is largely made up into bricks, similar to fire-brick for furnace linings. It is also used un-consolidated, as 'grain' magnesite. For such, an iron content is desirable, as it allows of a slight sintering in forming the brick. Dead-burned, pure, magnesia can not be sintered except at very high temperatures; and it has little or no plasticity, so that it is hard to handle. Its plasticity is said to be improved by using with it some partly calcined or caustic magneste. Heavy pressure will bind the material sufficiently to allow it to be sintered.

A coating of crushed magnesite is laid on hearths used for heating steel stock for rolling, to prevent the scale formed from attacking the fire-brick of the hearth.

Imports and Domestic Production.

Reports of the U. S. Bureau of Foreign and Domestic Commerce show imports of calcined magnesite to have been 172,591 tons in 1913; 144,747 tons in 1914, and 63,347 tons in 1915; most of it coming from Austria-Hungary and some from Greece. For the same years the production of crude (from 2 to 2½ tons of crude ore required to yield one ton of the calcined) magnesite in California (the sole producer of those years, in the United States) was: 9632 tons, 11,438 tons, 30,721 tons, respectively. For 1916 the California output leaped to 154,052 tons of crude and to 209,648 tons in 1917, but has dropped considerably since then on account of resumption of foreign importations, which totaled 52,483 tons in 1921, valued at $776,384, being admitted duty free. Shipments from Washington were begun late in 1916.

The Fordney Tariff Bill now before Congress places a duty on magnesite, which it is hoped will enable our domestic mines to operate. As passed last July by the House, the schedule placed the duty at ½¢ per pound for crude or ground, and at ¾¢ per pound for dead-burned. As reported out of the Senate Finance Committee April 11, 1922, the figures are placed at: Crude magnesite, $\frac{5}{10}$¢ per lb.; caustic, calcined magnesite, $\frac{8}{8}$¢ per lb.; dead-burned and grained magnesite, not suitable for manufacture into oxychloride cements, $\frac{4}{10}$¢ per lb.; magnesite brick, $\frac{3}{10}$¢ per lb., and 10% ad valorem.

Output and Value.

In considering mineral production, the value of the crude material is used as far as practicable. Magnesite presents a peculiar example of a material which previous to 1916 was seldom handled on the market in the crude state. It is mainly calcined and ground before being considered marketable. From 2 to 2½ tons of the crude material are mined to make one ton of the calcined. In the earlier reports an arbitrary value for the crude material at the mine was calculated from the above on the basis of the calcined value, there having been very little product shipped crude. On the contrary, however, considerable tonnages since 1916 have been shipped in the crude state, contracted for at prices ranging from $7 to $17 per ton, f. o. b. rail points. The average was $10.65 per ton, for 1921. This is the basis of the valuation used herein.

The production of crude magnesite in California during the year 1921 totaled 47,837 tons, valued at $511,102 f. o. b. rail-shipping point. This is a considerable decrease from the 83,695 tons and $1,033,491 in 1920.

It looks as if the main hope for the future for California magnesite lies in the development of the plastic business, particularly in the territory west of the Rocky Mountains; and in the manufacture of refractory brick to be utilized mainly by the copper and lead smelters in the same district. It is possible that, after ocean shipping has resumed its normal routes, California magnesite may be sent via the Panama canal to the Atlantic seaboard; but, on account of our higher production costs, it is difficult to see how we can compete with the Grecian article at Atlantic ports.

Several plants reported making refractory brick here from California magnesite in 1920–1921, at Porterville, Los Angeles and Richmond. The ore from the White Rock Mine in Napa County, and that from the old Kolling (Refractory Magnesite Company) Mine, Sonoma County, is a natural ferro-magnesite and has found a ready market for refractory purposes.

In 1918, for the first time since Tulare County became an important producer of this mineral, it was surpassed in tonnage output for the year, but regained the lead in 1919, followed by Santa Clara and Napa counties, respectively. The same ranking was retained in 1920; but Santa Clara took the lead in 1921. The largest individual producer in 1920–1921 was the Western Magnesite Development Co., in Santa Clara County, operated under lease by C. S. Maltby. A total of 20,187 tons were reported as shipped calcined, representing approximately 45,421 tons of crude ore.

Production of crude magnesite for 1921, by counties, is given in the following table, with total crude value:

County	Tons	Value
Fresno	954	$9,540
Santa Clara	25,800	280,000
Stanislaus	3,378	33,158
Tulare	11,454	125,594
Napa, San Benito, Sonoma*	6,251	62,810
Totals	47,837	$511,102

*Combined to conceal output of a single operator in each.

Total Magnesite Production of California.

The first commercial production of magnesite in California was made in the latter part of 1886 from the Cedar Mountain district,[1] southeast of Livermore, Alameda County. Shipments amounting to 'several tons' or 'several carloads' were sent by rail to New York; but there is apparently no exact record of the amount for that, first year. The statistical records of the State Mining Bureau began with the year 1887, and the table herewith shows the figures for amount and value, annually, from that time. Shipments of magnesite from Napa County began in 1891 from the Snowflake Mine; from the Red Mountain deposits in Santa Clara County, in 1899; and from Tulare County in 1900.

[1]See U. S. Geol. Surv.: Mineral Resources of U. S., 1886, pp. 6 and 696.

Annual production of magnesite for California, amount and value, since 1887, is shown in the following tabulation:

Year	Tons	Value	Year	Tons	Value
1887	600	$9,000	1906	4,032	$40,320
1888	600	9,000	1907	6,405	57,720
1889	600	9,000	1908	10,582	80,822
1890	600	9,000	1909	7,942	62,588
1891	1,500	15,000	1910	16,570	113,887
1892	1,500	15,000	1911	8,858	67,430
1893	1,093	10,930	1912	10,512	105,120
1894	1,440	10,240	1913	9,632	77,056
1895	2,200	17,000	1914	11,438	114,380
1896	1,500	11,000	1915	30,721	283,461
1897	1,143	13,671	1916	154,052	1,311,893
1898	1,263	19,075	1917	209,648	1,976,227
1899	1,280	18,480	1918	83,974	803,492
1900	2,252	19,333	1919	44,696	452,094
1901	4,726	43,057	1920	83,695	1,033,491
1902	2,830	20,655	1921	47,837	511,102
1903	1,361	20,515			
1904	2,850	9,298	Totals	773,865	$7,386,558
1905	3,933	16,221			

PYRITES.

Bibliography: Bulletin 38. Min. & Sci. Press, Vol. 114, pp. 825, 840.

Pyrites are mined for use in the manufacture of sulphuric acid, which in turn is used in large quantities in the preparation of explosives and of fertilizers. Two properties in Alameda and one each in Shasta and Mariposa counties reported a total production in 1921 of 110,025 tons, valued at $473,735, which is a decrease from 1920. The material shipped carried 42% to 46% S.

This does not include the large quantities of pyrite, chalcopyrite and other sulphides which are otherwise treated for their valuable metal contents. Some sulphuric acid is annually made as a by-product in the course of roasting certain tonnages of Mother Lode auriferous concentrates for their precious-metal values. California has available supplies of sulphide ores suitable for the manufacture of sulphuric acid far in excess of the local requirements; but the excess acid if made here is not of sufficient value per ton to pay the freight rates to eastern markets. One of our large copper smelters here could, alone, flood the market with sulphuric acid from its copper ores roasted.

The total recorded pyrite production in California to date is as follows:

Year	Tons	Value	Year	Tons	Value
1898	6,000	$36,000	1911	54,225	$182,954
1899	5,400	28,620	1912	69,872	203,470
1900	3,642	21,133	1913	79,000	218,537
1901	4,578	18,429	1914	79,267	230,058
1902	17,525	60,306	1915	92,462	293,148
1903	24,311	94,000	1916	120,525	372,969
1904	15,043	62,992	1917	111,325	323,704
1905	15,503	63,958	1918	128,329	425,012
1906	46,689	145,895	1919	147,024	540,300
1907	82,270	251,774	1920	146,001	530,581
1908	107,081	610,335	1921	110,025	473,735
1909	457,867	1,389,802			
1910	42,621	179,862	Totals	1,966,585	$6,751,624

MUSEUM.

Each issue of the Monthly Chapter will contain a brief account of current museum activities. This will include a list of new acquisitions received, with names of donors, a report of the number of visitors registered, and other items tending to keep the public advised of the advantages, from an educational standpoint, afforded by the exceptionally fine collection of rocks and minerals of both economic and academic value comprising the 16,000 specimens on exhibition. The museum contains not only one or more samples of most of the known minerals found in California, but hundreds of specimens from other states and foreign countries as well. An account of the arrangement and classification of specimens in this collection will be given in an early issue of 'Mining in California.'

Aside from its purely educational features, the museum daily attracts throngs of tourists and travelers, and furnishes visual evidence of the immense mineral resources of California. The State Mining Bureau supplies a collection of forty typical minerals and ores, appropriately labeled, to any public school in the state upon request.

Mineral specimens suitable for exhibit purposes are solicited and their donation will be appreciated by the State Mining Bureau, as well as those who utilize the facilities of the collection.

Among specimens received recently, and catalogued for the museum, are the following:

19581. *Scorodite* (hydrous ferric arsenate with Arsenopyrite). Two pieces—one showing crystals; one amorphous or massive. From Western Utah Copper Co., Salt Lake City, Utah, by R. T. Walker, Salt Lake City.

19582, 19583, 19584. *Bauxite* and *Bauxitic Clay*. From Riverside County, Cal., by L. M. Richard, Venice, Cal.

19585. *Cassiterite* (tin oxide, 'Wood Tin'), showing variety of colors. From Ropp Mine, Northern Nigeria, British West Africa, by W. E. Thorne, London, England.

19586. *Cassiterite* (tin oxide; crystals and massive crystalline pieces). From Ropp Mine, Northern Nigeria, British West Africa, by W. E. Thorne, London, England.

19587. *Topaz* (aluminum fluo-silicate; associated with cassiterite in tin placers). From Ropp Mine, Northern Nigeria, British West Africa, by W. E. Thorne, London, England.

19588. *Tschermigite* (hydrous ammonium-aluminum sulphate, 'ammonia alum'). From Royce Mine, Sweetwater Co., Wyoming. Purchased.

19589. *Hematite* (iron oxide; suitable for paint pigment). From Riverside County, Cal., by W. H. Cone, San Francisco.

19590 to 19595. *Pyrite, Chalcocite*, Kaolinized *Shale, Cuprite, Dacite, Quartz Porphyry*. From Nevada, by D. A. Hall, San Francisco.

19596. *Breccia* (recemented and silicified; contains bornite, oxidized). From Engels-Walter district, Plumas County, by D. A. Hall, San Francisco.

19597. *Turgite* (hydrous iron oxide, 'hydro-hematite'). Distinguished from hematite and limonite by its exploding when heating a/c water. From Inyo County, Cal., by Rocky Mtn. George, Shoshone, Cal.

19598. *Chalcedony* and *Quartz* (silicon dioxide, cryptocrystalline and crystalline, respectively). From near Healdsburg, Sonoma County, Cal., by C. A. Perry, Healdsburg.

19599. Amphibole *Asbestos* (variety of crocidolite; complex Na-Fe silicate). From South America, by Gilbert Rayburn, Long Beach, Cal.

19600. *Iceland Spar* (variety of calcite). From near Wabuska, Nev., by Fred Eckley, San Francisco.

19601. *Realgar* (arsenic monosulphide). From near Geyserville, Sonoma County, Cal., by John King, Healdsburg.

19602. *Graphite* (flat crystals disseminated in calcite). From Indian Reservation, Imperial Valley, Cal., by Geo. M. Nelson, San Francisco.
19603. *Chalcedony* (cryptocrystalline silica, banded; in part polished). By Mrs. E. Stahl, Berkeley, Cal.
19604. *Alunogen* (hydrous aluminum sulphate). From Inyo County, Cal., by S. F. Paul, Oakland, Cal.
19605. *Garnet* (Grossularite variety, in Eclogite schist). From near Healdsburg, Sonoma County, Cal., by C. A. Perry, Healdsburg.
19606, 19607. *Dacite* (quartz andesite). Pyroxene *Andesite* ('basaltoid'). From Java, by Dr. F. Boscha, Clarens, Switzerland.

During the month a total of 463 visitors signed their names on the museum register, and in addition there are many others daily who fail to take note of our request for their signatures.

LABORATORY.

FRANK SANBORN, Petrologist.

A total of 269 samples were received and determined during the thirty days covered by this report. A sample of massive crocidolite (a complex silicate) from Napa County, and one of bauxite from Riverside County, were two of the few that were interesting in a mineralogical way. The latter came from a deposit that may prove to be of commercial value.

Bauxite is a hydrated oxide of aluminum and is valuable as an aluminum ore and for the manufacture of refractory brick. The general appearance of the mineral is unattractive and would in all probability remain unnoticed by the average prospector. The color varies from white to yellow, brown to red, and occurs in earthy masses resembling clay; also in concretionary forms.

The following very simple test for determining bauxite was devised by Mr. J. M. Hill of the U. S. Geological Survey: If a fragment of bauxite is firmly rubbed on a piece of glass, a thin coating of the mineral will adhere to the smooth surface, and if high grade, it is very difficult to remove by rubbing with the fingers. The coating left by a high alumina clay can be rubbed off without great effort. The more bauxitic the material, the greater the adhering properties—until it is almost impossible to rub off a pure bauxite film with the fingers.

A list of the minerals of possible value, judged from the sample submitted only, is appended.

The Bureau will supply the name and address of the party who sent in any sample listed upon request, if the reference number is given.

05–105 Arsenopyrite, and some scorodite.
05–106 Clay, does not burn white.
05–107 Sodium sulphate.
05–108 Limonite (yellow ocher).
05–109 Clay, alumina content low.
05–110 Fluorspar.
05–111 Fluorite (fluorspar).
05–112 Copper ore, some gold and silver present.
05–113 Thenardite.
05–114 Calcium sulphate.
05–115 Coal, non-coking.
05–116 Chrysotile asbestos, long fibre.
05–117 Alunogen.

05–118 Calcium sulphate, some silica and impurities.
05–119 Dumortierite, associated with lime carbonate.
05–120 Diatomaceous earth.
05–121 Realgar.
05–122 Arsenopyrite, some gold present.
05–123 Pumice.
05–124 Magnesite, good grade.
05–125 Chalcedony.
05–126 Soapstone; also diatomaceous earth.
05–127 Gold quartz.
05–128 Magnetite.
05–129 Copper ore, some gold and silver present.
05–130 Oxides and sulphides of iron (paint pigment).
05–131 Soapstone.
05–132 Mica, biotite variety.
05–133 Molybdenite.
05–134 Amorphous silica.
05–135 Mica; also amphibole asbestos.
05–136 Soda nitre.
05–137 Molybdenite and molybdite in quartz.
05–138 Petzite, free gold associated.
05–139 Limestone.
05–140 Feldspar (orthoclase).

LIBRARY.

E. Cooney, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received during the month, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the state are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geological Survey Professional Paper 129-C, Graphic and Mechanical Computation of Thickness of Strata and Distance to a Stratum. By J. B. Mertie, Jr.

U. S. Geological Survey Professional Paper 129-E, The Byram Calcareous Marl of Mississippi and Its Foraminifera. By Wythe Cooke and Joseph A. Cushman.

U. S. Geological Survey Mineral Resources; Stone in 1920, by G. F. Loughlin and A. T. Coons.

U. S. Geological Survey Mineral Resources; Cement in 1920, by Ernest F. Burchard.

U. S. Bureau of Mines Reports of Investigations:

Serial No. 2318—The Unsaturated Hydrocarbon Constituents of Gas from Destructive Distillation of a Water-Gas Tar and Coal Mixture. By Ralph L. Brown (Associate Organic Chemist, U. S. B. M.).

Serial No. 2319—Prevention of Illness Among Miners. By R. R. Sayers, Chief Surgeon, U. S. B. M., and P. A. Surgeon, U. S. Public Health Service.

Serial No. 2320—Performance of Fan-Pipe Installations in Metal Mines. By D. Harrington (Supervising Mining Engineer, U. S. B. M.) and George M. Hunt (in charge, Section of Wood Conservation, U. S. Forest Products Laboratory, Madison, Wis.).

Serial No. 2322—Properties of Typical Crude Oils from Producing Fields of Kansas. By E. W. Dean, M. B. Cooke and A. D. Bauer.

Serial No. 2324—Some Factors Affecting Products from Destructive Distillation of Oil Shals. By Lewis C. Karrick (Associate Oil-Shale Technologist, U. S. B. M.).

OFFICIAL PUBLICATIONS RECEIVED, *Governmental*—Continued.

Serial No. 2325. Fighting a Mine Fire with Its Own Gases. By C. A. Allen (Mining Engineer, U. S. B. M., and Chief Mine Inspector for the Industrial Commission of Utah) and A. C. Watts (Chief Engineer and Geologist for the Utah Fuel Co.).

Serial No. 2326—Platinum.

Serial No. 2327—Soapstone. By Raymond B. Ladoo (Mineral Technologist, B. of M.).

Serial No. 2329—Use of Low-Pressure Gas Burners in Oil-Field Boilers. By M. P. Yonker (Ref. Engineer, B. of M.).

Serial No. 2330—Recent Articles on Petroleum and Allied Substances. Compiled by E. H. Burroughs (Bibliographer, U. S. B. M.).

U. S. Bureau of Standards Technological Papers:

No. 203—Influence of Phosphorus Upon the Micro-Structure and Hardness of Low-Carbon, Open-Hearth Steels. By Edward C. Groesbeck (Associate Chemist, Bureau of Standards).

No. 204—Cutting Fluids. By Eugene C. Bingham (Chemist, B. of S.).

No. 205—Tensile Properties of Some Structural Alloy Steels at High Temperatures. By H. J. French (Physicist, B. of S.).

U. S. Bureau of Standards Scientific Papers:

No. 426—Thermal Expansion of Nickel, Monel Metal, Stellite, Stainless Steel and Aluminum. By Wilmer H. Souder (Physicist) and Peter Hidnert (Assistant Physicist).

No. 427—Some Effects of the Distributed Capacity Between Inductance Coils and the Ground. By Gregory Breit (Consulting Physicist).

Commission of Bureau of Mines, Arkansas; Minerals of Arkansas. By Jim G. Ferguson.

Surveyor General, State of California; Rules and Regulations Concerning Oil and Gas Permits and Leases.

Surveyor General, State of California; Laws Governing the Sale of School Lands in the State of California.

Twenty-third Annual Report of Mining Industry of Idaho, 1921.

Kentucky Geological Survey; The Coal Industry of Kentucky. By Willard Rouse Jillson.

Michigan Geological and Biological Survey; Bulletin No. 30, Geological Series 25, Inland Lakes of Michigan. By I. D. Scott.

Department of Conservation and Development, New Jersey; Annual Report, 1921.

Tennessee Geological Survey; Bulletin No. 25, Administrative Report of the State Geologist, Nashville, Tenn., 1920.

Bulletin No. 26, Mineral Resources of the Waynesboro Quadrangle, Tenn. By Hugh D. Miser.

Boletin del Petroleo, Mexico.

Boletin Minero, Organ del Departmento de Minas, Mexico, Tomo XII, Numero 6, December, 1921.

Records of the Geological Survey of Victoria, Vol. IV, Pt. III. Department of Mines, Victoria, Australia.

Department of Mines, Queensland Geological Survey. Pub. No. 289, Small Gasteropoda from the Lower Cretaceous of Queensland, by R. Etheredge, Jr.

Catalog of the Fossil Bryoza (Polyzoa) in the Department of Geology, British Museum. Vol. III. By W. D. Lang, ScD., F.G.S.

Societies and Eucational Institutions.

American Mining Congress Journal. April, 1922.

American Mineralogist. December, 1921.

Mining and Metallurgical Society of America. Bulletin No. 153.

Mining and Metallurgy. January, February and March, 1922.

Journal of Geology. February and March, 1922.

Proceedings of the Engineers Society of Western Pennsylvania. July and October numbers, 1921.

Philippine Journal of Science. November, 1921.

Bulletin of the Canadian Institute of Mining and Metallurgy. April, 1922.

Proceedings and Transactions of the Nova Scotian Institute of Science, Vol. XV, Part I. Session of 1918-1919.

OFFICIAL PUBLICATIONS RECEIVED,
Societies and Educational Institutions—Continued.

Transactions of the Institution of Mining and Metallurgy. Vol. XXIX.
Journal and Proceedings of the Royal Society of New South Wales for 1920. Vol. LIV.
Proceedings of the Royal Society of Queensland for 1919. Vols. XXXI–XXXII.
Archivos de la Asociascion Peruana Progreso de la Ciencia. Ano. 1921. Lima, Peru.

Books.

American Mining Manual, 1922.
Placer Mining, Surface Arrangements, Ore, Mining, Assaying. International Library of Technology.
Patents. Graham and Harris.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

Architect and Engineer, San Francisco.
Arizona Mining Journal, Phoenix, Arizona.
Asbestos, Philadelphia, Pennsylvania.
American Petroleum Institute, New York.
Chemical Engineering and Mining Review, London, England.
Cement, Mill and Quarry, Chicago, Illinois.
Engineering and Mining Journal-Press, New York.
Financial Insurance News, Los Angeles, California.
Journal of Electricity and Western Industry, San Francisco.
Metallurgical and Chemical Engineering, New York.
Mining and Oil Bulletin, Los Angeles.
Mining and Engineering Record, Vancouver, B. C.
Oil Weekly, Houston, Texas.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil Paint and Drug Reporter, New York.
Oil Trade Journal, New York.
Oil Age, Los Angeles.
Oil News, Galesburg, Illinois.
Petroleum Record, Los Angeles.
Petroleum Refiner, Kansas City, Missouri.
Petroleum Age, New York.
Petroleum World, Los Angeles.
Queensland Government Mining Journal, Brisbane, Australia.
Rock Products, Chicago, Illinois.
Southwest Builder and Contractor, Los Angeles.
Stone, New York.
Salt Lake Mining Review, Salt Lake City, Utah.
Standard Oil Bulletin, San Francisco.
Safety News, Industrial Accident Commission, San Francisco
The Record, Associated Oil Company, San Francisco.

PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of consumers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

Sufficient publicity has not heretofore been given to this feature of the Bureau's work, but in 'Mining in California' a suitable medium is provided for current inquiries of this nature, and, therefore, written or verbal inquiries that come to the attention of the Bureau are summarized in each issue.

The name of the product wanted or offered, only, is published; the name of the owner of the deposit, or buyer, and other details being supplied upon request.

In writing, the reference number of the item should be given.

Mineral Products or Deposits for Which a Market Is Sought.

02–65 Asbestos deposit; both chrysotile and amphibole.
02–66 Gravel mine; old Table Mountain Channel.
02–67 Cinnabar deposit in Kings County.
02–68 Fuller's earth.
02–69 Drift gravel mines in Nevada and Sierra counties.
02–70 Nitrate deposits in Inyo County; or financial aid in developing.
02–71 Hydraulic property; twenty-one claims, Trinity County.
02–72 Dredging ground, Siskiyou County.
02–73 Limestone, manganese and magnesite.
02–74 Chrysotile asbestos deposit; San Luis Obispo County.
02–75 Mining equipment; Inyo County (2-stamp mill, 40 h. p. and 6 h. p. gas engines, windmill, and one mile of pipe).

Mineral Products or Deposits Wanted.

03–50 Pyrite (for export).
03–51 Zinc ores; carbonate, oxide or silicate, or old dumps containing above.
03–52 Lepidolite and colemanite.
03–53 Gold placers which do not conflict with debris law.
03–54 Diatomaceous earth; tonnage.
03–55 Volcanic ash; fine-grained, in Southern California; tonnage.
03–56 Placer gravel deposit.
03–57 Alunogen; or other aluminum sulphate mineral; deposit or tonnage.
03–59 Mica; deposit or tonnage.
03–60 Cadmium; five to six tons per month.
03–61 Peacock copper ore (bornite).
03–62 Quarry owners; who may be interested in the manufacture of a new composition wall board made from waste rock by a cheap chemical process.

EMPLOYMENT SERVICE.

Following close upon the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

The Bureau contemplates registering technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

A list of applicants for positions and 'positions open,' received by the Bureau during each 30-day period preceding the date of publication of the Monthly Chapter is carried in each issue.

Each notice is designated by a key number, and communications sent to the Bureau in reply to any notice will be forwarded to the proper party without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau, to avoid possible loss.

Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

01– 9 Anything connected with chemistry, mineralogy, or assaying. Student, single. Age 18. References.

01–10 Anything in chemical laboratory or assay office. Student, single. Age 21. References.

01–11 Assayer. Ten years mining experience. Student under U. S. Veterans Bureau. Married. Age 32.

01–12 Miner, timberman, assayer, surveyor, or mine bookkeeper. Technical graduate. Speaks Spanish. Some experience. Single. Age 25.

01–13 Assayer-Chemist. Ten years experience, smelter assaying. Married. Age 36. References.

MAY, 1922

REPORT XVIII OF THE STATE MINERALOGIST

DISTRICT REPORTS OF MINING ENGINEERS.

In 1919–1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each division working out from a local branch office.

This move brought the Bureau into close personal contact with operators, but did not materially shorten the time between the gathering of data in the field and their publication in the Report of the State Mineralogist at the end of an annual or biennial period.

Mining activities and development noted by district engineers in their respective fields are now embodied in monthly reports published in each issue of 'Mining in California,' thus making these data available within a maximum period of thirty days, and the Monthly Chapter as far as possible a compendium of current mining progress throughout the State.

The counties included in each field division and the location of the local offices are shown on the accompanying outline map of the State. (Frontispiece.)

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the State's oil fields is included under this heading.

REDDING FIELD DIVISION.

W. Burling Tucker, Mining Engineer.

Shasta County.

T. P. Peterson of Heroult has located twenty claims on an extensive outcrop of iron gossan, on the south side of Pit river opposite Heroult. The deposit is being developed for mineral paint. Different colors of material have been obtained from the gossan outcrop.

Harvey Sallee of Old Diggins, has taken a lease on the *Mammoth* and *Texas Consolidated* group of mines, and a force of men are employed in cleaning out the lower tunnels on both of these properties. The Mammoth tunnel is 2000 feet in length, and the Texas Consolidated tunnel is about 1600 feet in length. The ore shoots on both of these levels were cut off by faults, and the present development work will be confined to picking up these ore shoots.

The *Mount Shasta Silica Company* of Weed, will start excavating work on their deposit of diatomaceous earth, which is situated in the northeastern part of the county. J. W. West, of Weed, is president of the company.

A high grade shoot of ore has been developed at the *Summit Mine* in the French Gulch District. Two hundred tons of ore have been broken and the Brunswick mill has been put into shape to mill this ore. The property is under lease to Charles Fox and associates of French Gulch.

Siskiyou County.

Hydraulic mining is active near Cecilville, Oak Bar, Forks of the Salmon River, Sawyer's Bar, Scott's Bar, and Fort Jones. At Cecilville, the *Jefferson Consolidated, Consetti* and other properties are under operation

It is reported that the *Humbug Mining Company* has uncovered some very encouraging prospects at their mine on Humbug Creek. One nugget taken out weighed over half an ounce.

Trinity County.

Placer mining is active at more than a score of properties in the county, and the placer gold output this year promises to be large.

The deep snow of the past winter has provided ample water and most of the companies are either operating to capacity or are preparing to do so.

Three hydraulic giants are in operation at the *Lorenz Hydraulic Mine*, near Weaverville.

It is reported that hydraulic operations will soon be resumed on the *Union Hill Placer Mine*, near Douglas City. The flumes and ditches will be repaired in a short time.

The *American-Italian Mining Company* are operating two giants on the Paulson ranch near Lewiston.

The *Shasta Dredging Company* has taken over its option on the Van Matre ranch near Minersville.

The *Layman Mine*, four miles southwest of Hayfork, which is under lease and bond to George Bland of Redding is under operation. There is a five-stamp mill on the property. Seven men are employed.

It is reported that an important strike has been made in the *Old Venicia Mine*, in Eastman Gulch, five miles up the Trinity River from Lewiston. A nine-inch vein of quartz, carrying rich sulphide ore was cut in a new tunnel which has been driven a distance of 212 feet. This tunnel is 150 feet below the old workings. The mine has a record of production of $500,000, from the upper levels.

The mine is owned by the Paulson Bros. of Lewiston, who have bonded the property to J. E. Bennett of San Jose. Four men are employed.

The *Golden Jubilee Mine*, which is situated on Coffee Creek, northwest of Carville, has been bonded to the *Coffee Creek Mining Company*. C. J. Kerr is general manager.

The *Strode Mine*, situated north of Carrville, has been under active development for the past two years by the *Strode Mining Company* of Milwaukee, Wisconsin, J. S. Maxwell, president; John Hillips, secretary. A new tunnel has been driven 1200 feet, 210 feet below No. 6 tunnel level, and No. 1 ore shoot has been opened up on this level for a distance of 300 feet. The vein is from 4 to 12 feet wide, and is said to carry high values in gold. The company proposes to continue development work on this level until No. 2 ore shoot is intersected. With the development of these two shoots of ore, the company proposes to start their mill. James F. Meikel is superintendent.

The *Enterprise Mine*, in East Fork Mining District, 8 miles north of North Fork, has been recently bonded by W. R. Biglow, of Weaverville. A considerable tonnage of ore has been developed and ore is being trammed to mill bins. The mill is expected to be placed under operation sometime this month. Twelve men are employed.

The *Bonanza Group* of mines, which are situated on the East Branch of the East Fork, about 11 miles north of North Fork, are being developed by J. L. Johnston of North Fork.

AUBURN FIELD DIVISION.

C. A. Logan, Mining Engineer.

El Dorado County.

This county has been the scene of quartz mining since 1850, but although a multitude of companies have operated there, and much gold has been produced, few workings have been put down to sufficient depth to conclusively prove the mines. El Dorado County has been and still remains a favorite hunting ground for the small promoter. Two reasons are chiefly responsible for this. The romantic early history and the easily won wealth of the old placer diggings have been powerful magnets. The neglected state of the quartz mines during the past twenty years has tended to depreciate the price of mining properties to the point where many prospects of real merit can be had on very liberal terms. Many such have as a result been bought cheaply and have been made the basis for stock promotions, but the promoters have usually lacked the funds and the capacity as miners to do justice to their properties. The cumulative result of such work has been to further bring the region into disrepute among those who are financially able to do the right kind of mining. The production of gold in later years has fallen very low and at present will probably not exceed $20,000 annually.

Distribution and character of the mines.

The quartz mines occur in a number of rather distinct belts each with its own peculiar characteristics. The east belt mines lie in the granodiorite and mica schist east of the Mother Lode, and are typified by usually narrower and richer veins, and richer and more complex sulphides than the main lode. The Mother Lode traverses the county for about thirty miles and shows here as far as developed the same characteristics as in the counties to the south; namely, wider veins, heavier gouges, generally lenticular quartz bodies, low and medium grade ores and simple ores carrying free gold with little silver, the sulphides being almost entirely iron pyrites, and the treatment of the ore being simple, the chief aim desired being cheapness because of the usual good size but lower grade of the ore bodies, as distinguished from the narrower and richer veins in the schists and granite. Diabase flanks the Mariposa slates of the Mother Lode on the west for over 20 miles, but most of the mining done on this lode has been within the black slates. North of Garden Valley a wedge of amphibolite splits the slate into two belts. Mines have been worked here both in the slate and in the amphibolite.

West of the Mother Lode in the southern part of the county gold has been mined in the metamorphic and igneous rocks. One type here is the replacement deposit, in which the gold occurs mostly in the pyrite, which is disseminated rather evenly through the replacement area; there are also quartz mines here, and these have usually shown ores more capricious in grade and less regular in their distribution than on the main lode. Some disseminated sulphide ore bodies have also been exploited east of the main lode.

In the extreme western part of the county, south of Auburn in Placer County, and in granodiorite and amphibolite, lie numerous but slightly prospected quartz veins. They are narrow and medium in width, are usually accompanied by dikes like so many of the east belt veins, and

show medium and high grade ores which carry a high silver content and good grade sulphides, principally galena and pyrite.

Brief notice of a few of the deeper mines of the county will serve to strengthen the opinion that there must be numerous properties left in the county that well merit development. There is not at present any active mine operating at any important depth in the county. It is peculiarly a region for the operator who is willing to begin operation without waiting for the other fellow to first open a big mine nearby. Most of the mines and prospects have been idle so long and their present owners know so little about them that they are unable to furnish the information necessary to interest engineers and attract adequate capital.

The deepest mines worked in the county are: Union, 1640 feet; Mount Pleasant, 1065 feet; Taylor, 1200 feet; Pacific, 2000 feet; Zantgraf, 1100 feet; Nashville, 1200 feet, and Church, 1400 feet. Leaving out the Taylor, for which figures are not fully at hand, six of these have produced about twelve and a half million dollars, and the Pacific is possibly the only one of the list whose deeper levels may be said to have been at all prospected.

Argonaut Mine is near Greenwood on the Mother Lode. Its history for the past year and a half illustrates the working of the system called the unit plan. The limited mine workings show the wide quartz vein and the stringer lead vein of the lode. Numerous open cuts and shallow shafts were opened in the big quartz vein and the rock that was milled years ago was nearly all from this vein, which is here as elsewhere of pockety nature but of general low grade. The old mill had burned 30 years ago or more and the claims had lain idle for a long time when they were bought very cheap in May, 1921. A Gibson mill was put up in July and the sale of 'units' was begun. About 60 tons of rock was gathered from different parts of the claims and crushed. About the end of October work was stopped, and has not been resumed since.

Big Canyon Mine is five miles south of Diamond Springs. The ore was formed by the mineralization of a mass of diabase breccia, which was silicified and impregnated with auriferous pyrite, the pyrite forming about 3% of the ore. It was a wide and cheaply mined ore body and is said to have been stoped for a depth of 500 feet, length of 400 feet and a thickness of 20 to 30 feet. The last work was in 1914. The ore was narrower and more broken on the 700 level than above.

The *Fairview* prospect near Garden Valley is being promoted on the unit plan by F. C. Fox, who did a little work along the same lines last year at the Argonaut property.

Hercules Mining Company is doing some work at the *Buzzard Mine*, which is about eleven miles from Auburn and three miles from the Zantgraf Mine. A body of complex ore, carrying copper, zinc, gold, silver and possibly other metals, has been partly opened by a shaft 250 feet deep and some short drifts. From time to time small quantities of ore have been crushed in a five-stamp mill but the property has never been adequately financed so progress has been slow. It is thought the ore will necessitate a different plan of treatment. At last report a contract had been let to deepen the shaft.

Work has been resumed on the *Hines Gilbert* property near Spanish Dry Diggings and some encouraging reports have been sent out by the promoters.

The *Mount Pleasant* is on the east belt near Grizzly Flat and the three veins lie at and near the contact of the granodiorite and micaceous schists. A shaft has been sunk 1065 feet and levels driven every 100 feet, with between nine thousand and ten thousand feet of drifts. Several ore shoots from 100 to 800 feet long and in places 7 or 8 feet thick have been stoped between the 700 level and the surface. About 75,000 tons milled have yielded $1,046,748 according to a report by W. B. Tucker.

The *Standard Unit* near Garden Valley is being prospected by an adit. From time to time rich float has been picked up on the surface there, but no vein in place of corresponding value has been found yet. The operators hope to find this vein in the adit.

The *Taylor Mine* was the best producer in the northern part of the county. It is on the westward section of the Mother Lode near Garden Valley. It has an amphibolite schist footwall and a slate hanging wall. The mine was discovered about 1865 and was a producer until 1902. On the surface the vein was small, increasing to six feet wide at 100 feet depth, and in the lower levels was milled 20 to 30 feet wide, keeping 40 stamps and later more in operation. The shaft reached an inclined depth of 1200 feet with levels every 100 feet. The ore shoot is said to have been about 500 feet long. The later operators attempted to make a big tonnage record and handled much low grade ore in consequence. Certain geological conditions, to be more fully covered in the Mother Lode report, also intervened below 600 feet. There is said to have been 4 to 5 feet of very good ore on the hanging wall, which would have paid handsomely alone.

Union Mine is on the Mother Lode three miles south of El Dorado. It was worked from 1851 to 1876 and again from 1902 to 1909. A vertical depth of 1640 feet was reached in the Springfield shaft. Several ore shoots from 150 to 250 feet long and up to 15 feet thick, but averaging about 4 feet were stoped to a maximum depth of 1300 feet. The veins lie in slate walls and show general characteristics of the mines in the slate further south on the lode. The ore is reported to have averaged $6 a ton in later years but that taken out near the surface in the early days ran around $30 a ton. The owners have held this mine many years with the intention of reopening it when costs recede sufficiently.

The *Zantgraf* was the representative mine on the west granodiorite-amphibolite area, and the only one yet opened there to any depth worth mentioning. The vein on this property does not outcrop conspicuously, and the land had been patented as railroad land for many years before it was discovered to be mineral by Jake Zantgraf, who found some promising float and in tracing it found the vein. The main shoot was of good length and was stoped from near the surface to an inclined depth of 1100 feet. The ore was of only average grade, taken as a whole, but varied greatly in value, some areas being very good and others low grade. Like many mines that would make good under proper treatment, it was burdened with a plant too large for it and excessive overhead expenses. There are a number of veins running nearly parallel to the Zantgraf in the same district that have never been more than scratched.

Placer County.

Blue Eyes Prospect. Gold Dollar Mining Co. The new prospect adit on this property has reached a length of about 1200 feet, little work having been done during the winter. The channel has not yet been struck in this adit. A contract has just been let for 500 feet additional work in the adit.

Copper Bottom Mine is in the Iowa Hill district. In July, 1921, H. Melbourne Saggan bought the property and took options on several hundred acres adjoining, including the old Succor Flat Mine and the Golden Star, a prospect which is thought to cover the upstream extension of the channel. These combined properties give a length of about a mile on the probable course of the Succor Flat channel, in ground that has so far been worked only to the line of the Succor Flat Mine, just west of the Copper Bottom.

Up to the time of his death in May, 1922, Saggan had done considerable work here. A 30 h.p. steam boiler, air compressor, drills, hoist and pumps were put in. A few days before his death he reported that he had mined some 300 tons of gravel from a bench or remnant of an upper run, which lies about 50 feet vertically above the main channel. This upper gravel was worked 100 feet wide for a length of 30 feet and depth of six feet, and was low grade, although Saggan claimed it could be worked at a small profit as it is free wash. The lower channel is reached on the Copper Bottom through an adit 400 feet long and a slope of 300 feet, giving a vertical lift of 120 feet for the water, which at last report was making about 300 gallons per minute. He reopened these old workings and claimed he had in the bottom gravel that would run $9 to $10 a yard, but had not run any new drifts or crosscuts so had no idea of the width of the channel here.

The Succor Flat Mine, though itself supposed to be pretty well worked out is of possible value with the Copper Bottom as the old Succor Flat workings might be reopened sufficiently to give drainage to the new ground after a short connecting drift is run.

Georgia Hill Mining Company operating near Yankee Jims have continued their upper drift some 500 feet since the 1921 report but have not yet reported finding any pay gravel.

William Davis of Auburn expects to take a crew of eight men to the *Home Ticket* property near Last Chance before the first of June to resume work on the incline that is being put down from the bottom of the old workings in search of a deeper channel. If this lower channel is found to carry gravel of payable grade, it will probably mean new life for Last Chance as the channel is virgin for some distance.

Lyman Gilmore has done considerable exploratory work the past year in search of channel gravel on claims near Iowa Hill, but to date has not reported finding any continuous channel.

SAN FRANCISCO FIELD DIVISION.

E. S. Boalich, Chief Mining Engineer.

San Benito County.

The last full report on San Benito County was published by the Bureau in 1916, and is contained in Report XV of the State Mineralogist. Most of the other counties have been covered within the past two, or at most, three years. Even though conditions in general were known to

be quiet in this portion of the state, it was deemed proper to visit San Benito, when opportunity offered during April of the present year, so that up-to-date information might be at hand, and that corrections in the 1916 report might be made a matter of record.

The following material is presented as a result of several days of field work where no investigations were pursued further, if inquiry revealed the fact that properties were idle and remained in the same hands as they were when Report XV was written. Changes in ownership, additional development, and new activities are particularly noted, and, under the heading of each mineral, reference is made to publications already in circulation which give details relative to the subject being discussed.

Acknowledgments.

The writer wishes to acknowledge the uniform courtesy extended him by owners and operators of mines and mineral deposits throughout the county, and particularly the personal assistance in the field rendered by Mr. Hugo Fischl, of Hollister.

Geography and Geology.

The geography and more particularly the geology of this county have been discussed at length in the following State Mineralogist's Reports: XI, p. 370; XII, p. 493; XV, p. 616; and in State Mining Bureau Bulletin No. 89, p. 69.

Briefly summarized, it may be stated that San Benito County lies in the heart of the middle Coast Range Mountains, occupying an area about twenty-four miles wide and sixty-six miles long. The eastern border includes a portion of the Diablo Range; the center includes the San Benito, Tres Pinos and several smaller mountain valleys; and the western portion is occupied by the Gavilan Range.

The Gavilan is composed of crystalline schists, limestone and granitic rocks of Paleozoic age, all known as the Santa Lucia Series.

Franciscan formations are found in the northern portion of the Diablo Range within the county, and in the New Idria region in the southeastern corner.

Sedimentary rocks occur in the area between Hollister and the Lomas Muertas; in the main central valleys; and in the Diablo Range south of Panoche Valley, as well as in the southwestern portion of the county.

Mineral Resources.

For many years San Benito has led all other counties in the state in regard to production of quicksilver. It does not rank very high as far as other mineral output is concerned, although its resources include deposits of antimony, asbestos, barite, bituminous rock, chromite, clay, coal, dolomite, gypsum, gems, limestone, magnesite, mineral water, miscellaneous stone, and other mineral substances.

Lack of transportation facilities has retarded development in this region. Many of the streams have not been bridged, and in periods of high water, even teams are often unable to negotiate the river crossings for days at a time.

The only railroads in the county are the branch line of the Southern Pacific from Gilroy to Tres Pinos, via Hollister, and the 'California Central' which runs from Chittenden to the cement plant at San Juan.

Distributing points for the southern portion of the county are Mendota and Coalinga (Fresno County), and Kings City (Monterey County).

MINERAL PRODUCTION TABLE.

Year	Quicksilver		Lime and limestone	Gypsum		Mineral water		Stone	Dolomite		Other minerals
	Flasks	Value	Value	Tons	Value	Gallons	Value	Value	Tons	Value	Value
[1]Total including 1915	296,899	$14,551,450	$189,528	58,712	$238,795	128,720	$25,415	$1,111,619			[2]$163,232
1916	11,110	1,032,156						155,250	8,100	$25,515	[3]526
1917	11,150	1,057,770						101,148	7,000	15,000	[4]59,245
1918	10,715	1,234,027						103,295	5,000	20,625	[5]170,516
1919	7,409	668,989						134,360	7,000	21,540	[6]418,687
1920	3,887	296,912						207,250	18,000	57,750	[7]921,082
Totals	341,170	$18,841,334	$189,528	58,712	$238,795	128,720	$25,415	$1,842,862	45,100	$143,390	$1,742,288
Grand total value											$23,023,612

[1]For details in previous years see Report XV State Mineralogist, p. 620.
[2]Includes antimony, asphalt, coal, gems, and clay.
[3]Includes antimony and mineral water.
[4]Includes antimony, chromite, magnesite, and mineral water.
[5]Includes cement, manganese, mineral water, chromite, and magnesite.
[6]Includes cement, magnesite, and mineral water.
[7]Includes cement, magnesite, and mineral water.

ANTIMONY.

References: State Mineralogist's Reports VIII, p. 485; X, p. 516; XV, p. 622.

There has been absolutely no activity in the antimony mines lying in the northeast corner of the county, during recent years. Conditions are approximately as described in Report XV except for the fact that the Florence Group and the Rip Van Winkle mines have been abandoned entirely, title to the French Group has reverted to Mr. T. H. French of Hollister, and the Quien Sabe Mine is now owned by the De Laveaga Estate, Hollister. Most of the deposits lie on Antimony Mountain, the bulk of which is included in T. 11 S., R. 7 E., M. D. M.

ASBESTOS.

On the southwest slope of Sampson Peak and extending down Clear Creek toward Hernandez, in the eastern portion of T. 18 S., R. 11 E., there is a broad belt of serpentine which contains chrysotile asbestos to a greater or less extent. As mentioned in Report XVIII of the State Mineralogist, p. 46, the California Asbestos Mining Co. is actively developing four claims in that region and is erecting a mill for the separation of the fibre before making shipments. Mr. Norris K. Davis, 400 7th Street, San Francisco, is the principal owner of the property, and the mill mentioned is being constructed according to original ideas of his own, patent for which has been applied for.

The ore so far developed is low grade and the company does not contemplate the production of the higher grades of spinning fibre.

Some desultory prospecting for asbestos is going on at two or three other points near Clear Creek, but nothing particularly encouraging was noted.

ASPHALT.

References: U. S. Geol. Survey Annual Report XXII, Part I, p. 409; State Mineralogist's Report XV, p. 624.

As shown in above references, asphalt has been commercially produced in a small way from a deposit about ten miles northeast of Metz. Occurrences have also been reported along the contact of the sedimentary rocks with the Santa Lucia Series on the east flank of the Gavilan range, southwest of Hollister, but as far as is known no investigations have ever been carried on which would tend to show their extent or importance.

H. V. Underwood, Hollister, Cal., has recently leased a portion of the Rancho El Gabilan owned by John S. Bryan, also of Hollister, and is planning to develop an outcropping of asphaltum which was found about two miles southwest of the Old Mission Portland Cement Company's quarries, southeast of the town of San Juan.

BARITE.

Reference: State Mineralogist's Report XV, p. 624.

The only known occurrence of barite in the county is on the ranch of Bardin Bros., Salinas, Cal., which includes a portion of Gavilan (or Fremont) Peak. It is said that this deposit was first discovered in the early '60's, but the only work done was between 1915 and 1919. Idle at the present time.

BITUMINOUS ROCK.

References: U. S. Geol. Survey Annual Report XXII, Part I, p. 409; State Mineralogist's Report XV, p. 626.

Part of deposit mentioned above under asphalt, lying ten miles northeast of Metz. Of little apparent economic importance. Idle and undeveloped. John Matthews, King City, Cal., owner.

CEMENT.

Reference: State Mineralogist's Report XV, p. 626.

Large deposits of limestone suitable for the manufacture of cement are known in this county.

There is one cement plant, that of the Old Mission Portland Cement Company, J. A. McCarthy, president, at San Juan Bautista. The company's offices are in the Mills Building, San Francisco.

In Report XV there will be found a detailed description of the property owned and controlled by this company, and of the plant, which was only partially completed in 1916 when that publication was being prepared.

Cement production began here in 1918 and has been continuous ever since.

This is one of the two plants, only, in California using the wet process, the other being that of the Southwestern Portland Cement Company, at Victorville, San Bernardino County.

CHROMITE.

References: State Mineralogist's Reports IV, p. 136; VI, pt. I, p. 100; VIII, pp. 483, 490; XV, p. 630. State Mining Bureau Bull. 27, p. 126; Bull. 38, pp. 269, 362; Bull. 67, p. 81; Bulletin 76, p. 166. U. S. Geol. Survey Bull. 603, p. 208.

In the serpentine area in the vicinity of New Idria, chromite occurs abundantly as small float. No large bodies have ever been discovered and even under the stimulus of war time demand the production was very small. This branch of the mineral industry is dormant in San Benito County as is the case elsewhere throughout the state. By reference to the above publications, the reader may obtain complete details relative to work previously done, owners of deposits, etc.

CLAY.

References: State Mineralogist's Report XV, p. 630. State Mining Bureau Bull. 38, p. 226.

The deposit of plastic clay mentioned in above report as occurring on the San Justo Ranch, three miles south of Hollister, is now owned by Dr. J. M. O'Donnell, of Hollister. It has never been commercially developed.

Clay which would make good brick is abundant in many of the valleys of the county. It is reported that the Alpine Quicksilver Mining Company burned 260,000 brick on lower Clear Creek, near Hernandez, in 1915. Some of them remain where they were made and from a cursory inspection are still first class in every respect.

In this connection it is interesting to note the deposit of montmorillonite, or 'mineral soap,' which lies along San Benito River about eighteen miles south of Tres Pinos, on the San Benito Road. According to local authority, a considerable quantity of this material was hauled to the railroad and shipped to San Francisco in the late '80's.

COAL.

References: State Mineralogist's Reports IV, p. 14; V, p. 104; VI, p. 117; VIII, p. 483; XI, p. 372; XII, p. 61; XIII, p. 54; XV, p. 630; XVIII, p. 145. U. S. Geol. Survey Bull. 431–6; Bull. 585, p. 29; Bull. 603, p. 209. U. S. Bur. Mines Bull. 22, pp. 53, 396.

Indications of coal have been noted at a great many points in the sedimentary rocks of the county. The only deposits that have been developed to any extent are the Mascovich Mine (formerly known as the Trafton), near the head of James Creek, N.W. ¼, Sec. 21, T. 17 S., R. 10 E., and the property of the San Benito Coal Mining Company near the Ashurst Ranch, on Larious Creek in the New Idria District.

The former, owned by N. P. Mascovich, Gilroy, Cal., is described fully in Report XV of the State Mineralogist, and has been idle since that publication was issued, and details regarding the latter mine were given in the April number of Mining in California (Chap. of Rept. XVIII, p. 145). The companies' offices are in the Bank of Italy Building, Oakland, Cal. Operations were under way during recent months, but had been temporarily suspended when the district was visited in April, 1922.

In the opinion of the writer, coal in this county is an item of considerable potential importance, but at the present moment the possibility of profitably exploiting deposits of this fuel here does not appear to be very encouraging.

The producer faces high haulage costs from the mine to the railroad, in addition to other obstacles which are common to practically all California operators, some of whom are much more favorably situated.

Without attempting to analyze the conditions which exist in the southern part of San Benito County, it would appear that there should be some advantage to be gained by cooperation between the coal interests and the operators of the quicksilver and magnesite mines that are located in the same vicinity.

COPPER.

References: State Mineralogist's Reports VIII, p. 489; XI, p. 371; XV, p. 631. Bull. 23, p. 146; Bull. 50, p. 172.

Traces of copper are to be seen near the Vancouver Pinnacles, in Sec. 33, T. 16 S., R. 7 E., and on Lewis Creek, in Secs. 2, 3, and 4, T. 19 S., R. 10 E. There is nothing new to report in this connection since this field was investigated by the Bureau in 1916. The small amount of development work which was done at both of these localities, years ago, gave negative results.

DIATOMACEOUS EARTH.

Reference: State Mineralogist's Report XV, p. 636.

The above reference contains the only mention of this material in the county as far as has been ascertained. Occurrences are reported on the N. D. Page ranch near San Benito, and on the Leonard Estate, Sec. 28, T. 17 S., R. 8 E. Neither have been prospected to date.

DOLOMITE.

Reference: State Mineralogist's Report XV, p. 633.

Dolomite, associated with the limestones of the Gavilan Range, exists in large quantities in the hills southwest of Hollister. The facts relative to this subject, as given in the above reference, cover the situation today quite completely. Consistent production has been made annually from the deposits of the San Benito Quarries Company, on the O'Hara Ranch; the San Benito Vineyards Company; and the E. L. Martin Ranch. Work done on the Leopold Palmtag property resulted in the opening up of high grade limestone, rather than dolomite.

GEMS.

References: State Mineralogist's Report XV, p. 636. Bull. 67, p. 157. Bull. Dept. Geol. Univ. of Cal., Vol. 5, pp. 149, 331. U. S. Geol. Survey Bull. 603, p. 208; Mineral Resources 1909, Pt. II, p. 742. Am. Jour. Sci. Vol. 27, p. 398. Science, 1908, p. 616.

In Sec. 25, T. 18 S., R. 12 E., about 9 miles southeast of New Idria, there is a deposit of a gem mineral called benitoite, which, to date, has never been discovered elsewhere. It is a titano-silicate of barium.

R. W. Dallas of Coalinga opened up this deposit shortly after its discovery in 1907 and placed some of the gems on the market. For several years no output has been recorded, however. In 1920 a company called the San Benito Gem Co., with headquarters in Hollister, acquired the property, but it still remains inactive.

The publications cited at the beginning of this paragraph will give complete details regarding this entire subject to any one interested in going into the matter further.

GOLD.

References: State Mineralogist's Reports VIII, p. 490; XII, p. 227; XIII, p. 318; XV, p. 637.

The extent of the county's mineralization is emphasized by recording the fact that gold has been found at several places in sufficient quantity to encourage the expenditure of considerable money in carrying on prospecting operations. As far as could be learned, all such attempts have been long since abandoned, and hope of commercially producing gold has died.

The principal showings of the yellow metal were on the northeast flank of North Chalone Peak, in about Sec. 14, T. 17 S., R. 7 E.; about three miles south of those prospects, and on the Flint Estate in San Juan Canyon, west of Hollister.

GYPSUM.

References: State Mineralogist's Reports VIII, p. 490; XIII, p. 504; XV, p. 638. Bull. 38, p. 287.

At this time there is no gypsum being produced in the county, but several deposits have been developed and are capable of considerable output. There is little of interest to note in addition to the material contained in the 1916 report. The quarries mentioned in that publication, in Secs. 8 and 17, T. 18 S., R. 9 E., are now owned by the Lyons Gypsum Co., T. W. G. Lyons, president, King City, Cal., and are no longer in the hands of J. F. Dunne of Hollister.

IRON.

References: State Mineralogist's Reports VIII, p. 490; XV, p. 639; XVIII, p. 111. Bull. 38, p. 299.

Surface indications of iron, none of which have been investigated, have been reported between Stayton and the Panoche Pass, in the Diablo Range; in T. 17 S., R. 12 E.; and in T. 15 S., R. 6 E.

LIMESTONE.

References: State Mineralogist's Reports VIII, p. 488; XII, p. 393; XIII, p. 629; XV, p. 640.

The above references, particularly the last one which was written in 1916, contain complete information regarding the limestone resources of this county. The principal recent activity in the development of limestone deposits has been by the Old Mission Portland Cement Co., San Juan, Cal. Many of the deposits, though long known, have been inactive for years.

There is now being developed limestone on the ranch of Leopold Palmtag, about ten miles southwest of Hollister. This property has been bonded to the Pacific Coast Steel Co., which organization is sinking test pits and thoroughly prospecting the ground. It is understood that if sufficient tonnage is developed the Southern Pacific Railroad Co. will put in a spur track to the property—right of way over the route to be traversed being already held by the railroad.

MAGNESITE.

References: State Mineralogist's Report XV, p. 643. U. S. Geol. Survey Bull. 355, p. 38; Bull. 540, p. 503; Bull. 603, p. 208; Min. Res. 1911, Pt. II, p. 1120.

On the west slope of Sampson Peak, in T. 17 S., R. 11 E., there is a massive deposit of magnesite practically all of which is owned by the following companies: Sampson Magnesite Co., Ralph H. Moore, president, 547 New Call Building, San Francisco. This company's property and operations have been described in detail in the above-mentioned references. Since the last report of the State Mineralogist considerable production has been reported, a calcining plant has been constructed at the property and many improvements as regards buildings, road construction, etc., have been carried on. There now exists a good auto road to Mendota, Fresno County, which is the most convenient railroad connection. Haulage costs by truck to that point are said to be about $6.50 per ton.

San Benito Magnesite Company (Standard Group), Hugo Fischl, Hollister, and Mrs. Alexander Morrison, San Francisco, owners.

Adjoining the Sampson property on the southwest lies the Standard Group of eleven claims which have been developed by a number of surface workings and which give evidence of containing a very large quantity of high grade magnesite. Equipment here consists of camp buildings, blacksmith shop, tool house, etc. Only two carloads of ore have been actually shipped to date. From this ore there was manufactured a refractory brick which is said to have exceeded the standard requirements of that product now on the market.

MANGANESE.

References: State Mineralogist's Reports XII, p. 330; XV, p. 644. Bull. 76, p. 59.

There is nothing new to report regarding manganese in this county. This branch of the mineral industry is dormant almost everywhere, and the deposits in this particular section were never proved to be of commercial value or extent. The showings which have been noted in the past all lie in T. 13 S., R. 8 E., near the Merced County line.

MINERAL WATER.

References: State Mineralogist's Reports XIII, p. 516; XV, p. 645. U. S. Geol. Survey W. S. Paper 338, p. 306.

Since 1890 there has been a small annual output of mineral water from a well four miles southeast of Hollister which is said to have medicinal effects. The San Benito Mineral Spring Company artifically carbonates the water, most of which is sold locally.

PETROLEUM AND NATURAL GAS.

References: State Mineralogist's Reports VIII, p. 488; XI, p. 372; VII, p. 356; XV, p. 646. State Min. Bur. Bull. 19, p. 148; Bull. 89, p. 69. U. S. Geol. Survey Bull. 431; Bull. 581-d; Bull. 603; Monograph 13.

Seepages of oil and gas have been long known to exist in many localities in the county. Exploration or drilling operations have been carried on in the Santa Ana Valley; Topo Valley; San Benito Valley; between New Idria and Little Panoche Creek; near Twomey Creek; west of Silver Creek; in the Vallecitos, and elsewhere, but to date no commercial production has resulted.

The geology and oil possibilities of San Benito County are discussed at length by Vander Leck in Bull. 89, pages 69 to 82 (issued July, 1921), and the reader interested in going into this question should consult that bulletin as well as the many other references cited above.

QUICKSILVER.

References: State Mineralogist's Reports VIII, p. 483; X, p. 515; XI, p. 373; XII, p. 365; XIII, p. 599; XV, p. 647. State Mining Bureau Bull. 27; Bull. 78, p. 93. U. S. Geol. Survey Monograph XIII.

For the last twenty years San Benito County has been the leading quicksilver producing center, not only in California, but in the United States.

Here is located the New Idria Mine, which has a record of continuous operation and total output second only to the famous New Almaden property in Santa Clara County.

No attempt will be made here to give comprehensive data on the occurrence and production of quicksilver, first, because the industry is now dormant, and second, because the subject has been covered in the fullest possible detail, particularly in Bull. 78, 'Quicksilver Resources of California,' by Walter W. Bradley, published in 1918.

Bradley describes the geology and ore occurrences in various portions of the county, lists all the mines, and records their development, equipment, and possibilities; and touches on the metallurgical practice in every instance. His report also contains maps of the quicksilver districts and bibliography of literature referring to each mine as well as to the general subject under discussion.

STONE INDUSTRY.

Reference: State Mineralogist's Report XV, p. 671.

No new development in the stone industry was noted in addition to the gravel pits near Hollister and the granite quarry at Logan, described in Report XV, above cited.

The latter quarry, operated by the Granite Rock Company, A. R. Wilson, manager, Watsonville, Cal., is of great size and has produced hundreds of thousands of tons of crushed rock annually for several years past.

The rock is a basic granite and is ideal for railroad ballast and highway construction.

Conclusion.

San Benito County is typical of many portions of California as regards its relation to the mineral industry of the state.

It would probably be overlooked by the average mining man if he were making up a list of the 'mining counties' of California—and the casual visitor might note only the hay, fruit, and cattle industries as being of importance.

However, minerals worth a million and a half dollars were produced here last year—at a period of general depression—and as the Pacific Coast becomes more thickly populated and demand for raw materials grows, a survey of the situation gives ample proof of the ability of this section to increase its mineral yield indefinitely, and in many directions.

LOS ANGELES FIELD DIVISION.

M. A. NEWMAN, Mining Engineer.

Kern County.

Mojave Mining District: Considerable interest has been directed to this district, due to the discovery by *Wagman and McFarland* about the middle of April, 1922, of a gold vein lying to the west of the holdings of the Standard Gold Mining Company. The outcrop is reported to be 100 feet long, and the vein averages 5 to 8 feet in width, carrying good gold values for the entire width. Some very high grade ore also has been found by Wagman and McFarland on their new locations.

Randsburg District: *Fox and Barret*, who have leases numbers 2, 3, 4 and 5 of the *Foster Group* are now sinking to develop this territory in depth. This work will be watched with much interest, for if ore is encountered in this ground, it will result in a great deal more development in this particular section of the camp.

The *Minnehaha*, which adjoins the Yellow Aster Mine, is reported to have made a rich strike on the 200 foot level. A sample taken over a width of one foot is said to have assayed $300 gold to the ton, the ore being almost entirely of a free milling nature.

The property is owned by Judge E. Maginnis, and is said to have produced $100,000 to date.

The *Mizpah-Tonopah*, lying to the northwest of the California Rand Silver, is reported to have encountered good values on its claims.

Standard Gold Mining Company. This company, last year, took over the holdings of the old Exposed Treasure Mine. For the last few months, it has been recyaniding old tailings in a leaching plant. A new slimes plant of 125 tons capacity has just been completed, and this will be put in operation very soon on the accumulated slimes from former operations.

The company also proposes to unwater the mines and commence vigorous development work. W. H. Tharpe is manager of the property.

Los Angeles County.

The *California Graphite Leasing Company* is operating the graphite property of the California Graphite Company, situated in the San Francisquito Canyon, 18 miles north from Saugus.

The leasing company has been running its flotation mill, which has a capacity of 1000 lbs. of finished product per hour. The plant was erected in 1920, but has operated only intermittently up to the present time.

In view of the duty which the proposed new tariff will give the graphite industry, this company should be able to meet foreign competition from Ceylon, Madagascar, and Canada, and the higher graphite content of its ores should allow it to more than hold its own with the graphite producers of Alabama, New York and Pennsylvania.

The duty proposed in the new tariff is as follows:

"Graphite or plumbago, crude or refined; Amorphous, 10 per cent ad valorem; crystalline, crystalline lump, shipped or dust, 20 per cent ad valorem; crystalline flake 2 cents per lb. The term crystalline flake as used by the Senate Committee is specified to mean graphite or plumbago which occurs disseminated as a relatively thin plate throughout its containing rock, decomposed or not, and which may be or has been separated therefrom by ordinary crushing, pulverizing, screening, or mechanical concentration process, such flake being made up of a number of parallel laminae, which may be separated by mechanical means."

California Rock Products Company is running its plant continuously. It is on the San Fernando Road, a few miles from Los Angeles. This company is crushing green, red, yellow and white colored igneous rock to supply the artificial-roof companies in Los Angeles with roofing material, and is developing a business of considerable importance.

Riverside County.

The *Brooklyn* gold claim has been bonded by Mr. J. Holmes for $40,000. This is located four miles north of the Iron Chief Mine in the

Eagle Mountains. At present Mr. Holmes is sinking a well for the development of water near his claim, prior to commencing development work.

The *Good Hope Mine,* situated 4½ miles southwest of Perris, has come into the possession of Sellio Trujillo, whose grandfather discovered the mine more than fifty years ago. Mr. Trujillo proposes to unwater the mine, and develop the ore bodies in same. The property originally had a five-stamp mill, and later a twenty-stamp mill with Frue concentraters was built and operated by a Massachusetts company. Owing to internal dissension within the company and outside litigation the company finally suspended operations and the mine was allowed to fill with water.

The average value of the ore is reported to have been $10 gold per ton, being mainly free milling.

The mine is referred to in the following reports of the State Mineralogist: VIII, page 527; IX, page 151; XI, page 106; XII, page 221; XIII, page 311.

San Bernardino County.

The *American Trona Company* resumed the manufacture of potash and borax about April 15, having had its plants at Trona closed down since June, 1921. The company expects to produce 50 tons of potash and 30 tons of borax daily, and will undoubtedly be benefited by the duty imposed by the new proposed tariff bill before Congress.

The tariff bill, as reported by the Senate Committee, places a duty on potash for a period of five years, after which it is placed on the free list. The section of the bill referring to potash is as follows:

"Potassium chloride or muriate of potash, potassium sulphate, kainite, wood ashes, and all crude potash salts not specially provided for:

"*Provided*, that for a period of five years, beginning on the day following the passage of this act, there shall be levied, collected, and paid on the actual potash (potassium oxide) content of all the foregoing, a duty of two and one-half cents per pound the first two years, two cents per pound the third year, one and one-half cents per pound the fourth year, and one cent per pound the fifth year;

"*Provided, further*, that thereafter the said potash content shall be free of duty."

With this tariff protection and the further advantage that the company can also produce borax, thus distributing its overhead charges, the company undoubtedly will be in a position to meet all competition from other sources.

Randsburg District: There is nothing so convincing as actual results obtained at a mining property, and the following may be of particular value to those interested in Randsburg.

Besides the regular dividend (No. 28) of two cents, the *California Rand Silver* directors declared the fourth extra 10 cents for 1922, the two dividends representing a distribution of $153,600. Since January 1st of this year, a total of 50 cents per share, or $640,000, and since organization it has paid a grand total in dividends of $1.33½ per share, or $1,708,800.

EXTRACTION AND PROGRESS.

For the month of April General Manager C. S. Meroney reports the following figures:

Ore shipped to smelter	999 tons
Ore to mill	2182 tons
Ore to mill dump	89 tons
Waste	3831 tons
Total extraction	7101 tons

Advancement in the workings of the mine was as follows:

Drifts	673 feet
Crosscuts	437 feet
Raises	146 feet
Twelfth level station	41 feet
Number two shaft	9 feet
Number four shaft	90 feet
Number six shaft	40 feet
Total progress	1436 feet

Of the twenty-eight cars shipped during the month, the smelter has made returns on 22 cars, giving a total revenue for April of $132,947.69. The six cars to be reported on, including one car of concentrates, represent production of better than average value. Pay roll for the month was $28,839.78.

Of the 2832 tons milled in April, assays gave $16.45 per ton, recovery per ton $14.49. The total value of the concentrates from this ore was $34,276.98, an average of $460.26 per ton.

The *Riggs Mine*, 1¼ miles from Riggs Station, on the Tonopah and Tidewater Railway, and 12 miles north of Silver Lake, is to be reopened and developed along modern lines of mining. The property was originally developed by the late Col. Frank Riggs, and had a production record of several hundred thousand dollars of high grade silver ore.

The officers of the new company are as follows: E. S. Freeze, president, Mrs. M. M. Riggs, vice president, and Philip Chandler, secretary.

San Diego County.

The *Vitrified Products Company* has been formed to work a clay deposit, situated about 14 miles from San Diego. It proposes to erect a plant at the property for the manufacture of brick and tile and later enlarge this to produce vitrified brick, tile, and other clay products.

OIL FIELD DEVELOPMENT OPERATIONS.

R. E. Collom, State Oil and Gas Supervisor.

From April 8, 1922, to and including May 6, 1922, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well	Field
FRESNO COUNTY:					
Premier Oil Company	24	20	14	17	Coalinga
KERN COUNTY:					
Bear State Oil Company	30	28	21	10	Belridge
Associated Oil Company	26	30	24	2	Elk Hills
Pacific Oil Company	31	30	24	9	Elk Hills
Pacific Oil Company	27	30	24	21	Elk Hills
Pacific Oil Company	35	30	24	51	Elk Hills
Pacific Oil Company	35	30	24	9	Elk Hills
Pan American Petroleum Company	2	31	24	1-G	Elk Hills
Pan American Petroleum Company	2	31	24	6-F	Elk Hills
Pan American Petroleum Company	2	31	24	7-F	Elk Hills
Pan American Petroleum Company	2	31	24	8-F	Elk Hills
Union Oil Company	26	30	24	9	Elk Hills
Bangor Oil Company	19	28	28	2	Kern River
Union Oil Company	11	28	27	5	Kern River
Associated Oil Company	31	31	23	56	Midway
Boston Pacific Oil Company	32	31	24	5-B	Midway
Caribou Oil Mining Company	28	31	23	5	Midway
Consolidated Mutual Oil Company	28	31	23	16	Midway
Engineers Oil Company	14	31	22	10	Midway
Honolulu Consolidated Oil Company	12	32	24	1	Midway
Midway Pacific Oil Company	24	31	22	9	Midway
Pacific Oil Company	7	32	24	38	Midway
Pacific Oil Company	7	32	24	76	Midway
Pacific Oil Company	35	31	23	5	Midway
Pacific Oil Company	9	32	24	11	Midway
Louis Titus	28	31	23	3	Midway
Union Oil Company	30	31	23	13	Midway
Union Oil Company	34	31	23	12	Midway
P. B. & O. Oil Company	28	12	24	25	Sunset
C. J. Berry	34	12	24	9	Sunset
C. J. Berry	34	12	24	20	Sunset
Pacific Midway Company	32	12	23	4	Sunset
Republic Petroleum Company	6	11	23	9	Sunset
Tapo hill Oil Company	33	12	24	14	Sunset
P. Welch	18	11	23	1-G	Sunset
Elkern Oil Company	20	29	23	1	----------
LOS ANGELES COUNTY:					
Black Bear Petroleum Syndicate	29	4	12	1	Long Beach
Drexel Clarkston	25	4	13	1	Long Beach
Dabney Syndicate	30	4	12	9	Long Beach
Geo. F. Getty	20	4	12	1	Long Beach
Henderson Petroleum Syndicate	29	4	12	1	Long Beach
A. T. Jergins Trust	19	4	12	1	Long Beach
A. T. Jergins Syndicate	29	4	12	2	Long Beach
Leonard Jones	29	4	12	2	Long Beach
W. M. Keck	29	4	12	1	Long Beach
Pan Pacific Consolidated Oil Co.	20	4	12	1	Long Beach
Petroleum Midway Company, Ltd.	19	4	12	1	Long Beach
Shell Company	29	4	12	1	Long Beach
Shell Company	29	4	12	Dobyns 1	Long Beach
Shell Company	19	4	12	1	Long Beach
Shell Company	29	4	12	Bixby 1	Long Beach
Shell Company	29	4	12	3	Long Beach
Shell Company	20	4	12	4-A	Long Beach
Shell Company	29	4	12	2	Long Beach
Union Oil Company	29	4	12	2	Long Beach
Union Oil Company	30	4	12	3	Long Beach
United Oil Company	29	4	12	4	Long Beach
Rancho La Brea Oil Company	16	1	15	53	Salt Lake
Amalgamated Oil Company	31	2	11	4	Santa Fe Springs
General Petroleum Corporation	6	3	11	86	Santa Fe Springs
General Petroleum Corporation	6	3	11	79	Santa Fe Springs
General Petroleum Corporation	5	3	11	6	Santa Fe Springs
Standard Oil Company	31	2	11	2	Santa Fe Springs
Central Oil Company	23	2	11	73	Whittier
F. F. Hoard	25	1	13	1	----------
C. C. Mangenheimer	25	2	15	1	----------
Santa Monica Pet. and Dev. Co.	28	1	19	1	----------
Sunland Oil Company, Inc	2	2	14	1	----------

Company	Sec.	Twp.	Range	Well	Field
ORANGE COUNTY:					
Brea Canon Oil Company	2	3	10	35	Brea Olinda
Standard Oil Company	18	3	10	92	Coyote Hills
Edlystone Oil Corporation	34	5	11	1	Huntington Beach
Globe Petroleum Corporation	34	5	11	1	Huntington Beach
Invader Oil Company	2	6	11	1	Huntington Beach
J. P. Oil Company	11	6	11	2	Huntington Beach
Mails-Anchor Oil Company	2	6	11	2	Huntington Beach
Petroleum Midway Company, Ltd.	2	6	11	2	Huntington Beach
Petroleum Midway Company, Ltd.	2	6	11	2-A	Huntington Beach
Shell Company	2	6	11	1	Huntington Beach
Standard Oil Company	34	5	11	12	Huntington Beach
Standard Oil Company	34	5	11	11	Huntington Beach
Standard Oil Company	2	6	11	7-A	Huntington Beach
Sun Oil Company of California	2	6	11	6	Huntington Beach
United States Oil Corporation	2	6	11	1	Huntington Beach
U. S. Petroleum Syndicate	27	6	10	1	Newport
Amagamated Oil Company	28	3	9	2	Richfield
Standard Oil Company	29	3	9	15-A	Richfield
Henry R. Dabney	14	5	12	1	----------
SACRAMENTO COUNTY:					
Associated Development Company	25	6	7	1	----------
VENTURA COUNTY:					
Calumet Oil Company	3	3	19	13	Bradsdale
Oak Ridge Oil Company	1	3	19	2	Bradsdale
Camarillo Refining and Pet. Co.	34	2	20	3	Concio
Cooper Petroleum Company	33	2	20	43	Concio
Equity Petroleum Company	4	1	20	1	Concio
Equity Petroleum Company	4	1	20	2	Concio
Equity Petroleum Company	4	1	20	3	Concio
Equity Petroleum Company	4	1	20	4	Concio
Equity Petroleum Company	4	1	20	5	Concio
Equity Petroleum Company	4	1	20	6	Concio
Equity Petroleum Company	4	1	20	7	Concio
Equity Petroleum Company	4	1	20	8	Concio
Equity Petroleum Company	4	1	20	9	Concio
Equity Petroleum Company	4	1	20	10	Concio
A. J. Singer	28	2	20	2	Concio
Santa Fe Petroleum Company	17	4	18	6	Piru
Oak Ridge Oil Company	21	3	21	2	Santa Paula
Wilson Petroleum Company	33	3	2	1	Santa Paula
A. H. MacFarland	10	2	19	1	Simi
Santa Paula Oil Company	18	3	20	7	South Mountain
McKee-Bramlam-Lonn	33	4	23	1	----------

SPECIAL ARTICLES.

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the Bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff containing much information that will add to the permanent value of the Monthly Chapter are included in each number of 'Mining in California.'

It is anticipated that these special articles will cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations, as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the text of new laws and official regulations and notices affecting the mineral industry.

PROGRESS REPORT ON PLACER GOLD INVESTIGATION.

By Chas. S. Haley.

The district covered this month embraces some of the most important and valuable placer deposits in California. A preliminary survey is being made of the whole district embraced by the drainage of the Yuba, the Bear, the American, and the Mokelumne, Cosumnes and Calaveras rivers; with the intention of completing the work in detail as soon as the weather conditions permit work in the high Sierras.

In the Nevada City and Grass Valley districts, much has been learned regarding small or 'pup' channels since Lindgren's report, and much new drift ground has been and is being developed. At North Bloomfield, in the Malakoff diggings, the presence of a new and deeper channel to the west has been evidenced by drifting operations recently, with the discovery of gravel which runs twenty-five dollars a yard and over. On the authority of the manager of the property of the River Mines, who control about seven miles of this channel, it is stated that prospecting operations have evidenced about eight hundred million yards of gravel still available for hydraulicking, with an average value of over twelve cents a yard.

In the Greenhorn and Bear River country, recent development work, notably at the Quaker Hill Mine, has shown several hundred million yards of fifteen cent gravel.

The estimates of gravel ultimately available on the drainage of the rivers above mentioned will evidently have to be revised, and greatly revised, in an upward direction. From my own investigations so far, it seems fairly safe to assume a total of about seven billion yards of gravel, distributed among the different drainage areas as follows, approximately: Feather River, 500,000,000 yards; Yuba River, 3,500,000,000 yards; Bear and American rivers, 2,500,000,000 yards; Mokelumne, Cosumnes, Calaveras and Stanislaus rivers, 500,000,000 yards. The above figures include both drift and hydraulic ground.

The above total of seven billion yards, judging from past performance in the days of unrestricted mining, should yield from twelve to fifteen cents a yard; and if hydraulic mining is restored under proper restrictions with regard to control of debris, there is roughly a billion dollars to be recovered from these drainage systems alone.

The importance of glacial action with regard to distribution of gravels and pay has been greatly underestimated; and present theories seem capable of considerable revision in this regard. It is not necessary, as many geologists seem to have thought, to postulate a pre-Tertiary glacial period to admit the possibility of glacial action on these channels. The Tertiary period extended over several hundred thousand years; and during that time, previous to and during the extensive vulcanism, there must have been many climatic changes caused by shifting of ocean currents and pressure areas, which would have given the Sierras a climate similar to that prevailing at present in Alaska and British Columbia, entirely independent of any general shifting of the polar ice-cap. The evidence and positive proof of local glaciation in these channels is so pronounced that it can not be overlooked. Discrepancies in bedrock elevations in the downstream course of the channels may be in part, although not altogether, explained by the differences in datum from which these elevations were obtained; but the presence of bedrock fluting; of single and double U-shaped channels; of heaps of heavy boulders of varied character which could not have been carried far from their source by water alone; of the immense white quartz channels in which all the metamorphic wall rock has been ground up and transported out by water—the grinding would have been impractical without the aid of ice action; and the fact that the depth and width of these channels so often increase as one follows upstream; all of these phenomena indicate the deposition of much of this material and the hollowing out of the channels by local glaciation.

That water sorting followed, and was intermittent with, this action, is also indubitable; as the shingling and sorting of the gravel shows beyond doubt that these were the courses of ancient streams.

One thing which may well be noticed; and a point on which the writer intends to make investigations, is the relative elevations of the lava-gravel contacts. It may well be possible that a series of readings taken on these will show the original grades of these streams far better than bedrock elevations will, even when properly correlated. At any rate, it is worth trying out.

The economic value of these gold placers to the state as a whole; and the inestimable benefit which will accrue to the farming industry of the state by a proper conservation of the water for their working, and its release during the dry season, are more than ever evident to any unprejudiced investigation. This without in any way interfering with the existing rights of the power and irrigation companies; and eventually working to their positive advantage. The additional benefit of clearing the river channels in the valley to their old grades and restoring navigation up to Marysville and Colusa for all time, without the need of maintaining expensive levees, will also function to the benefit of the agricultural interests in giving them permanent protection from floods and low transportation rates for their produce. Thirty millions spent by the United States in building restraining dams according to the

original provisions of the Caminetti act will be repaid to the farmers and miners of the state fifty times over in the course of the next century; and the flood problems caused by present conditions from natural erosion of denuded soil will be solved for all time.

MEMORANDA ON ASPHALT AND BITUMINOUS SAND DEPOSITS OF CALIFORNIA.

By Lawrence Vander Leck.

The bituminous shales and sands in California are found in strata of Tertiary Age. The principal deposits are either in, or in close association with the Miocene diatomaceous shale, commonly known as Monterey shale. These bituminous shales and sands differ from those of the Rocky Mountain Region in that the organic matter contained in them has been distilled and is present in either the form of liquid petroleum or asphaltum, whereas the Rocky Mountain deposits have to undergo the process of destructive distillation of the organic matter before petroleum or asphaltum is formed. As a matter of fact the California deposits are nothing more than sands and porous lenses of shale, which are more or less saturated with liquid petroleum. These sands and shales, by reason of structural movements have been uplifted into the zone of erosion with the result that most of the lighter constituents have evaporated, or run off, leaving behind a tarry residuum.

The simple process of distillation will separate the petroleum from the particles of sand and shale. In the Santa Maria District the return by distillation is about 20 gallons of crude oil per ton of sand or shale. The only distillation plant now in operation is located near Casmalia Station, Santa Barbara County, and is operated by David E. Day, formerly of the U. S. Bureau of Mines. The following is a list of the principal deposits:

Point Arena District.

About two and one-half miles north of the town of Point Arena, Mendocino County, on the O'Neill Ranch, are two outcrops of bituminous sand interbedded in the Monterey shale. These sands are from four to six feet in width and can be followed for one and one-half miles along the strike. A second deposit occurs about 500 feet north and east of the Point Arena lighthouse. The asphaltum here is found directly in the Monterey shale.

Marin County.

Seams of asphalt are found in the Monterey shale along the cliffs about two miles north of the town of Bolinas. This deposit is not very extensive.

Santa Cruz District.

Beginning at the town of Santa Cruz, deposits of asphalt occur along the coast for a distance of about six miles north. These deposits are very extensive and have in recent years been used as quarries for paving stone.

Santa Clara County.

About two miles west of the town of Sargent, in what is known as the Sargent Oil Field, are large deposits of bituminous shale outcropping along the contact of the Monterey shale and the serpentine. These deposits are about 15 acres in extent.

Salinas Valley District.

About ten miles northeast of King City and two miles west of the town of Loanoke, in Secs. 14 and 15, T. 19 S., R. 9 E., M. D. B. and M., occur deposits of bituminous shale along the contact of the Santa Marguerita formation and the granite. These deposits were known as the Mylar Quarry. On the west side of the Salinas Valley, about ten miles southeast of the town of Bradley, is what is known as the Pleyto District, an outcropping of bituminous sand at the contact of the Paso Robles formation and the Salinas shale.

San Luis Obispo District.

The principal deposits in this district occur between the town of Pismo and the town of Edna, on the north portion of what is known as the Arroyo Grande Oil Fields. This is probably the largest deposit of bituminous sand in California. It occurs in the Pismo formation, the total area covered by this deposit being, approximately, two square miles. At one time, there was an asphalt mine located about one mile south of the town of Edna. This, however, has been dismantled.

Santa Maria District. (Santa Barbara County.)

About four miles south and west of the town of Guadalupe, on the Pezzoni Ranch, there are numerous outcrops of bituminous shale. These deposits cover about twenty acres in extent. In Schumann Canyon, about one mile north of Casmalia Station, the Monterey shale is heavily bituminized and it is at this location that Dr. Day has his distillation plant. Deposits in this locality cover about 600 acres. In the old Santa Maria Field, along Graciosa Ridge, there are outcrops of bituminous sands along the contact of the Monterey and the Fernando formation. On the Rancho San Carlos Jonata, just south of Red Rock Mountain, there are numerous outcrops of bituminous sand in the Monterey shale. About six miles west of Zaca Lake and about two miles east of the town of Sisquoc, on what is known as Asphaltum Creek, there are large deposits of bituminous sand and shale occurring at the contact of the Fernando and the Monterey shale.

Coast Region from Gaviota Pass to Santa Barbara.

Along the shore between these two points the Monterey shale is present and is dipping at a high angle to the west. At various points there are outcrops of bituminous sand in the shale.

Ojai Valley District.

In the Ojai Valley, about four miles east of Nordhoff, on the property of the Pan American Petroleum Company, are numerous deposits of asphaltum.

Sunset District.

Along the southwest edge of the Sunset Oil Fields, in Kern County, at the contact of the McKittrick formation and the Maricopa shale, are numerous deposits of bituminous sand and shale. These deposits are found in the following sections, 14 and 13, T. 11 N., R. 24 W., and in sections 18, 19 and 20, T. 11 N., R. 23 W., S. B. B. and M.

McKittrick District.

One mile south and west of the town of McKittrick, in Secs. 19 and 20, 21, 28 and 29, R. 22 E., T. 30 S., M. D. B. and M., at the contact of the McKittrick formation and the Maricopa shale, there are very large deposits of bituminous shale and asphaltum. In the Gould Hills, about ten miles north of the town of McKittrick, in Sec. 7, T. 29 S., R. 21 E., is an outcrop of bituminous shale in the Santa Marguerita formation.

Santa Monica District.

Along the ocean front about one mile north of Santa Monica Canyon, there are small deposits of asphaltum in the diatomaceous shale.

Los Angeles County.

There are a few dry sand outcrops in the Brea Canyon. In Los Angeles County asphalt deposits occur at the La Brea Pit, in the Salt Lake Oilfield near Sherman. These pits are on the Hancock Ranch, and are being excavated by the Smithsonian Institute or the Carnegie Foundation, for fossils. There are also some outcrops of tar sands in the northwestern residence district of Los Angeles.

References: U. S. Geol. Survey 22d Annual Report; 'Asphalt and Bituminous Rock Deposits in the United States,' G. H. Eldridge, pp.379–452. U. S. Geol. Survey Santa Cruz Folio, No. 163. U. S. Geol. Survey San Luis Obispo Folio, No. 101.

NON-METALLIC MINERALS OF SOUTHERN CALIFORNIA.

By M. A. Newman.

GYPSUM.

In 1895, the reported production of gypsum from 13 producing states was 265,503 tons. By 1920, the records of 19 states gave returns for crude gypsum mined amounting to 3,129,142 tons.

California produced in 1895 a tonnage of 5158, and, in 1920, this was increased to 20,507 tons.

Southern California imported from Nevada and Utah, in 1921, approximately 120,000 tons, of which 95% came from Nevada.

And yet, within the counties of Southern California, and, particularly, in Riverside, San Bernardino and Imperial counties, there exist literally, not thousands, but millions, of tons of commercial rock gypsum. The deposits that contain these enormous amounts occur in the arid regions of the Mojave and Colorado deserts, and, for one reason only—lack of transportation—have they heretofore not been developed.

The gypsum that is imported into Southern California is used almost entirely for wall plaster and plaster board, and comes from Arden,

Arrowhead, and Mound House, in Nevada, and from Nephi, Utah. These deposits are all either on the railroads, or within a very few miles of them, and for this reason solely, and not on account of any superiority over the Southern California deposits, have they been developed.

Gypsum in Southern California is used as land plaster, as a retarder for cement, as wall plaster and for plaster board.

As land plaster, crude gypsum is finely ground and used as a fertilizer. About 7000 tons was used as fertilizer, last year, the greater part of which came from the deposit at Amboy.

In the cement industry, from 2 to 2½ per cent raw gypsum is used as a retarder in the setting of cement. For this purpose, crude gypsum is crushed to pass a two-inch ring and is added to the cement clinker as it comes from the roaster. 12,000 to 14,000 tons are used by the cement plants in Southern California as a retarder, and the major part of this also came from Amboy.

Of the 120,000 tons of gypsum that came from Nevada and Utah into Southern California, the larger part of this was sold as wall plaster, and the balance as wall board.

There are now in Los Angeles four companies which manufacture wall board, and undoubtedly there will be a gradual expansion of the wall board industry.

As yet the amount of gypsum used as tile, block, or stucco in Southern California is comparatively small, yet there is a very large industrial field to be developed along these lines. This is especially true now, as more and more attention is being directed to the use of fire resisting materials in construction.

GYPSUM DEPOSITS.

The gypsum deposits of Southern California may be divided into four groups, according to their origin—efflorescent deposits, periodic lake deposits, interbedded deposits and crystallized veins, or selenite. Of these, all but selenite may have a local value.

The efflorescent deposits are widely distributed from the Tehachapi Mountains through to Los Angeles County. They overlie a variety of Tertiary sediments of fine and coarse sandstone and shales. In general, these have little economic value. However, locally they may be utilized where transportation is not an obstacle.

The deposit at Amboy is an excellent example of a periodic lake deposit. However, it is the interbedded deposits of the Palen, Maria, Avawatz and Fish mountains, which are of most economic value.

There are three very large deposits of gypsum in Southern California, each of which has tonnages running into the millions, and which are of especial interest:

Riverside County.

In the Maria Mountains, seventeen miles south of Blythe Junction, a station on the Parker cutoff, of the Atchison, Topeka and Santa Fe Railroad, lie the holdings of the United States Gypsum Company. These are situated in the southwest corner of T. 3 S., R. 21 E. and in the northwest and southeast corners of T. 4 S., R. 21 E., S. B. B. and M. These have been partially developed by open cuts and shafts; as they lie but a few miles from the Atchison, Topeka and Santa Fe Railroad, they are of great economic importance.

Imperial County.

In the northwestern edge of the Fish Creek Mountains, in Sec. 29, T. 13 S., R. 9 E., S. B. M., the Imperial Gypsum Company has 400 acres of an immense deposit of rock gypsum. As the thickness of this deposit is over 100 feet and can easily be mined by quarrying methods, mining costs should be exceedingly low. The company at present is building a narrow-gauge railway from a station, Maria, on the San Diego and Arizona Railroad, to the deposit, a distance of about 25 miles. Maria is about 18 miles west of El Centro. The company is now erecting a crushing plant of 250 tons capacity at Maria, and later proposes building a calcining unit.

San Bernardino County.

In the Avawatz Mountains, not far from the northern boundary of San Bernardino County, and at the extreme southern end of Death Valley, lie immense deposits of gypsum. These are about ten miles west of the Tonopah and Tidewater Railroad. The Avawatz Salt and Gypsum Company has locations in sections 15, 22, 23, 25, and 26, T. 18 N., R. 5 E., S. B. M. This company has completed extensive railroad surveys from the deposits to the Tonopah and Tidewater Railroad, showing a line 17 miles in length could be easily constructed. The possibility of not only mining gypsum, but also salts, which occurs in immense quantities on its claims, gives the property a very great potential value.

Other Counties.

Besides the deposits referred to, all of which have tonnages which run into the millions, gypsum occurs in other localities in the above counties, as well as in Inyo, Kern, Los Angeles, Orange, Santa Barbara, and Ventura counties. These deposits are described in detail in Reports XIV, XV, XVII of the State Mineralogist. Also, in Bullein No. 697 of the United States Geological Survey.

Conclusion.

I have endeavored in the above to give a brief, but accurate, view of the gypsum industry, showing the present consumption and the available deposits in Southern California. It is easy to see that the market for gypsum is not unlimited by any means at the present time, and that our gypsum deposits will probably last far into the future. That there will be an increasing demand for wall plaster and plaster board on the Pacific Coast is practically assured. The possibility of creating a further market for wall board in the Orient, Australia, and South America, is simply a matter of educating those countries to its use.

Appended below is a short historical sketch and a description of the chemical and physical properties of gypsum, which has been abstracted from the bulletins of the United States Geological Survey, to whom thanks are duly acknowledged:

Historical.

The peculiar properties of gypsum for certain uses have been known to man from the earliest of recorded time. The Egyptians, over 4000 years ago, made plaster of calcined gypsum, the same as plaster of Paris

of today. Some of the plaster work in the Pyramids is hard and durable today. The sculpture of the Assyrians was made of alabaster. White rock gypsum or alabaster has been used in Europe for centuries, for ornamentation of buildings, especially that of the cathedrals, and is today still used in large quantities for sculpture in Italy.

Calcined gypsum has had no extensive use until within the last half century, though utilized for several centuries for making plasters and casts. It is somewhat over 100 years ago that gypsum was first quarried in the United States. As early as 1792, gypsum was discovered in central New York, and, in 1808, a company was formed to sell it as land plaster, but not until 1892 was the first production of gypsum plaster recorded in New York. Following New York, gypsum was found in Virginia, and, as the population of the United States gradually crept westward, deposits were found by the settlers in Michigan, Ohio, and Iowa. In 1835, the use of gypsum as land plaster was advocated. In 1840, deposits were found near Grand Rapids, Michigan, and, in 1850, gypsum was being mined at Sandusky, Ohio. Iowa began to produce gypsum in 1872, and California, in 1875.

Chemical and Physical Properties.

Gypsum is a common mineral, and is found widely distributed in the United States. It occurs both massive and crystalline. The crystalline form, known as selenite, can be split into layers or sheets, and any variety of gypsum is so soft as to be scratched with a finger nail. The chief commercial value of gypsum is due to the fact that if calcined and then mixed with water, it will set and harden, thus making its use ideal for wall plaster. Chemically, gypsum is a hydrous calcium sulphate, having the chemical formula $Ca\ SO^4\ 2\ H^2\ O$, which, reduced to its component parts,

$$\text{Gypsum } Ca\ SO^4\ 2\ H^2\ O \begin{cases} \text{Calcium Sulphate} \\ Ca\ SO^4 = 79.1\% \\ \\ \text{Water} \\ H^2\ O = 20.9\% \end{cases} \begin{cases} \text{Lime} \\ Ca\ O = 32.5\% \\ \\ \text{Sulphur Trioxide} \\ SO^3 = 46.6\% \end{cases}$$

Pure Gypsum, or sulphate of lime, is seldom found pure in nature. Nearly all gypsum deposits contain oxides of iron and aluminum, carbonates of calcium, magnesium, and other impurities. Anhydrite, or $Ca\ SO^4$, is often found with gypsum, either disseminated through it, or occurring in separate masses. The specific gravity of pure gypsum is 2.3 to 2.33, and pure rock gypsum is white, while selenite is colorless and transparent or translucent. Owing to impurities, however, gypsum varies in color from gray to black, from flesh pink to red, and brown, and some is yellow or pale blue. However, pure powdered gypsum is always white.

Gypsum as selenite crystallizes according to the forms of the monoclinic system. Gypsum is soluble in hydrochloric acid, but does not effervesce, or gelatinize. Gypsum occurs in four different forms, as rock gypsum, gypsite, selenite, and satin spar.

Rock or massive gypsum is the variety of most economic value, and occurs interbedded in sedimentary rocks, and is composed of minute, even microscopic crystals, which make a generally opaque rock. When

pure, it is white. However, commonly, it is more often pink, gray or brown, or buff. Rock Gypsum that is white and fine grained is known as alabaster, and is suitable for sculpturing.

Gypsite, or earthy gypsum, is soft, incoherent, impure gypsum, formed on the surface from gypsiferous water. It ranges from material as fine as powder through to a sandy or slightly consolidated form. In color, it may be gray, brown, pink, or, where it contains much iron, red.

Selenite occurs in distinct crystals. These have been known to be over 4 feet long, but these, however, are rare. Pure selenite is colorless and transparent, easily splits into sheets, and is often mistaken for mica. However, the sheets are not elastic, like mica, and thus can be easily distinguished from it. Satin spar is a crystalline form of needle-like fibres. It occurs in narrow veins, or seams, seldom over 3 or 4 inches thick, either in massive gypsum deposits, or in the wall rocks near these. Satin spar is usually white or pink.

MINE ASSESSMENT YEAR.

By C. McK. Laizure.

That there is still a great deal of confusion in the minds of holders of unpatented mining claims regarding the periods in which the annual assessment work must be performed, is apparent from the large number of inquiries received by the Bureau in regard to the change from the calendar year to the fiscal year basis.

Federal government bureaus, technical magazines, and daily papers in mining districts have also been besieged with inquiries.

The text of the law now in effect was published in the February issue of 'Mining in California,' and it is believed that the mining public is fairly familiar with the act itself, but its interpretation has been the subject of much discussion, and it will be fortunate, indeed, if it is not the cause of unnecessary litigation.

In an endeavor to clarify the situation the following graphic chart has been prepared in the hope that by visualizing the calendar years and assessment periods, their relation will be shown more clearly and the overlapping of the two explained.

Under the old law the first work required on a *new* location had to be performed before the end of the 'year' following the 'year' in which the claim was located.

This period, under the old law, coincided with the calendar year and began at 12 a.m. the first of January next succeeding the calendar year in which the claim was located. The period is now, however, represented by the 'assessment year' which corresponds to the fiscal year, and comprises each twelve months between noon July 1st and noon July 1st annually; with the exception of the transition period of eighteen months between January 1, 1920, and July 1, 1921. For the purpose of figuring when the first work must be done this eighteen-month long 'year' merely worked to the advantage of the locator, by giving him an additional six months time for the '1920 work,' while the change was being made.

By referring to the diagram, it will be readily seen just how the 'assessment years' relate to the 'calendar years.'

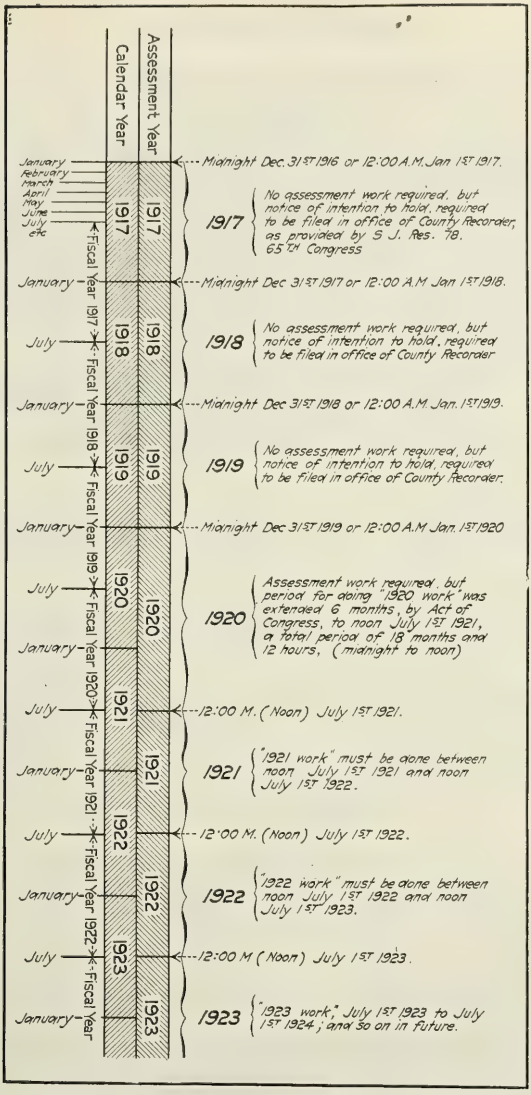


Diagram showing relation between 'calendar years' and periods for performing annual assessment work due to changing period from the calendar year to the fiscal year, beginning July first of each year.

The owner of a claim located at any time during the year 1919 would have until noon July 1, 1921, in which to perform his first assessment work, a maximum period of approximately two years and six months, if the claim was located at the beginning of 1919, and a minimum period of approximately eighteen months, if located at the end of 1919.

If located during the calendar year 1920, it would be located within the '1920 assessment period' and the owner would have until the end of the following 'assessment period' or fiscal year in which to complete his first work, or until noon July 1, 1922, as indicated on the diagram.

A claim located between January 1, 1921, and July 1, 1921, would still be located within the '1920 assessment period or year,' they being opposite each other in the diagram, and the first work would have to be completed by noon, July 1, 1922, which is the end of the succeeding or '1921 assessment period or year.'

A claim located after July 1, 1921, and before July 1, 1922, is located in the 'fiscal year 1921,' which begins and ends on those dates, and the first work would have to be completed by July 1st of the succeeding fiscal year, or assessment period; that is, by July 1, 1923.

There appears to be little question regarding old locations or claims that have been in existence for a number of years; the difference of opinion arising over the work required on locations made during the change.

The following statement and comment on the same was published by the American Mining Congress in General Bulletin No. 20 under date of May 13, 1922:

"MINING ASSESSMENT.

"Conflicting opinions having arisen as to the performance of assessment work on mining claims, Acting Secretary of Interior Finney has rendered a decision in reply to a request by Senator Bursum of New Mexico. The Senator's request was based on an inquiry of an Arizona miner relative to when assessment work on mining claims located between January 1 and July 1, 1921, must be performed to avoid danger of relocation. The Attorney General of Arizona ruled that such locators would be required to perform annual assessment work prior to July 1, 1922. The opinion of Acting Secretary Finney coincides with that of the Arizona Attorney General and follows:

"This is a question which can not be settled by the opinion of the Attorney General of the State nor by the Secretary of the Interior, as the question would arise, if at all, in the event of a relocation of such a claim and upon adverse proceedings, in the courts. However, I give my opinion for what it is worth, and state that it coincides with that of the Attorney General of Arizona.

"The statute (42 Stat. 186) provides that the period within which work shall be performed shall commence at 12 o'clock meridian on the first day of July succeeding the date of location of such claims. A further proviso is to the effect that in all such valid existing claims the annual period ending December 31, 1921, shall continue to 12 o'clock noon, July 1, 1922. The latter proviso was designed, to take care of existing claims and to give an extension of six months within which work might be performed thereon. One of the reasons for the latter proviso was to avoid having the year within which assessment work must be performed end at different times for different classes of claims. As to the first provision of law, it seems clear that it was intended to permanently change the time within which annual assessment work upon mining claims must be performed, so as to have the year begin and end with the first of July, instead of the first of January as heretofore. The requirement in the statute is that the year within which assessment work is required to be performed begins on the first day of July succeeding the date of location. Therefore, if a claim were located, say in June, 1921, the year within which work was required to be done began on the next first of July, or July 1, 1921, and to avoid relocation must have been performed during the year beginning July 1, 1921, and ending July 1, 1922.'

"The American Mining Congress is not convinced that the opinion of Acting Secretary Finney above referred to on mining assessment will be upheld by the courts, nevertheless it urges holders of all claims located between January 1, 1921, and July 1, 1921, to do annual assessment work thereon before July first of this year."

SECRETARY'S OFFICE.

W. W. Thayer, Secretary.

The California State Mining Bureau was created April 16, 1880, by legislative act. In March, 1893, the original act was repealed and an amended act approved and passed by the legislative body. Again on June 16, 1913, a new Mining Bureau Act was approved which became effective August 10, 1913, repealing all former acts, and forming the basic law under which the Bureau now functions.

It is doubtless true that both the mining and lay public have not in the past always recognized the part played by the Bureau in the development of the state's mineral resources. Innumerable inquiries regarding them, originating within and without its borders and in foreign countries, have been answered with ultimate results reflected by a consistent growth in the value of the state's mineral output since the records of production were first compiled by the Bureau in 1887.

It is believed that a better understanding of the economic position occupied by the Bureau will be imparted to the public, whose funds support it, by embodying in the Monthly Chapter a review of the executive activities.

The responsibility for the coördination of effort of each department, to the end that the utmost efficiency may be maintained with the limited and variable appropriations accorded the Bureau by successive legislatures, rests upon the office of secretary.

Activities referable to that office, such as reports of new maps and publications issued, amount of mail handled, changes and enlargements in offices, changes in personnel of the staff, property and equipment, financial statements, etc., are therefore included herein.

New Publications.

During the month the following Bureau publications have been made available for distribution:

Summary of Operations, California Oil Fields, February, 1922, Vol. 7, No. 8.

Mining in California, April, 1922 (monthly), Vol 18, No. 4.

Distribution of Publications.

The Bureau's publications are constantly in demand, requests for copies coming from all over the United States and foreign countries. Publications were distributed during the month as follows:

Publications	Number distributed
Report XI, State Mineralogist	2
Report XIV, State Mineralogist	4
Report XV, State Mineralogist	3
Report XVII, State Mineralogist	14
Mines and Mineral Resources of Del Norte, etc.	1
Mines and Mineral Resources of Imperial, etc.	3
Mines and Mineral Resources of Alpine, etc.	2
Mines and Mineral Resources of Butte, etc.	1
Mines and Mineral Resources of Los Angeles, etc.	3

Publications	Number distributed
Mines and Mineral Resources of Monterey, etc.	5
Mines and Mineral Resources of San Bernardino, etc.	3
Mines and Mineral Resources of Shasta, etc.	1
Mines and Mineral Resources of Nevada County	10
Mines and Mineral Resources of Plumas County	4
Mines and Mineral Resources of Sierra County	3
Bulletin No. 6, California Gold Mill Practices	3
Bulletin No. 23, Copper Resources of California	3
Bulletin No. 37, Gems, Jewelers' Materials and Ornamental Stones of California	5
Bulletin No. 50, Copper Resources of California	3
Bulletin No. 72, Geologic Formations of California	15
Bulletin No. 75, Mining Laws, United States and California	75
Bulletin No. 78, Quicksilver Resources of California	5
Bulletin No. 85, Platinum and Allied Metals in California	7
Bulletin No. 89, Petroleum Resources of California, with special reference to unimproved area	205
Bulletin No. 90, California Mineral Production for 1920	70
Preliminary Report No. 8, Review of Mining in California during 1921	100
Mining in California (Monthly) Vol. 18, No. 3, March, 1922	240
Mining in California (Monthly) Vol. 18, No. 4, April, 1922	1960
County Maps and Registers of Mines	3
El Dorado Forest Map	4
Madera Forest Map	1
Placer Forest Map	4
Shasta Forest Map	1
Sierra Forest Map	2
Siskiyou Forest Map	6
Tuolumne Forest Map	2
Lake Map	1
Desert Map	4
Inyo Geological Map	3
Amador Mineral Map	1
Calaveras Mineral Map	3
Tuolumne Mineral Map	2
Forest Map, unmounted	1
Forest Map, mounted	1
Geological Map of California, unmounted	1
Geological Map of California, mounted	10
Reg. Oil Wells, Los Angeles County	1
Colored Map of California, showing generalized classification of land regarding oil possibilities	37
Oil Field Maps	418

Mails and Files.

The Bureau maintains in addition to its correspondence file a mine report file which includes reports on some 7500 mines and mineral properties in California. Also there is available to the public a file of the permits granted to mining and oil corporations by the State Commissioner of Corporations.

During the month 750 letters were received and answered. They are practically all requests for information and the inquiries cover all phases of prospecting, mining and developing mineral deposits, reduction of crude minerals and marketing of refined products.

Drafting.

The Bureau maintains an up-to-date drafting department, where topographic and geological maps, tracings, oil well logs, and oil field maps are prepared.

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Statistician and Curator.

STATISTICS.

California produces commercially at least fifty different mineral substances, with a total annual value of nearly $250,000,000. There are several thousand operating properties, including mines, quarries, oil and gas wells, mineral springs, gravel pits, mills, and smelters; hence, the task of compiling accurate and dependable statistics covering their activities is not a simple one.

Some figures of the 1921 production were given in the April issue of 'Mining in California,' and additional data are presented herein; but as we have still to receive reports from a few of the operators it is not yet possible to compile the final figures for last year.

ALUMINUM.

Bibliography: Bulletins 38, 67. U. S. G. S., Min. Res. of U. S.

To date, there has been no commercial production of aluminum ore in California. The first authentic find of bauxite in this state was noted in the April issue of 'Mining in California' (see page 198, *ante*; also 'Pacific Mining News,' p. 13, May, 1922).

Minerals containing aluminum are abundant, the most widely distributed being the clays. There are only two, however, thus far of consequence, commercially, in the production of the metal: bauxite (to which may be added the related, hydrated oxides, hydrargillite and diaspore), and cryolite. Cryolite is found in commercial quantities only in South Greenland, and was formerly the only ore of aluminum used, being still employed as a flux in the extraction of the metal. Bauxite has been, for some years, the most important source of aluminum and its salts. Its color varies from gray to red, according to the amount of iron present, the composition ranging usually between the following limits: Al_2O_3, 30%–60%; Fe_2O_3, 3%–25%; SiO_2, 0.5%–20%; TiO_2, 0.0%–10%. Besides its reduction to the metal, bauxite is also utilized in the manufacture of: aluminum salts, refractory bricks, alundum (fused alumina) for use as an abrasive; and in the refining of oil (stated to be of growing importance). The most important producing countries, both of bauxite and the metal, are the United States and France, the former yielding more than 60 per cent of the world's output. In 1913 France led.

Because of its light weight (2.58 specific gravity), the metal, aluminum, has many important industrial uses, particularly in the manufacture of aeroplanes, airships, automobiles, cooking utensils, and electrical apparatus. The use of aluminum dust in place of zinc dust for precipitating precious metal from cyanide solutions is increasing. In the Thermit process of welding and casting, aluminum in fine grains or filings is mixed with the oxide (usually iron oxide) to be reduced.

Present quotations for aluminum are 17c–20c per pound according to grade, for the refined metal.

ANTIMONY.

Bibliography: State Mineralogist Reports VIII, X, XII, XIII, XIV, XV, XVII, Bulletin 38.

Production of antimony in California has been irregular, and small in amount except during the year 1916 when the high war-time prices permitted American producers, for a short period, to compete with Chinese antimony. The principal commercial production of antimony in California has come from Kern, Inyo, and San Benito counties, and other occurrences have been noted in Nevada, Riverside, and Santa Clara counties. The commonest occurrence is in the form of the sulphide, stibnite; but in the Kernville and Havilah districts in Kern County there were notable deposits of the native metal, being among the few localities of the world where native antimony has been found.

California producers claim that they can not operate profitably unless the price of antimony be above 12 cents per pound. Present New York quotations are around 5 cents per pound.

Pure antimony metal, and manufactured antimony compounds are of considerable importance as pigments in the ceramic industry. The most important use of the metal, commercially, is in various alloys, particularly type-metal (with tin and lead), babbitt (with tin and copper), and britannia metal (with tin and copper).

The production of antimony in California by years since 1887 has been as follows:

Year	Tons	Value	Year	Tons	Value
1887	75	$15,500	1900	70	$5,700
1888	100	20,000	1901	50	8,350
1889			1902		
1893	50	2,250	1915	510	35,666
1894	150	6,000	1916	1,015	64,793
1895	33	1,485	1917	158	18,786
1896	17	2,320	1918		
1897	20	3,500			
1898	40	1,200	Totals	2,363	$199,050
1899	75	13,500			

ARSENIC.

Bibliography: Bulletin 67. U. S. G. S., Min. Res. of U. S.

Arsenic is found in a number of localities in California in the mineral arsenopyrite (FeAsS), which is frequently gold bearing. The occurrence of realgar (AsS) has also been noted (see page 197, *ante*. To date, there has been no commercial output of arsenic from California ores. The principal source of the arsenic of commerce in the United States has been as a by-product from the metallurgical treatment of copper, gold, and lead ores. It is usually recovered in the form of the tri-oxide, or 'white arsenic.'

BISMUTH.

Bibliography: Bulletins 38, 67. Am. Jour. Sci. 1903, Vol. 16.

Several bismuth minerals have been found in California, notably native bismuth and bismite (the ochre) in the tourmaline gem district in San Diego and Riverside counties near Pala. Other occurrences of

bismuth minerals, including the sulphide, bismuthinite, have been noted in Inyo, Fresno, Nevada, Tuolumne, and Mono counties, but only in small quantities. The only commercial production recorded was 20 tons valued at $2,400, in 1904, and credited to Riverside County.

In 1917, a few pounds of bismuthinite (Bi_2S_3) with associated bismutite ($Bi_2CO_5.H_2O$), was taken out at the United Tungsten Copper mine, in the Morongo district, San Bernardino County. It is associated with scheelite in a contact deposit between limestone and granite.

Recovery of bismuth from blister copper in the electrolytic refinery has been noted,[1] ranging as high as 27.3 pounds of metallic bismuth per 100 tons of blister copper from the Iron Mountain, Shasta County, ores. In the United States, the principal recovery of bismuth is obtained as a by-product from the refining of lead bullion.

The uses of bismuth are somewhat restricted, being employed principally in the preparation of medicinal salts, and in low melting-point or cliché alloys. These alloys are utilized in automatic fire sprinkler systems, in electrical fuses, and in solders.

Present quotations for bismuth are $2.00–$2.10 per pound for the refined metal.

CADMIUM.

Biblography: U. S. G. S., Min. Res. of U. S., 1908, 1918.

During 1917 and 1918, cadmium metal was recovered by the electrolytic zinc plant of the Mammoth Copper Company in Shasta County. It was shipped in the form of 'sticks' and amounted to a total of several thousand pounds for the two years, the exact figures being concealed under 'Unapportioned.' That was the first, and thus far the only, commercial production of cadmium recorded from California ore. Cadmium there occurs associated with zinc sulphide, sphalerite, probably as the sulphide, greenockite. Cadmium also occurs in the Cerro Gordo Mine, Inyo County, associated with smithsonite (zinc carbonate).

There are several cadmium minerals, but none of them occur in sufficient quantities individually to be profitable as distinct ores. The cadmium of commerce is derived as a by-product in the reduction of zinc minerals and ores, in nearly all of which it occurs in at least minute proportions, the average ratio being about 1 of cadmium to 200 of zinc. As cadmium behaves metallurgically much the same as zinc, it constitutes a fraction of 1 per cent of nearly all metallic zinc.

Cadmium is produced in the United States in two forms—metallic cadmium and the pigment, cadmium sulphide. The principal use of the metal is in low-melting point, or cliché alloys, and its salts are utilized in the arts, medicine, and in electroplating. The sulphide is employed as a paint pigment, being a strong yellow, which is unaffected by hydrogen sulphide gas from coal smoke. It is also employed in coloring glass and porcelain. Cadmium cliché metal is stated to be superior to the corresponding bismuth alloy, for making stereotype plates. Cadmium is also used in bronze telegraph and telephone wires, and gives some promise of being utilized in electroplating.

Present quotations for cadmium are $1.00–$1.25 per pound for the refined metal.

[1]Trans. Am. Inst. Min. Eng., Vol. 47, pp. 217–218.

COBALT.

Bibliography: Report XIV; Bulletin 67. U. S. G. S., Min. Res. of U. S., 1912, 1918.

Occurrences of some of the cobalt minerals have been noted in several localities in California, but to date no commercial deposits have been developed. Some of the copper ores of the foothill copper belt in Mariposa and Madera counties have been found to contain cobalt up to 3%.

The most important use of cobalt is in the manufacture of the alloy, stellite, in which it is combined with chromium, for making high-speed lathe tools, and non-tarnishing cutlery and surgeons' appliances. The metal is also used in electroplating, similarly to nickel; and the oxide, carbonate, chloride, sulphate and other salts are used in ceramics for coloring. Some of the organic salts of cobalt (acetate, resinate, oleate) are employed as 'driers' in paint and varnish.

Present quotations for cobalt are \$3.00–\$3.25 per pound for the refined metal.

MOLYBDENUM.

Bibliography: Reports XIV, XVII. Bulletin 67. U. S. Bur. of Min., Bulletin 111. Proc. Colo. Sci. Soc., Vol. XI.

Molybdenum is used as an alloy constituent in the steel industry, and in certain forms of electrical apparatus. Included in the latter, is its successful substitution for platinum and platinum-iridium in electric contact-making and breaking devices. In alloys it is used similarly to and in conjunction with chromium, cobalt, iron, manganese, nickel, tungsten, and vanadium. The oxides and the ammonium salt have important chemical uses.

The two principal molybdenum minerals are: the sulphide, molybdenite; and wulfenite, lead molybdate, the former furnishing practically the entire commercial output. Molybdenite is found in or associated with acidic igneous rocks, such as granite and pegmatite. The chief commercial sources have been New South Wales, Queensland, and Norway, with some also from Canada.

Deposits of disseminated molybdenite are known in several localities in California, and in at least two places it occurs in small masses associated with copper sulphides. The only recorded commercial shipments of molybdenum ore in California were during the war, 1916–1918. Some development work has recently been done on a high-grade deposit at the head of the Kaweah River, Tulare County.

The 1917 output included some concentrates assaying up to 58% MoS_2, but the bulk of it was 1.5% ore which was shipped to Denver, Colorado, for concentration. That production came mainly from Shasta County, with smaller amounts from Inyo, Mono and San Diego counties. There were two concentrating plants built in California—one in each of the above first and last-named counties.

In the spring of 1918, a flotation plant operated for a short time by a lessee on the Boulder Creek mine, near Gibson Siding, Shasta County, made a small amount of 90% MoS_2 concentrate. The ore treated carried 2.6% MoS_2. There has been none produced in California since 1918.

Present quotations for molybdenum ore are @ 50¢ per pound for 85% MoS_2 concentrates.

The California production of molybdenum ore by years is summarized in the following tabulation:

Year	Tons	Value
1916	8	$9,945
1917	243	9,014
1918	*	300
Totals	251	$19,259

*300 pounds of 90% MoS_2 concentrate.

NICKEL.

Bibliography: Reports XIV, XVII. U. S. G. S., Bulletin 640–D.

Nickel occurs in the Friday Copper Mine in the Julian District, San Diego County. The ore is a nickel-bearing pyrrhotite, with some associated chalcopyrite. Some ore has been mined in the course of development work, but not treated nor disposed of, as they were unable to get any smelter to handle it for them. Nickel ore has also been reported from other localities in California, but not yet confirmed.

Present quotations for nickel are 30¢–39¢ per pound, according to grade and quantity.

TIN.

Bibliography: Reports XV, XVII. Bulletin 67.

Tin is not at present produced in California; but during 1891–1892, there was some output from a small deposit near Corona, in Riverside County, as tabulated below. Small quantities of stream tin have been found in some of the placer workings in northern California, but never in paying amounts.

Two occurrences have also been noted, in northern San Diego County. Crystals of cassiterite were found there, associated with blue tourmaline crystals, amblygonite and beryl. No commercial quantity has been developed, only small pockets having been taken out.

The principal sources of the world's supply of tin are the islands of Banka, Billiton and Singkep, Netherlands India (Dutch East Indies), followed by the Federated Malay States (Perak, Pahang, Negri Sembilan and Selangor). Bolivia, Siam, Cornwall, Transvaal, New South Wales, Queensland and Tasmania are also important sources. A measurable amount of the metal is also recovered by de-tinning scrap and old cans.

Total output of tin in California:

Year	Pounds	Value
1891	125,289	$27,564
1892	126,000	32,400
Totals	251,289	$59,964

TUNGSTEN.

Bibliography: Reports XV, XVII. Bulletins 38, 67. U. S. G. S. Bull. 652. Proc. Colo. Sci. Soc., Vol. XI. South Dakota School of Mines, Bulletin No. 12. Eng. and Min. Jour.-Press, Vol. 113, pp. 666–669, Apr. 22, 1922.

Tungsten ore has been produced in California principally in the Atolia-Randsburg district in San Bernardino and Kern counties, followed by the Bishop district in Inyo County, with small amounts coming from Nevada County and from the district near Goffs, in eastern San Bernardino. Most of the California tungsten ore is scheelite (calcium tungstate), though wolframite (iron-manganese tungstate) and hübnerite (manganese tungstate) also occur. The deposits at Atolia are the largest and most productive scheelite deposits known,[1] and the output has in some years equaled or exceeded that of ferberite (iron tungstate) from Boulder County, Colorado. It is interesting in this connection to note that, in practically all other tungsten producing districts of the world, wolframite is the important constituent. Burma, the largest producer, reported[2] for 1917–1919, yields of 4,537, 4,443, and 3,577 tons of wolframite concentrates, respectively, most of which was obtained from placers, in part associated with cassiterite (tin oxide).

Imports of foreign tungsten ores into the United States during 1921 amounted to 1,441 long tons, valued at $276,757, compared with 1,740 long tons, at $779,593, in 1920, 8,400 long tons, at $6,261,190, in 1919, and 10,362 long tons valued at $11,409,237, in 1918, which ores are duty free. Owing to lack of protection against the cheap coolie labor of Asiatic tungsten mines, and the present low market prices, practically all of the tungsten mines in the United States have been closed down since the middle of 1919. The quotations during 1921 ranged around $2.50–$3.00 per unit. Present quotations are $2.25–$2.50 for Chinese ore, and $3.00 for Bolivian, with a minimum of 60%. The tariff act of 1922, now before the U. S. Senate, proposes a duty on tungsten ore or concentrates of 45¢ per pound on the metallic tungsten contained therein. Duties are also provided for imported tungsten-bearing alloys.

The value of the ore is based upon the content of tungstic trioxide (WO_3), and quotations are commonly made per unit (each 1%) of WO_3 present.

In California in 1920–1921, there was no production of tungsten, neither of ore nor concentrates, for the first time since the beginning of tungsten mining in this state. The tonnages here shown are recalculated to a basis of 60% WO_3. Concentrates usually carry 59% to 63%. Previous to 1915, a single company produced almost all of California's tungsten. During the latter part of 1915, and the early months of 1916, because of the high prices prevailing, prospecting was much stimulated, and the known tungsten-bearing areas were considerably extended both in San Bernardino and Kern counties. In the Clark Mountain and New York Mountains districts in eastern San Bernardino County, wolframite and hübnerite are the principal ores, with some scheelite, while at Atolia it is scheelite only. Scheelite is also the tungsten min-

[1] U. S. G. S. Bull. 652, p. 32.
[2] U. S. Commerce Reports, No. 78, April 5, 1921, p. 95.

eral in Inyo County near Bishop, and three concentrating mills have been in operation there. The Nevada County ore is scheelite.

The metal, tungsten, is used mainly in the steel industry and in the manufacture of electrical appliances, including the well-known tungsten filament lamps. Because of its resistance to corrosion by acids, it is valuable in making certain forms of chemical apparatus. Its employment in tool-steel alloys, permits the operation of cutting tools, such as in lathe work, at a speed and temperature at which carbon steel would lose its temper—hence the name 'high-speed' steels for these tungsten alloys. As made in the United States, tungsten forms 13% to 20% of such steels. Some chromium, nickel, cobalt, or vanadium, are sometimes also included. Tungsten compounds are used in the manufacture of colors.

Tungsten is introduced into the molten steel charge, either as the powdered metal or as ferro-tungsten (containing 50%-85% tungsten). The specific gravity of the pure metal, 19.3–21.4, is exceeded only by platinum, 21.5; iridium, 22.4; and osmium, 22.5. Its melting point is 3.267° C. (5,913° F.), being higher than any other known metal. Though millions of tungsten filament lamps are now made, the wires are so fine that the metal they contain represents but a few tons of tungsten concentrates annually.

The annual amount and value of tungsten produced in California since the inception of the industry is given herewith, with tonnages recalculated to 60% WO_3:

Year	Tons at 60% WOs	Value	Year	Tons at 60% WOs	Value
1905	57	$18,800	1914	420	$180,575
1906	485	189,100	1915	962	1,005,467
1907	287	120,587	1916	2,270	4,571,521
1908	105	37,750	1917	2,466	3,079,013
1909	577	190,500	1918	1,982	2,832,222
1910	457	208,245	1919	214	219,316
1911	387	127,706	1920		
1912	572	206,000			
1913	559	234,673	Totals	11,800	$13,221,475

VANADIUM.

Bibliography: Report XV. Bulletin 67. Proc. Colo. Sci. Soc., Vol. XI. U. S. Bur. of Mines, Bulletin 104.

No commercial production of vanadium has as yet been made in California. Occurrences of this metal have been found at Camp Signal, near Goffs, in San Bernarindo County, and two companies at one time did considerable development work in the endeavor to open up paying quantities. Each had a mill under construction in 1916, but apparently no commercial output was made. Ore carrying the mineral cuprodescloizite and reported as assaying 4% V_2O_5 was opened up. Late in 1917, some ore carrying lead vanadate was discovered in the 29 Palms, or Washington district, on the line between Riverside and San Bernardino counties.

The principal use of vanadium is as an alloy in steels, especially in tool steel and in those varieties where resistance to repeated strains is required. Present New York quotations for vanadium ore are @ $1 per pound of contained V_2O_5 (guaranteed minimum of 18% V_2O_5).

MUSEUM.

The Museum of the State Mining Bureau possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the first five of such collections located in North America; and contains not only one or more samples of most of the known minerals found in California, but many specimens from other states and foreign countries as well.

Aside from its purely educational features, the Museum daily attracts throngs of tourists and travelers, and furnishes visual evidence of the immense mineral resources of California. The State Mining Bureau supplies a collection of forty typical minerals and ores, approximately labeled, to any public school in the state upon request.

Mineral specimens suitable for exhibit purposes are solicited and their donation will be appreciated by the State Mining Bureau, as well as those who utilize the facilities of the collection.

Among the specimens received recently, and catalogued, for the Museum are the following:

19608. *Gold*-bearing sulphide ore (2 pieces). From Columbus Mine, West Point District, Calaveras County, Cal., by W. W. Gibson.

19608-b. *Gold*-bearing, sulphide ore. From Washington Mine, near Sheep Ranch, Calaveras County, Cal., by Fred Walker.

19609 to 19615, inclusive. *Talc* ($H_2Mg_3Si_4O_{12}$, hydrous magnesium silicate). 'Banco' (white), high-grade, massive foliated; 'Grigio' (gray), foliated; Powdered 'ventilato' (air-floated), high-grade. From Cavé Roussa, Comune di Roure; Cavé 'Sapatle,' Comune di Praly; Cavé Malzas, Comune di Faetto; Cavé Fontane, Comune di Salza; Pinerolo, Italy, by Societa Talco é Graphite Val Chisone, Pinerolo, Italy.

19616. Mainly *Pyrargyrite* (Ag_3SbS_3, silver sulph-antimonide, dark 'Ruby Silver Ore.' Assay value $6000 per ton). From 450-foot level, Rand mine, San Bernardino County, near Randsburg, by California Rand Silver, Inc., Randsburg, Cal.

19617. *Oil Shale*. Yields oil of 22° Baumé on destructive distillation. From Casmalia, Santa Barbara County, Cal., by F. D. Gore, Santa Maria, Cal.

19618. *Scheelite* ($CaWO_4$, calcium tungstate. Massive, high-grade, with Calcite). From Atolia Mine, San Bernardino County, Cal., by Atolia Mining Co., San Francisco.

19619 and 19620. *Molybdenite* (MoS_2, molybdenum sulphite). In granodiorite, with Pyrite associated. Crystals, high-grade. From head of Kaweah River, Tulare County, Cal., by Kent S. Castle, Oakland, Cal.

19621. *Petzite* ($Ag_3Au)_2Te$—silver-gold telluride with Ag:Au::3:1. Free Gold associated. From Porphyry Dike Mine, near Callahan, Siskiyou County, Cal., by Fippen & Hayden, Callahan, Cal.

19622 and 19623. *Gold Ore*. (Gold-bearing Pyrite and Quartz, from 1700 and 5400-foot levels.) From Empire Mines, Grass Valley, Nevada County, Cal., by Empire Mines and Investment Company, Grass Valley, Cal.

19624. *Gold Ore*. Gold-bearing Pyrite (FeS_2) and Galena (PbS), with Quartz. From Uncle Sam Mine, Shasta County, Cal.

19626. *Crocidolite* (complex sodium-iron silicate, of amphibole group). From Pine Flat, Sonoma County, Cal., by W. P. Moore, Pine Flat, Cal.

19628 and 19629. Chrysotile *Asbestos* ($H_4Mg_3Si_2O_9$, hydrous magnesium silicate, fibrous serpentine). Veins of short fibre attached to country rock; 'Crude' asbestos, clean fibres hand-cobbed from rock. From south of Copperopolis, Calaveras County, Cal., by Pacific Asbestos Corporation, via Copperopolis, Cal.

19630 and 19631. *Bornite* (Cu_5FeS_3, copper-iron sulphide, 'Peacock Copper,' high-grade). From Engels and Superior mines, of Engels Group, Plumas County, Cal., by Engels Copper Mining Company, San Francisco.

19632. *Chalcopyrite* ($CuFeS_2$, copper-iron sulphide. High-grade). From Engels Group, Plumas County, Cal., by Engels Copper Mining Company, San Francisco.

19633 and 19634. *Diatomaceous Earth.* Sawed block of 'Celite'; burned brick of 'Celite.' For insulation purposes. From Lompoc, Santa Barbara County, Cal., by Celite Products Company, Los Angeles, Cal.

19637. *Quicksilver* (Hg, or Mercury. Retorted, pure metal. The only metal which is liquid at ordinary atmospheric temperatures). From New Idria Quicksilver Mining Company, Idria, Cal.

19640 and 19641. *Gold ore* (high-grade, carrying very fine free gold. Assay value stated to be $5,000 per ton). Free *Gold* (panned from an equal amount of rock, 5 lb.). From Juniper Mine, Lassen County, Cal., by Juniper Mining Company, Hayden Hill, Cal.

19642. *Orbicular Gabbro.* (Structure revealed by weathering.) From Stokes Mountain, near Cutler, Tulare County, Cal., by Gordon Surr, Porterville, Cal.

19643. *Asbolite* ('earthy cobalt,' a varety of wad, impure manganese oxide, carrying Cobalt Oxide). Coating on Serpentine. From old Chrysoprase workings, near Deer Creek, southeast from Porterville, by Gordon Surr, Porterville, Cal.

19644. Native *Silver* in Calcite. From El Dorado County, Cal., by C. H. Trester, Oroville, Cal.

19645. *Dumortierite* (a basic aluminum silicate, perhaps $Al_8Si_3O_{15}$, with part of Al replaced by Boron). From near Brawley, Imperial County, Cal., by Chas. E. Nice, Brawley, Cal.

19646. Amphibole *Asbestos* (calcium-magnesium metasilicate. Fibrous Tremolite). From Placer County, Cal., by Ben Rossi, Sacramento, Cal.

19647. Amphibole *Asbestos* (calcium-magnesium metasilicate. Fibrous Tremolite). From near Acme Station, Inyo County, Cal., by Henry Lang, Tecopa, Cal.

19648. *Coal.* From near Baker's Beach, San Francisco, Cal., by H. L. Benedict.

19649. *Pyrolusite* (MnO_2, manganese dioxide. Pseudomorph after manganite $Mn_2O_3H_2O$, by loss of water). From Lake Valley Mining District, New Mexico, by Clement C. Edwards, San Rafael, Cal.

19650. *Pyrite* (FeS_2, iron sulphide, crystals forming a druse on Quartz, SiO_2, crystals). From Mocking Bird Mine, near Mariposa, Mariposa County, Cal., by J. A. Schroeder, Mariposa.

19651. Red *Shale.* From Camp 9 on Arroyo Mocho, near Livermore, Alameda County, Cal., by W. S. McLean, San Francisco.

19652. 'California' *Travertine,* crushed and sized, for use in terrazzo. From near Tolenas, Solano County, Cal., by W. S. McLean, San Francisco.

During the month a total of 312 visitors signed their names on the Museum register and in addition there are many others daily who fail to take note of our request for their signatures.

LABORATORY.

FRANK SANBORN, Petrologist.

A radioactive kaolinized rock from Imperial County was among the interesting samples recently received at the laboratory. The general appearance of the rock is unattractive, resembling an ordinary altered igneous material with a faint incrustation of a yellow mineral which occurs in spots and also somewhat disseminated through the mass. This yellow mineral resembles carnotite (hydrous oxide of vanadium, uranium, and potassium); but chemical tests made on the extremely small amount available in the sample gave reactions for uranium phosphate—no vanadium being detected. A request has been made for a larger sample, and details as to locality, etc., so that further tests can be made.

A total of 320 samples were received and determined during the thirty-day period covered by this report. A list of those of possible value, judged from the sample submitted only, is appended.

05–141 Gold quartz, with some pyrite and arsenopyrite.
05–142 Coquimbite, and fibreferrite.
05–143 Copper-nickel ore.
05–144 Schist; contains gold.
05–145 Arsenopyrite; contains some gold.
05–146 Copper-silver ore.
05–147 Fluorite.
05–148 Lead-silver ore; contains a little gold.
05–149 Clay (Kaolinized material); also limestone.
05–150 Gold quartz.
05–151 Chrysotile asbestos.
05–152 Galena (lead ore).
05–153 Talc.
05–154 Bauxite.
05–155 Barite, good grade.
05–156 Gold quartz.
05–157 Alunogen; impure.
05–158 Copper-gold ore.
05–159 Scorodite (hydrous ferric arsenate); impure.
05–160 Gold quartz; also limestone.
05–161 Gold quartz; contains some silver.
05–162 Barite; grinds white.
05–163 Gold quartz.
05–164 Barite
05–165 Chrysotile asbestos; short fibre.
05–166 Diatomaceous earth.
05–167 Crystallized quartz, penetrated with crystals of black tourmaline.
05–168 Kaolinized material (fire clay); also lime carbonate.
05–169 Quartz; contains gold, silver and lead.
05–170 Arsenopyrite; also scorodite and galena.
05–171 Gypsum; fair grade.
05–172 Manganese oxide.

LIBRARY.

E. Cooney, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received during the month, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the state are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geol. Survey Bulletins:

No. 722-F—Metalliferous Lodes in Southern Seward Peninsula, Alaska. By S. H. Cathcart.

No. 725-J—Ore Deposits of the Sierrita Mountains, Pima County, Arizona. By F. L. Ransome.

No. 726-E—Geologic Structure of Parts of New Mexico. By N. H. Darton.

No. 730-A—Peneplains of the Front Range and Rocky Mountain National Park, Colorado. By Willis T. Lee.

No. 735-C—Bonanza Ores of the Comstock Lode, Virginia City, Nevada. By Edson S. Bastin.

U. S. Geol. Survey Mineral Resources:

Quicksilver in 1920. By F. L. Ransome with a Supplementary Bibliography by Isabel P. Evans.

Sulphur and Pyrites in 1919. By Philip S. Smith.

Mica in 1920. By B. H. Stoddard.

Tin in 1920. By Bertrand L. Johnson.

Gold, Silver, Copper and Lead in Alaska in 1920. By Alfred H. Brooks.

U. S. Geol. Survey Professional Papers:

No. 129-D—Stratigraphic Sections in Southwestern Utah and Northwestern Arizona. By John B. Reeside, Jr., and Harvey Bassler.

No. 129-F—The Foraminifera of the Mint Spring Calcareous Marl Member of the Marianna Limestone. By Joseph A. Cushman.

No. 129-G—The Flora of the Woodbine Sand at Arthur Bluff, Texas. By Edward Wilber Berry.

No. 129-H—Geology of the Lower Gila Region, Arizona. By Clyde P. Ross.

No. 129-I—The Flora of the Cheyenne Sandstone of Kansas. By Edward Wilber Berry.

U. S. Bureau of Mines Reports of Investigations:
Serial No. 2331—Water Gas Tar Emulsions. By Wm. W. Odell (Gas Engineer, Bureau of Mines).
Serial No. 2332—Analytical Distillations of Typical Shale Oils. By Martin J. Gavin (Oil-Shale Technologist, Bureau of Mines).
Serial No. 2333—Epsomite. By Raymond B. Ladoo (Mineral Technologist, Bureau of Mines).
Serial No. 2334—Fatalities at Coal Mines in February, 1922. By W. W. Adams (Statistician, Bureau of Mines).
Serial No. 2335—Tests of Hand Extinguishers of Zinc-Dust Fires. By S. H. Katz (Assistant Physical Chemist, Bureau of Mines) and J. J. Bloomfield (Junior Chemist, Bureau of Mines).
Serial No. 2336—Bibliography of Literature on Sampling. By W. J. Sharwood, and W. W. vonBernwitz.
Serial No. 2337—The Northwest Experiment Station of the Federal Bureau of Mines. By Clyde E. Williams (Superintendent, Northwest Experiment Station, Bureau of Mines).
Serial No. 2338—Physiological Effects of Exposure to Low Concentrations of Carbon Monoxide. By R. R. Sayers (Chief Surgeon, U. S. Bureau of Mines, P. A. Surgeon, U. S. Public Health Service); F. V. Meriwether (Car Surgeon, U. S. Bureau of Mines, A. A. Surgeon, U. S. Public Health Service); and W. P. Yant (Assistant Chemist, U. S. Bureau of Mines).
Serial No. 2339—Drilling and Dustiness of Metal-Mine Air. By D. Harrington (Supervising Mining Engineer, Bureau of Mines).
Serial No. 2340—Recent Articles on Petroleum and Allied Subjects. Compiled by E. H. Burroughs (Bibliographer, Bureau of Mines).

U. S. Bureau of Mines Technical Papers:
No. 258—Production of Gasoline by Cracking Heavier Oils. By E. W. Dean and W. A. Jacobs.
No. 282—Analysis of Detonating and Priming Mixtures. By C. A. Taylor and W. H. Rinkenbach.
No. 295—Quarry Accidents in the United States During the Calendar Year 1920. By William W. Adams.
No. 299—Metal Mine Accidents in the United States During the Calendar Year 1920. By William W. Adams.
No. 305—Specifications for Petroleum Products Adopted by the Interdepartmental Petroleum Specifications Committee.

U. S. Department of Commerce; Bureau of Standards, Technologic Papers:
No. 200—An Investigation of Oxyacetylene Welding and Cutting Blow-Pipes, with Especial Reference to Their Design, Safety, and Economy in Operation. By Robert S. Johnston (Engineer Physicist, Bureau of Standards).
No. 203—Influence of Phosphorous upon the Microstructure and Hardness of Low-Carbon, Open-Hearth Steels. By Edward C. Groesbeck (Associate Chemist, Bureau of Standards).
No. 205—Tensile Properties of Some Structural Alloy Steels at High Temperatures. By H. J. French (Physicist, Bureau of Standards).
No. 206—Effect of Heat Treatment on the Mechanical Properties of 1 Per Cent Carbon Steel. By H. J. French (Physicist, W. George Johnsen, Assistant Physicist, Bureau of Mines).

U. S. National Museum. Smithsonian Institution Bull. No. 118—Handbook and Descriptive Catalogue of the Collections of Gems and Precious Stones in the United States National Museum. By George P. Merrill.

Idaho Bureau of Mines and Geology Bull. No. 1—The Copper Deposits of the Seven Devils and Adjacent Districts. By D. C. Livingston and F. B. Laney.
Preliminary Report No. 2—Clays of Idaho. By Frank H. S. Keels.
Bull. No. 3—A Reconnaissance in South Central Idaho, Embracing the Thunder Mountain, Big Creek, Stanley Basin, Sheep Mountain, and Seafoam Districts. By J. B. Umpleby and D. C. Livingston.

Illinois Geological Survey Bull. No. 42—Engineering and Legal Aspects of Land Drainage in Illinois. By G. W. Pickels and F. B. Leonard, Jr.

Department of Conservation of Louisiana, Technical Paper No. 1—Mud Laden Tables on Specific Gravities and Collapsing Pressures. By Ben K. Stroud.

Virginia Geological Survey Bull. XXII—The Geology and Coal Resources of Russell County, Virginia. By Chester K. Wentworth.

Minister of Mines Province of British Columbia Annual Report for the Year Ending 31st of December, 1921, being An Account of Mining Operations for Gold, Coal, etc.

The Ontario Department of Mines Thirteenth Annual Report—1921.

Ontario Department of Mines, Vol. XXX, Pt. III—Gowganda and Other Silver Areas. By A. G. Burrows.

Western Australia Geological Survey Bull. No. 83—The Geology and Mineral Resources of the Northwest, Central and Eastern Divisions.

Secretaria De Industria, Comercio Y Trabajo, Boletin Del Petroleo, Vol. XIII, Num. 5, Mexico.

Imperial Geological Survey—Japan, Reports 7, 8, 84.

Societies and Educational Institutions.

The American Mineralogist, March, 1922.

Geographical Review, April, 1922.

University of California, Bulletin of the Department of Geology, Vol. 13, No. 4—Pinnipeds from Miocene and Pleistocene Deposits of California. By Remington Kellogg.

University of Kansas, Science Bulletin, Vol. XIII, No. 1.

University of Washington Engineering Experiment Station, Bull. No. 13—Tension in Track Cables and Logging Skylines. The Catenary Loaded at One Point. By Samuel Herbert Anderson.

Bulletin No. 14—Current Suppression by Means of Parallel Resonance. By Henry Godfrey Cordes.

Bulletin No. 15—Electric Heating of Residences. By Edgar Allen Loew.

Bulletin of the Institution of Mining and Metallurgy, April, 1922.

Boletin Del Cuerpo De Ingenieros De Minas Del Peru No. 102—Observaciones Hidrologicas, 1911–1920, Lima, Peru.

Boletin Del Cuerpo De Ingenieros De Minas Del Peru No. 103—Estadistica Minera En 1920, Lima, Peru.

Books.

Petroleum Register, 1922.

Maps.

U. S. Geol. Survey Topographic Maps:
- Bellaire, Texas.
- Big Stone Gap, Va.
- Bonita Ranch, Cal.
- Booneville, Miss.
- Brownsville, Ky.
- Cape San Martin, Cal.
- Forest, Miss.
- Hephzibah, Ga.
- Houston Heights, Texas.
- Howard Ranch, Cal.
- Keyser, W. Va.-Md.
- Madera, Cal.
- Natchez, Miss.-La.
- Nipomo, Cal.
- Onego, W. Va.
- Park Place, Texas.
- San Luis Creek, Cal.
- Santa Rita Bridge, Cal.
- Settegast, Texas.

Province of Ontario, Department of Mines:
- Map No. 30d—Boston-Skead Gold Area, District of Timiskaming, Ontario.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

Architect and Engineer, San Francisco.
Arizona Mining Journal, Phoenix, Arizona.
Asbestos, Philadelphia, Pennsylvania.
American Petroleum Institute, New York.
Chemical Engineering and Mining Review, London, England.
Cement, Mill and Quarry, Chicago, Illinois.
Engineering and Mining Journal-Press, New York.
Financial Insurance News, Los Angeles, California.
Journal of Electricity and Western Industry, San Francisco.
Metallurgical and Chemical Engineering, New York.
Mining and Oil Bulletin, Los Angeles.
Mining and Engineering Record, Vancouver, B. C.
Oil Weekly, Houston, Texas.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil Paint and Drug Reporter, New York.
Oil Trade Journal, New York.
Oil Age, Los Angeles.
Oil News, Galesburg, Illinois.
Petroleum Record, Los Angeles.
Petroleum Refiner, Kansas City, Missouri.
Petroleum Age, New York.
Petroleum World, Los Angeles.
Queensland Government Mining Journal, Brisbane, Australia.
Rock Products, Chicago, Illinois.
Southwest Builder and Contractor, Los Angeles.
Stone, New York.
Salt Lake Mining Review, Salt Lake City, Utah.
Standard Oil Bulletin, San Francisco.
Safety News, Industrial Accident Commission, San Francisco.
The Record, Associated Oil Company, San Francisco.

PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of consumers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

Sufficient publicity has not heretofore been given to this feature of the Bureau's work, but in 'Mining in California' a suitable medium is provided for current inquiries of this nature, and, therefore, written or verbal inquiries that come to the attention of the Bureau are summarized in each issue.

The name of the product wanted or offered, only, is published; the name of the owner of the deposit, or buyer, and other details being supplied upon request.

In writing, the reference number of the item should be given.

Mineral Products or Deposits for Which a Market Is Sought.

02–76 Collection of mineral specimens.
02–77 Quartz prospect; four-foot vein, assay $14.00, some copper and silver.
02–78 Quartz prospect; three-foot vein, assay $35.00, free gold.
02–79 Quicksilver property; 200,000 tons blocked out, in Lake County.
02–80 Gold quartz property; patented, small, low price, easy terms.
02–81 Zirconium deposit; 300,000 tons, San Diego County.

Mineral Products or Deposits Wanted.

03–63 White potters clay, and calcined gypsum; carload lots.
03–64 White-burning clays, within radius of 100 miles of Los Angeles and near railroad; deposits.
03–65 Chalcedony, onyx or travertine, preferably pink or red, that will cut to one-inch cubes.
03–66 Quartz crystals; clear; for export.
03–67 Plastic, white-burning clay; deposit or car-lots.
03–68 Asphalt and bituminous sand deposits.
03–69 Granite.
03–70 Abalone shell, sea pearls, gems, emeralds, sapphires; for export.
03–71 Silica sand, within radius of fifty miles of Los Angeles.

EMPLOYMENT SERVICE.

Following close upon the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

The Bureau contemplates registering technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

A list of applicants for positions and 'positions open,' received by the Bureau during each 30-day period preceding the date of publication of the Monthly Chapter is carried in each issue.

Each notice is designated by a key number, and communications sent to the Bureau in reply to any notice will be forwarded to the proper party without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau, to avoid possible loss.

Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

01–14 Mining Engineer-Draftsman. Experienced; especially in coal-mining. Single. Age 31. References.

During the month notices of two 'positions open' were received by phone from employers wanting technical help, and registered applicants were at once placed in touch with the opportunities offered.

JUNE, 1922

REPORT XVIII OF THE STATE MINERALOGIST

DISTRICT REPORTS OF MINING ENGINEERS.

In 1919–1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each division working out from a local branch office.

This move brought the Bureau into close personal contact with operators, but did not materially shorten the time between the gathering of data in the field and their publication in the Report of the State Mineralogist at the end of an annual or biennial period.

Mining activities and development noted by district engineers in their respective fields are now embodied in monthly reports published in each issue of 'Mining in California,' thus making these data available within a maximum period of thirty days, and the Monthly Chapter as far as possible a compendium of current mining progress throughout the State.

The counties included in each field division and the location of the local offices are shown on the accompanying outline map of the State. (Frontispiece.)

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the State's oil fields is included under this heading.

REDDING FIELD DIVISION.

W. B. TUCKER, Mining Engineer.

Shasta County.

The *Gold Dollar Mining Company* has been incorporated to operate the Gold Dollar Mine, near Shasta. The incorporators are F. A. Zimmerman, J. W. Carter and J. D. Anderson. Considerable development has been done on the property by Zimmerman and Anderson.

The *South Star Mine* has been located in the French Gulch Mining District, in section 32, township 33 north, range 7 west, by Charles Garrett, J. G. Pepper, W. P. Donnelly and W. W. Treat of Anderson.

The *Gladstone Mine*, located at French Gulch, which was being operated by the French Gulch Mining Company of San Francisco, suspended operations the first part of this month.

The Brunswick mill was operated the early part of this month on ore from the *Summit and Brown Bear* mines of the French Gulch District.

The properties are under lease to Borges Bros. of French Gulch.

A pump has been installed at the *West End Mine*, near Whiskeytown in the Shasta Mining District, and the underground workings are being unwatered through a shaft 100 feet deep. There are about 2000 feet of crosscuts and drifts on the property. The shaft and these workings are to be retimbered. Five men are employed.

The property is under bond to the C. D. Jones & Company, of Los Angeles. W. N. Parsons is directing the work.

The construction work on the *Shasta Zinc and Copper Company's* new refining plant at Bully Hill was completed early this month and

production of copper matte and zinc oxide commenced on the 12th of June. The plant consists of roasters, storage bins, cooling system, reverberatory furnaces and bag house. The smelter has a capacity of 150 tons of ore per day, producing about 30 tons of zinc oxide per day, with copper matte, containing some gold and silver values, as a by-product.

The zinc-copper-silver-gold ore comes from their Rising Star Mine.

G. T. Jackson is general manager.

Siskiyou County.

R. N. Diggles of Oakland has purchased the lease of the *Gilta Mine* on No-nothing Creek, a tributary of the Salmon River, from H. L. Johnson. The Gilta has a record of having produced over $1,000,000 in gold. There are five claims included in the lease with a water right that furnishes sufficient power for the operation of a sawmill, concentrator and ten-stamp mill.

It is reported that *E. T. Hayes* has discovered a rich lead at Packer's Gulch in the bend of Coffee Creek.

Harvey Bowerman is working on a seam of high grade ore in the *Wild Irishman Mine* on Canyon Mountain.

Trinity County.

The *Strode Mines Company* of Milwaukee, Wisconsin, made the final payment on the Strode Mine situated north of Carrville.

There are eleven mining claims in the group transferred, and a ten-stamp mill. The present company is working two shifts.

James F. Meikel is superintendent.

The *Trinity Bonanza King Mine*, situated nine miles north of Trinity Center, is being operated by the Foster Gold Mining Company of San Francisco. Ten men employed on development.

B. B. Brown of Weaverville has a lease on the *La Grange Hydraulic Mine*. The mine is being operated in a small way. Five men are employed.

The *American-Italian Hydraulic Gold Mining Company* of San Francisco, who have been operating the Paulsen Hydraulic Mine, on the Paulsen ranch, near Lewiston, are suspending operations for the season on account of the shortage of water. Three giants have been operating since the first of March. The water supply is secured from Rush Creek through two ditches, one seven miles in length, and a lower one three miles long.

The bank shows 25 feet of partly cemented gravel overlain by 20 feet of soil overburden. The gravel is drifted and blasted before being piped. When operating, eight men are employed. H. S. Whittard, superintendent.

The Lorenz Bros. of Weaverville, are operating four giants on the *Lorenz Hydraulic Mine* below Weaverville. Two shifts are employed. Owing to shortage of water, operations will be suspended about July first.

The *Jacobs Hydraulic Mine* near Junction City is being operated by J. O'Shay.

Piping is done with one giant. This property will also have to close this month on account of shortage of water.

The *Pacific Gold Dredging Company*, who have been operating a steel dredge all winter near Carrville, have suspended operations.

It is reported that the large dredge of the *Estabrook Gold Dredging Company* at Trinity Center, which was shut down in 1920, and was not operated in 1921, is to be started in the near future.

AUBURN FIELD DIVISION.

C. A. Logan, Mining Engineer.

Butte County.

Bader Brothers (Mat Bader) Mine. This old drift mine is in Sec. 36, T. 23 N., R. 3 E., less than a mile west of Magalia on the east side of Little Butte Creek Canyon. E. F. Woodworth of Paradise, began work November 15, 1921, on the property. There are a number of old tunnels, the principal one being reported 800 feet long. It is said to have crossed the channel and to be too high for proper working, although there was some production from it. Woodworth is driving a new tunnel nearby and a few feet lower than the old one. This new work is at an elevation of 1975 feet and to date of visit, June 9th, had reached a length of 150 feet in a direction a little south of east. A flow of about 12 miner's inches of water had just been encountered at the face and the adit was being advanced in soft schistose bedrock. About 10 inches of water was also flowing from the old tunnel. It was estimated that 250 to 300 feet more work will be required to reach the channel. Three men were employed.

Blue Hog Mine. Feather River Land and Mining Company, owner. Paragalia Mining Company, lessee. E. F. Woodworth, manager. Since the 1920 report, not much mining has been done, and the property is idle now. A lawsuit came up between the owner and lessee regarding water. The lessee claimed damages on the ground that lack of water had prevented washing proven gravel after $39,000 had been spent on the mine, and that the right to this water had been held forth as belonging to the mine, but the owners denied this and the lessee lost the decision in the Superior Court.

Butterfly (Morris Ravine, Goodall & Perkins) Drift Mine, three miles northeast of Oroville, has been idle since June, 1920, but some efforts are now being made toward resuming work. The last work was by the Table Mountain Mining Company. Besides extending an old tunnel 400 feet, they sank a double compartment incline 392 feet and drifted 110 feet in all from it, producing $4,000.

Cherokee Mine, near Cherokee and 13 miles from Oroville, has been worked in a small way during the rainy season in late years as a drift mine. An adit has been run 500 feet in the bedrock of the old hydraulic pit, and raises have been put up on both sides. The face of this adit is about under the face of the old hydraulic bank. The raise on the east side is near the face of the adit and is up about 30 feet entering fine free wash quartz gravel with a white sand roof. This gravel has been drifted on east and west 50 feet and is said by David Vinton to yield $2.50 a cubic yard. On the west side of the

adit, 250 feet in, a crosscut was run 50 feet and a raise put up a few feet into coarse blue gravel. This layer of gravel carried coarse gold and was the principal producing stratum in the old hydraulic mine. It is partly cemented and lies on a false bedrock of barren wash 10 to 20 feet thick, which in turn rests on the true bedrock.

Vinton estimates that 200 inches of water from a watershed of 16 square miles is available for washing gravel on an average of six months annually. The channel has a total width of 700 to 1000 feet, runs southwest, and if it maintains its grade the present tunnel ought to allow working about 600 feet downstream. Based on results had from his prospecting operations, Vinton states his belief that the property could be drifted profitably for a mile and a half in length and several hundred feet wide, if mined on a large scale through a lower water-grade tunnel.

Highland Chief Mine. Carl A. Phelps of Magalia and M. H. Ballou of Fairfax are just completing construction of a clam-shell dredger on this river claim on the West Branch of North Fork of Feather River in Sec. 30, T. 23 N., R. 4 E., about two miles northeast of Magalia by road and trail. There are 30 acres patented in the mine which is said to cover 1500 feet along the river and Phelps reports that tests made show the gravel to range from a thin layer to 24 feet deep.

It is proposed to first dredge the river bottom, and later some high bench gravel on the west bank, which has been drifted, may also be worked. The bedrock is schist and serpentine and some large boulders occur, but Phelps thinks he can handle these. The barge is of wood, 20 by 30 feet in dimensions and is anchored on two spuds 12 by 12 inches by 24 feet. Power is to be furnished by a 15-horsepower gas engine, geared to lift 8000 pounds on the boom. The clam-shell bucket holds $\frac{3}{4}$ cubic yard, weighs 2500 pounds empty and will weigh about 5000 pounds loaded. The outfit has an estimated capacity of 200 cubic yards for an 8-hour shift, but this does not make allowance for breaking and handling boulders.

Gravel will be screened and washed in a line of 12-inch sluices 500 feet long, with Hungarian riffles. A 3-inch centrifugal pump driven by a 3-horsepower gas engine is to be used to pump water from the river to the sluices.

This section of the stream is said to have never been flumed, and should carry good pay. The use of a clam-shell bucket in such ground is of course experimental, and results will be watched with interest.

Lucky John Mine. John D. Hubbard, Chico, trustee for owners; Enterprise Gold Mining Company, lessee; A. J. Martens, president; G. A. Phillips, superintendent. The mine is in Sec. 11, T. 22 N., R. 3 E., on the east side of Little Butte Creek, about two miles by road and trail from Paradise and contains 320 acres, patented. It adjoins the Mineral Slide Mine on the east.

There is an old tunnel near the west property line which was driven southwest some distance across the line, and it is locally reported that considerable ground was breasted upstream through it. Gravel in this old tunnel was first found in a raise 96 feet high, but as the tunnel went forward, it finally entered gravel.

A new tunnel is being driven southeast, 150 feet vertically above the old one and 350 feet from it on the slope. When visited (June 8) it

had reached a length of 566 feet; at 257 feet in, a raise put up by former operators had struck gravel 45 feet vertically above the tunnel and an area about 20 feet square had been mined. Near the face of this tunnel the present company has lately opened gravel for a total length of 100 feet, measured at right angles to the course of tunnel. Work so far shows the rim rising to the northeast and pitching away to the south and west, and it is evident that the gravel body has not yet been bottomed, nor can the exact direction of the flow of the ancient channel (if it be such) yet be stated from the amount of work done. Due to the proximity of this property to the old Neocene shore-line it is perhaps hazardous to theorize much regarding the character of gravel deposits in the immediate vicinity, whether they be channel gravels, delta or bay deposits. This gravel, however, appears to be stream gravel. It is slightly cemented and at the face is distinctly blue in color, being composed of schist and serpentine with little quartz. The bedrock of the district consists of black slate, serpentine and schist. So far the gravel is dry. It is yielding coarse gold in profitable quantity and the small amount of work done indicates the presence of a large body of it. Elevation at the upper tunnel is 1550 feet.

Work is now in progress to bring electric power to the property from the top of the ridge, 2700 feet distant. Water from the tunnels will be conserved in tanks for washing gravel, but this supply will have to be augumented if much work is done. As planned at present, gravel will be dropped down a chute to the lower tunnel level and will be run through a trommel before washing.

Pitts Mine. (*Old Bader, Mowry & Newman*). In sections 1 and 2, T. 22 N., R. 3 E., a mile and a half from Magalia by road and trail. J. M. Pitts et al. of Magalia have a lease and option.

Pitts started work here in December, 1920. He has driven a new adit 600 feet southeast in black slate bedrock to bottom the channel which traverses the property. To date of visit (June 9) the gravel had not been entered, and from surface indications it appears likely that it may lie as much as 100 to 200 feet ahead of the present face and to the eastward. One raise was put up 400 feet in, and another was being put up at the face, but both were in slate all the way, although they have probably been sent up high enough to catch the channel, if it lies above them, unless there has been considerable faulting. The elevation of the new tunnel is 1780 feet and it is 215 feet below the surface at the 600-foot point.

The channel has been mined profitably a short distance northeast of the present work. A good-sized hydraulic pit was opened on the west rim, and the portals of several old tunnels, now caved, are seen in the face of this pit. No. 1 tunnel was driven 2200 feet and is said to have been six feet too high to bottom the channel. The Newman tunnel was run to bottom it, and is said to have produced $200,000 in a few hundred feet; its exact length is unknown. The channel was 60 to 85 feet wide. Three other tunnels were also run nearby. About 1000 feet south of the new tunnel and 115 feet above it an incline was put down 45 feet on the west rim, and showed wash gravel, but was abandoned, presumably on account of water, before reaching the channel trough.

The property is equipped with a 25-horsepower gas engine, 8 x 6 air compressor, blower, air drills and several small buildings.

Besides the placer workings, there is a quartz vein 2 to 5 feet wide crossing the north end of the property and striking southeast. A drift has been run for 300 feet on this vein, and at the face is 100 feet below the surface. Some of the rock from surface pits was crushed years ago in an arrastra.

Steifer Mine. Contains 80 acres patented, in Sec. 12, T. 23 N., R. 3 E., three miles by road from Magalia. P. B. Steifer Mining Company, owner. The Evening Star Mining Company did the last work on the property in 1921 but quit on account of financial troubles, and the mine is now idle (June 10).

The Steifer shaft is about 200 feet from the old Magalia workings and the present face is said to be about 900 feet upstream from the face of the old Magalia drift. The channel is reached by a shaft and incline 508 feet deep. According to a former employee of the last operators, they ran ahead about 400 feet and the drift is said to be three feet above bedrock at the face. When the last company quit, they allowed the men to work the property a short time in an attempt to take out what was due them for wages. One of these men states that they had a breast of gravel at the face 20 feet wide and seven feet high worth $13 a yard in place, but it appears they were unable to make this pay because 20 men were required for surface work, hoists, etc., with only four or five at the working face. The owners and the last operators were not at hand and these figures could not be verified. The bedrock is slate and the gravel is free wash, averaging 2 to 6 feet deep and carrying some platinum. Two hoists have to be operated, one at the incline and one on top. The mine makes about 580 gallons of water a minute, and this is used for washing gravel. The property has its own hydro-electric power plant on the west branch of North Fork of Feather River, and also steam power equipment.

Surcease Mine. The Gruss Mining Company, formerly operators of the Gruss Mine near Genesee in Plumas County, have recently taken machinery to the Surcease Mine on Feather River near Las Plumas, and have begun preliminary work.

Nevada County.

South Star Gold Mines Company. A. W. Johnson, president, 57 Post Street, San Francisco. This property was locally reported to be idle at the time of the last trip to the district, and was not visited. It is located in Rough and Ready District, three miles from Grass Valley.

The president of the company states that since our 1920 report they have continued one shaft to a depth of about 300 feet and have connected it at the 100 level with another old shaft by a drift 240 feet long and 26 feet of crosscuts. Johnson claims they have good milling rock all along the 240 feet of formation, which is the usual white quartz of the district, with occasional specimens. Three or four men are employed.

Placer County.

American Bar Quartz Mine comprises several unpatented claims traversing the center of section 33, T. 14 N., R. 11 E., on the steep north side of the canyon of Middle Fork of American River, three and

one-half miles by road and trail from Michigan Bluff and 33 miles from Auburn. The river here flows at an elevation of about 1300 feet. The American Bar Gold Mining Company has done work recently on the claims.

The country rock is Carboniferous slate. Dikes probably of diorite have been intruded into the slate and their strike is about the same as the slate's schistosity but they dip at a small angle to it. The dikes contain much pyrite and weather a rusty red. In the underground workings they are hard and tough.

Numerous adits have been opened at intervals along the slope. The old workings were run 25 to 30 years ago and included an adit about 2000 feet long. A small mill was operated then. At present there is a ten-stamp mill which is designed to run by water power and is located near the river, but it is idle. The later accessible workings visited are as follows:

Adit No. 1, aneroid 1330 feet elevation, is near and just north of the mill. It was run 40 feet north, 20 degrees west. At the portal there is a bunch of quartz giving way to a ribbon formation of quartz and slate, and showing in the face only two or three seams of quartz one-half inch wide, with a gouge an inch wide on the hanging wall. The formation carrying the quartz seems to be bearing off to the northwest to the left of the line of the tunnel.

Northwest of the mill a few hundred feet the rock series is well exposed on the steep hillside. It shows a system of alternating layers of slate, quartz veins and rusty dikes striking north 20 degrees west and dipping northeast. This series has been followed 500 feet or more on the strike by surface prospecting and shows possibilities, with quartz veins from a foot to three feet or more thick.

Adit No. 2 runs north 30 degrees west at 1500 feet elevation and shows at the face two feet of quartz with a dike on the footwall, dipping northeast.

The third adit, elevation 1575 feet, is caved at the portal. The dump is slate and quartz. There are indications that a slide from the hillside occurred here.

The fourth adit is at 1725 feet elevation. It runs 200 feet about north 20 degrees west, showing near the portal a vein of solid quartz two and one-half to three feet wide, which soon gives way to ribbon rock, but there is a fair showing of bunchy quartz at the face. There is a raise up 15 feet on the vein 75 feet back from the face. The ground opened in this adit is rather heavy, black slate.

Adit No. 5, elevation 1780 feet, is the site of present work. This is a crosscut in a wide formation of ribbon rock (quartz and slate) for a short distance and there are drifts both ways on the vein from the crosscut for a total distance of about 100 feet. On the south the drift portal has been walled up and work was progressing north 20 degrees west at time of visit (May 29). This north drift is in good looking ribbon rock, carrying considerable pyrite and traces of galena; 27 feet back from the face the vein is six feet wide and at the north face was two feet wide, with a dike three feet wide on one wall; the vein here stands nearly vertical. There has been old work, including stoping, on and above this level, and a winze, now full of water, below the level,

On the surface above the vein is 12 feet wide, and several hundred feet north it shows 12 to 20 feet wide, accompanied by a wide dike. There is ample room for developing the property at depth through adits.

Centennial Mine on Duncan Hill, three miles west of Auburn, is being reopened by W. D. Chambers, who plans to prospect below the old workings by continuing one of the numerous shafts below the level of former operations. The greatest depth heretofore worked was about 250 feet, but most of the claim has been unexplored below 200 feet in depth.

Among operations recently started may be mentioned the work of the *Independence Mining Company* which has just taken in gas engines and other machinery to reopen some old drift mines near Forest Hill. The *Sacramento* and *Texas* drift claims near Forest Hill are also being rehabilitated by R. A. Nicol and others.

The recent death of *George Carmack*, discoverer of the rich diggings on Bonanza Creek, the finding of which started the Klondike rush, is noted with regret. Some years ago Carmack bought some drift mining prospects in the eastern part of Placer County, and since then has been spending his summers in exploring his property. Carmack endured thirteen years of hardships in the north before making his famous discovery, but when wealth came to him it did not spoil him, and he remained to the end the temperate and unassuming prospector, content to live in a rough log cabin and to do a hard day's work in spite of his wealth. His passing is a loss to the state and to all who knew him.

SAN FRANCISCO FIELD DIVISION.

C. McK. Laizure, Mining Engineer.

Opportunities for making field investigations of new development in this district were limited during the month and no important districts were visited. A few days were spent in Glenn County in collecting a number of missing mineral production figures and in visiting a reported strike of rich silver ore near Willows. The balance of the month was taken up with office duties.

Contra Costa County.

The *Pacific Sanitary Manufacturing Company*, recently organized with a capital of $2,000,000, will take over and operate three existing plants in this county, heretofore controlled by officials of the new organization.

These plants comprise an enameled iron works at North Richmond, and two potteries on Barrett Avenue, San Pablo. Plans are under way for extensive additions and improvements in all three plants, to increase the capacity approximately 100 per cent. N. W. Stern is president, and M. E. and E. S. Wangenheim, first and second vice-presidents, respectively. Home office, 67 New Montgomery Street, San Francisco.

Glenn County.

Titanic Mining Company, K. Reynolds, agent. K. Reynolds and D. McLoughlin, of Elk Creek, located fifteen claims for gold, silver, and copper in April of this year, on Atwood Gulch, one-half mile west of

the Geo. Gillaspy Ranch. The claims are in T. 21 N., R. 7 W., thirty-three miles westerly from Willows on the Alder Springs road which crosses the property. Fruto, about ten miles distant is the nearest railroad point.

The area in which the claims lie is made up of the Franciscan formation, consisting of altered sandstone, chert, schists and masses of intrusive serpentine; a narrow belt of the latter being crossed just before reaching the property.

A mineralized zone coursing N.E. to S.W., consisting of narrow quartz stringers, associated graphitic schists, and slates, is covered by the claims. Iron pyrite is sparsely disseminated throughout. Hematite was also noted in places. A shaft thirty feet deep, in which considerable values in silver were said to have been found, was half full of water at the time of visit.

The two owners and a third man were just starting an adit on another claim one-quarter mile southwest of the shaft. This is expected to cut a series of narrow stringers at moderate depth.

There is no definite ore body exposed as yet and the chances of developing one do not appear encouraging. Gold, silver, copper, and quicksilver indications have been found in this vicinity in the past, but they have never resulted in the opening up of any important deposits.

LOS ANGELES FIELD DIVISION.

M. A. Newman, Mining Engineer.

The clay industry in southern California is keeping apace with the growth of the state, and is slowly but surely cutting off the competition of the Ohio and other middle west states pottery manufacturers.

The Pacific Clay Products Company, with offices at 600 American Bank Building, Los Angeles, and formerly known as the Pacific Sewer Pipe Company, is manufacturing a varied line of clay products from its several deposits, as follows:

Los Angeles and Riverside Counties.

At present, the company is shipping clay from the Alberhill and the McKnight Pit, three miles southwest of Corona. From the latter, it produces a black flint clay, besides some blue refractory clay. This clay lies on the top and south side of a low hill in a bed dipping south at an angle of 35 degrees, and it is mined both in open cuts and tunnels. The black flint clay varies from 4 to 30 ft. in thickness, overlain by a heavy bed of blue clay, and about 10 to 20 ft. of a reddish variegated plastic clay capped by a coarse granitic sand. This clay is used in the manufacture of fire brick, and ten men are now employed mining it.

About one mile south of the south pit of the Alberhill Coal and Clay Company, and at the southern extremity of the ridge, is located what is known as the Alberhill deposit. This supplies the clay used in the manufacture of sewer pipe and drain tile. This clay is mined from a large open cut which exposes a bed of red mottled clay about 30 feet in thickness. Fifteen men are here employed.

In the Temescal Valley, north of Alberhill and one mile southwest of the Harrington Pit, the company owns another deposit known as the

Hoist Pit clay property. These clays are similar to those of the Alberhill deposit, except that there is an overburden of 5 to 25 feet of sand and boulders. At one side of the pit the sand is underlain by white plastic clay from 15 to 25 feet thick, underlain by a red mottled clay. At the opposite side of the pit the clay rests on red mottled clay, of which a portion has pisolitic structure. Both the red and white clays are smooth and plastic, but in places contain disseminated quartz grains, which prohibits their use in fine ware, unless carefully selected, or coarse particles removed by some method of washing. Fifteen men are employed at this deposit.

PLANTS.

The company operates three plants in Los Angeles County, having closed down or dismantled those it formerly had in Riverside County.

Plant No. 4. In Los Angeles, at 306 West Ave. 26. Used for manufacturing fire brick, face brick, stoneware, and yellow mixing bowls.

The equipment at this plant consists of three dry-pans, two wet-pans, one filter press, one sewer press, one Giant augur, 12-brick wire cutters, two Eagle re-pressers, one Bonnett re-presser, sixteen down-draft kilns, varying in diameter from 20 to 30 feet. Power is supplied by a 250-horsepower boiler, using fuel oil and operating a 200-horsepower engine. 100 men employed.

Plant No. 5. In Los Angeles, at Slauson and McKinley Avenues. This plant manufactures electric conduit, flue lining, gas flues, and fire clay. Plant formerly owned by the California Clay Manufacturing Company. 50 men employed.

Plant No. 6. Located at Los Nietos, 10 miles southeast of Los Angeles, on Santa Fe Railroad. Used mainly for making sewer pipe, and a complete line of gas flues and chimney pipe. 100 men employed.

San Bernardino County.

The *Anaconda Gold Mining Company* has been issued a permit by the Corporation Commission to sell 24,995 shares of stock at $0.50 per share. This company has six unpatented claims in the 29 Palms Mining District, being about 35 miles from the town of Bagdad.

The principal workings consist of an old shaft 185 feet deep, and 185 feet of tunnel work on the Anaconda claim. The ore occurs in small lenses and the company proposes a campaign of development work with the view of opening up ore of a commercial grade which will justify the erection of a milling plant.

RANDSBURG DISTRICT.

The *California Rand Silver, Inc.*, during May reports as follows:

Shipping ore, 858 tons; milling ore, 4150 tons; total advancement for the month, 1572 feet. The smelter returns from 22 cars of shipping ore and four cars flotation concentrates netted $125,012.81. The mill at present is crushing from 125 to 150 tons per day and the company proposes to increase this tonnage to 200 tons per day. The four cars of flotation concentrates shipped during May, amounting to 172 tons, had a gross value of approximately $65,000.

The shipping ore at present comes from the first and seventh levels. On the eighth level in the 806 drift 700 feet east of the main shaft a fine vein of milling ore eight feet wide has been opened up and from the gradual increase in values the management believes that shipping ore will also be developed at this point.

Regular dividend No. 28 for two cents per share, total distribution amounting to $25,600, was declared during the month.

The King Solomon Mine is to be reopened. For the present, work is to be confined to sinking the shaft from the 450 level, together with drifting and crosscutting from this point.

Randsburg Silver Mining Company (Coyote). The advance during May was close to 200 feet of development work and resulted in disclosing two new veins on the fifth level. On the Foster Group, the Foster shaft has reached a depth of 450 feet, and is said to be in the schist formation. The community shaft being sunk by Fox and Barret has reached a depth of 70 feet and hoisting and compressor equipment is now being installed. On the Herkalrath and Carrol lease the shaft is now down 214 feet and has penetrated the mud formation similar to that found in the Kelly mine.

The Grady shaft has gone through the superficial wash and is reported to have penetrated a schist formation. Present depth, 690 feet.

The Mizpah Montana shaft is now down 260 feet. A station has been cut at the 220-foot level and prospecting from this point is being commenced.

The *L. & L. Mining Company* has received a permit to sell 100,000 shares at $0.75 net per share to the company for development purposes.

The property consists of seven claims, known as Midway No. 1 to No. 7, inclusive, which lie on the west side of the Providence Mountains in T. 11 N., R. 13 E., S. B. M., about five miles northeast from the town of Kelso.

The claims are traversed by two veins and it is proposed to run a tunnel to intersect both veins at depth.

OIL FIELD DEVELOPMENT OPERATIONS.

R. E. Collom, State Oil and Gas Supervisor.

From May 6, 1922, to and including June 10, 1922, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well	Field
COLUSA COUNTY:					
Empire Producers Assn.	31	15	4	1	----------
Young Oil Co.	21	14	5	1	----------
FRESNO COUNTY:					
Henry H. Cassriel	20	19	15	1	Coalinga
Salvia Oil Co.	24	20	14	20	Coalinga
KERN COUNTY:					
Belridge Oil Co.	34	30	24	1	Elk Hills
Pacific Oil Co.	35	30	24	2	Elk Hills
Pacific Oil Co.	35	30	24	7	Elk Hills
Pan American Petroleum Co.	1	31	24	5-A	Elk Hills
Pan American Petroleum Co.	2	31	24	3-F	Elk Hills

Company	Sec.	Twp.	Range	Well	Field
KERN COUNTY—Continued.					
Pan American Petroleum Co.	2	31	24	9-F	Elk Hills
Pan American Petroleum Co.	2	31	24	16-F	Elk Hills
Pan American Petroleum Co.	2	31	24	17-F	Elk Hills
Pan American Petroleum Co.	2	31	24	18-F	Elk Hills
Associated Oil Co.	30	28	28	4	Kern River
Associated Oil Co.	30	28	28	3	Kern River
Gray Heirs	3	29	28	40	Kern River
C. H. Holbrook, Jr.	6	29	28	25	Kern River
A. W. Hunt	2	29	28	3	Kern River
A. W. Hunt	2	29	28	4	Kern River
Standard Oil Co.	11	28	27	3	Kern River
Midway McKittrick Oil Co.	29	30	22	2	McKittrick
Associated Oil Co.	34	31	23	43	Midway
C. C. M. O. Co.	22	31	22	19	Midway
Caribou Oil Mining Co.	28	31	23	5	Midway
Combined Oil Co.	14	31	22	34	Midway
Honolulu Cons. Oil Co.	6	32	24	29	Midway
Honolulu Cons. Oil Co.	6	32	24	51	Midway
Honolulu Cons. Oil Co.	4	32	24	9	Midway
Midway Gas Co.	27	31	23	37	Midway
Murvale Oil Co.	26	31	23	M-20	Midway
Pacific Oil Co.	27	31	23	33	Midway
Pacific Oil Co.	15	32	24	21	Midway
Pacific Oil Co.	31	31	24	16	Midway
Pacific Oil Co.	31	31	24	17	Midway
Pacific Oil Co.	7	32	24	37	Midway
Good Roads Oil Co.	12	12	24	15	Sunset
Goldman Oil Synd.	25	29	20	1	Temblor
Porterville Oil Synd.	7	22	27	1	----------
Standard Oil Co.	28	11	20	1	----------
LOS ANGELES COUNTY:					
Apex Petroleum Corp.	19	4	12	1	Long Beach
Apex Petroleum Corp.	29	4	12	2	Long Beach
Bartholomae Oil Synd.	29	4	12	1	Long Beach
R. R. Bush Co.	20	4	12	2	Long Beach
R. R. Bush Co.	19	4	12	1	Long Beach
Calmont Oil Co.	30	4	12	1	Long Beach
Coast States Oil Co.	30	4	12	1	Long Beach
Walter H. Fisher	30	4	12	1	Long Beach
General Petroleum Corp.	20	4	12	2	Long Beach
General Petroleum Corp.	19	4	12	2	Long Beach
Henderson Petroleum Synd.	20	4	12	1	Long Beach
Henderson Petroleum Synd.	30	4	12	1	Long Beach
Interstate Oil Corp.	29	4	12	2	Long Beach
C. O. Jaggers Co.	27	5	11	1	Long Beach
Wm. Keck	29	4	12	Swaffield 1	Long Beach
W. M. Keck	29	4	12	1	Long Beach
The Marine Oil Corp.	29	4	12	3	Long Beach
Oceanic Oil Co.	19	4	12	1	Long Beach
P. M. C. & M. Synd.	29	4	12	1	Long Beach
Parker-Anthony Oil Synd.	29	4	12	1	Long Beach
Progressive Syndicate	19	4	12	1	Long Beach
Shell Co.	29	4	12	1-A	Long Beach
Shell Co.	29	4	12	Lynch 1	Long Beach
Shell Co.	29	4	12	Pickler 2	Long Beach
Shell Co.	19	4	11	1	Long Beach
Shell Co.	29	4	12	1	Long Beach
Shell Co.	29	4	12	Stratton 1	Long Beach
Shell Co.	29	4	12	3	Long Beach
Temescal Oil Co.	20	4	12	1	Long Beach
Temescal Oil Co.	19	4	12	1	Long Beach
Joseph K. Tobin, Lessee	19	4	12	1	Long Beach
Transport Oil Co.	14	4	13	1	Long Beach
Union Oil Co.	30	4	12	4	Long Beach
Wigle-McBride	29	4	12	1	Long Beach
National Cons. Petroleum Co.	28	1	14	4	Salt Lake
Bandini Petroleum Co.	7	3	11	1	Santa Fe Springs
Cooperative Oil Synd. of Santa Fe Springs	6	3	11	1	Santa Fe Springs
J. J. Doyle	6	3	11	1	Santa Fe Springs
E. G. B. Oil Synd.	6	3	11	1	Santa Fe Springs
General Petroleum Corp.	5	3	11	7	Santa Fe Springs
General Petroleum Corp.	5	3	11	69	Santa Fe Springs
Jameson Oil Co.	6	3	11	1	Santa Fe Springs
Jameson Oil Co.	6	3	11	C-W 1	Santa Fe Springs
W. M. Keck	6	3	11	1	Santa Fe Springs

Company	Sec.	Twp.	Range	Well	Field
LOS ANGELES COUNTY—Continued.					
Claude E. McIntyre	6	3	11	1	Santa Fe Springs
McKeon & Parkford	7	3	11	1	Santa Fe Springs
Pacific Petroleum Corp.	6	3	11	1	Santa Fe Springs
Schaff-Noble Synd.	6	3	11	1	Santa Fe Springs
Shell Co.	31	2	11	3	Santa Fe Springs
Standard Oil Co.	5	3	11	3	Santa Fe Springs
Standard Oil Co.	5	3	11	4	Santa Fe Springs
Star Petroleum Co.	6	3	11	1	Santa Fe Springs
Twin Bell Oil Synd.	6	3	11	2	Santa Fe Springs
Union Oil Co.	5	3	11	6	Santa Fe Springs
Union Oil Co.	6	3	11	7	Santa Fe Springs
Union Oil Co.	6	3	11	8	Santa Fe Springs
Western Star Oil Co.	6	3	11	1	Santa Fe Springs
Whittier Santa Fe Springs Oil Synd.	5	3	11	1	Santa Fe Springs
National Cons. Petroleum Co.	22	2	11	4	Whittier
Citizens Oil & Land Corp.	36	7	9	1	----------
Wm. C. Critteaden	4	2	10	1	----------
Golden Gate Oil Co.	23	1	16	1	----------
A. L. Kitselman	22	3	14	2	----------
A. L. Kitselman	23	3	15	2	----------
W. W. Lange	2	2	14	1	----------
Locator's Co.	27	2	14	2	----------
Rock Creek Development Co.	2	5	11	1	----------
St. Helens Petroleum Co., Ltd.	3	2	10	1-B	----------
NAPA COUNTY:					
Associated Oil Co.	29	8	3	29-2	----------
Capell Oil Corp.	15	7	3	1	----------
Griffiths Oil Co.	7	8	3	5	----------
ORANGE COUNTY:					
Fullerton Oil Co.	2	3	10	18	Brea Olinda
Standard Oil Co.	17	3	10	93	Coyote Hills
Blue Shale Oil Mining Assn.	11	6	11	1	Huntington Beach
Bolsa Chica Petroleum Co.	2	6	11	2	Huntington Beach
Holly Oil Co.	35	5	11	3	Huntington Beach
Klesan Synd.	2	6	11	1	Huntington Beach
Miley Keck Oil Co.	2	6	11	3	Huntington Beach
M. H. Mosier, Special	34	5	11	2	Huntington Beach
Pacific Petroleum Corp.	2	6	11	9	Huntington Beach
Petroleum Midway Co., Ltd.	2	6	11	2-A	Huntington Beach
Republic Petroleum Co.	2	6	11	4	Huntington Beach
Rio Bravo Oil Co.	35	5	11	5	Huntington Beach
Selby, Root & Hogue	34	5	11	2	Huntington Beach
Standard Oil Co.	35	5	11	1	Huntington Beach
Standard Oil Co.	2	6	11	4	Huntington Beach
Standard Oil Co.	11	6	11	1	Huntington Beach
Standard Oil Co.	11	6	11	2	Huntington Beach
Standard Oil Co.	34	5	11	8	Huntington Beach
Standard Oil Co.	3	6	11	19	Huntington Beach
Standard Oil Co.	13	6	11	1-A	Huntington Beach
Standard Oil Co.	34	5	11	18	Huntington Beach
Wellington Oil Co.	2	6	11	2	Huntington Beach
C. C. M. O. Co.	35	3	9	R-4	Richfield
Union Oil Co.	34	3	8	7	Richfield
SAN DIEGO COUNTY:					
Paradise Oil Co.	54	Rode	Nacion	1	----------
San Diego Petroleum Co.	27	16	3	1	----------
SAN LUIS OBISPO COUNTY:					
Mazda Oil Co.	27	31	21	1	----------
TULARE COUNTY:					
Porterville Oil Synd.	7	22	27	1	----------
VENTURA COUNTY:					
Schell & Jennings	32	4	18	1	Piru
Converse Synd. Oil Co.	23	3	21	1	South Mountain
Oak Ridge Oil Co.	13	3	21	8	South Mountain
Oak Ridge Oil Co.	13	3	21	9	South Mountain
General Petroleum Corp.	21	3	23	3	Ventura
General Petroleum Corp.	21	3	23	4	Ventura
Shell Co.	28	3	23	4	Ventura

Drilling is actively concentrated in the new oil fields of the state, whereas development of the older fields has been slowed down and production shut in so as to make way for the high grade flush production

of the new fields which, together with small consumption, is forcing large quantities of oil into storage. Fifty per cent of the new drilling reported, since January 1, 1922, has been for the four new fields, as follows: Long Beach, 80 wells; Huntington Beach, 73 wells; Santa Fe Springs, 56 wells; and Elk Hills, 41 wells. The combined production of these fields from the 250 producing wells is about 75,000 barrels daily, which is one-fourth of the present daily consumption of crude and 7000 barrels per day more than the present daily surplus of production over consumption.

Apparently realizing the necessity of bringing about a more equable relationship between production and consumption of petroleum in spite of the overproduction brought about by the rapid drilling of new fields the larger companies have shut in about 26,000 barrels of oil daily. This was accomplished by shutting down 620 producing wells in the older fields of the San Joaquin Valley and Santa Maria District.

Union Oil Company of California, the successful discoverer of the valuable production at Santa Fe Springs oil field, on May 22 shut down over 100 wells, being all but its line wells, on eleven properties in the Santa Maria district. A number of producing wells were also shut down in Coalinga. Shell Company of California, discoverer of Long Beach oil field and with a daily production of about 6000 barrels in that field, has shut down approximately 135 wells in the Coalinga field with an estimated average daily production of 11,000 barrels. Standard Oil Company has about 30 wells shut in in Kern County, representing 4000 barrels daily. Pacific Oil Company has shut in the daily production of 3500 barrels from 170 wells in the Coalinga and Midway fields. General Petroleum Corporation has about 150 wells shut in which normally produce about 2000 barrels of oil daily.

Approximately 2,000,000 barrels of crude oil was run to storage during April, 1922, increasing the state's storage to a total of almost 37,000,000 barrels. Field storage facilities of the state can hold about 78,000,000 barrels of oil. Ninety per cent of these facilities are owned by the three large marketing companies: Associated, Standard and Union Oil. At least 4,000,000 barrels should be deducted from total storage in considering quantities available for the market. This represents the oil which lies below outlets in reservoir and tank bottoms and therefore is not available for the market.

On June 7, 1922, Chanslor-Canfield Midway Oil Company successfully completed its redrilling operations in well No. "Del Amo" 1, Sec. 9, T. 4 S., R. 14 W., S. B. B. and M., and brought in a 1200 barrel well of 23 gravity oil.

While drilling at 3118 feet in October, 1921, the well started flowing gas under a pressure of 700 pounds per square inch. It also showed a small quantity of oil. The 8¼- and 10-inch casing collapsed at this time, however, and the productivity of the Redondo field remained undetermined.

The successful completion of No. "Del Amo" 1 indicates that another oil field comparable with such fields as Long Beach and Huntington Beach has been discovered.

The Redondo oil field is in Los Angeles county at the north end of the Palo Verde Hills near Redondo Beach and town of Torrance.

SPECIAL ARTICLES.

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the Bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff containing much information that will add to the permanent value of the Monthly Chapter are included in each number of 'Mining in California.'

It is anticipated that these special articles will cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations, as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the text of new laws and official regulations and notices affecting the mineral industry.

GOLD LODES OF THE EAST FORK MINING DISTRICT, TRINITY COUNTY.

By W. Burling Tucker.

Situation.

The East Fork Mining District is situated in the northern part of Trinity County, on the East Fork of the Trinity river, north of North Fork.

Helena is the postoffice and is the distributing point for this region. The district is 80 miles northwest of Redding, and 33 miles from Weaverville. The district is practically confined to T. 35 N., R. 11 W.

History.

The East Fork Mining District was first discovered in 1884 by Day and Moore, who located the Yellowstone Mine at Coleridge. Day and Leavitt located the Enterprise Mine shortly afterward, which has been operated more or less continuously to date.

Production.

Alaska Mine has a record of	$600,000 00
Enterprise Mine	500,000 00
North Star Mine	200,000 00
Gold Chest Mine	9,000 00
Ozark Mine	60,000 00
Yellowstone Mine	160,000 00

The total production of gold from the district is approximately a million and a half dollars.

Geology.

The formation of the district is mainly granitic gneiss, hornblende schists, mica schists, and serpentine shales, overlying true granite, and the quartz veins seem to be enclosed in the strata between the primary and the metamorphic rocks.

In portions of the district the stratified rocks are much contorted, giving the veins very uncertain courses and dips, being especially noticeable in the Enterprise Mine, where the vein has been disturbed and broken and is resting on the formation as a blanket ledge. The mica of the gneiss and schists is a silvery-white (muscovite), in places the mica entering the quartz schist. In such cases the vein yielded to the granitic rocks and pinched out.

The veins of the district as a rule strike north and south and northwest and southeast, with dips varying from 10 to 70 degrees east. Width of veins varies from six inches to five feet. The ores are usually high in gold values. A considerable proportion of the free gold is coarse enough to be seen and amalgamates readily, but much of it is so fine as to be invisible and can be recovered only by cyanidation. The gold quartz also contains some pyrite, arsenopyrite and telluride.

The oxidized zone is from 30 to 100 feet in depth.

The outcrops of the district are in part prominent, but as a rule inconspicuous.

Timber and Water.

The mountain slopes of the district are clothed with a magnificent stand of pine and fir.

There is an abundant amount of water throughout the year; sufficient to furnish power for operating the mills, and small lighting plants.

Mines.

Alaska Mine, in Sec. 14, T. 35 N., R. 11 W., 10 miles northeast of North Fork, comprises 40 acres, at an elevation of 3100 feet; ore shoot 340 feet long and two and one-half feet wide between slate walls. Development—560-foot tunnel and 1500 feet of drifts. The property is said to have produced $600,000.

Bonanza Group of Mines, 11 miles northeast of North Fork by trail, in Trinity Reserve. Owner, J. L. Johnston. Comprises five claims, 100 acres, in Sec. 10, T. 35 N., R. 11 W. Two parallel veins which strike N. 15° E., and dip 70° east, have been developed on the Bonanza claim. Veins are from 12 inches to three feet in width. The east vein has been developed by two tunnels on north slope of ridge. The upper tunnel, about 25 feet below the outcrop, is 90 feet long, the vein having an average width of three feet of quartz.

About 20 feet below this level a tunnel has been driven south on the vein a distance of 135 feet.

The main working tunnel is on the southwest slope of the ridge. Here, at an elevation of 3625 feet, a crosscut tunnel is driven 60 feet northeast, cutting the vein, with drift 400 feet on the vein. On this level two shoots of ore have been developed, one 40 feet in length, the other 50 feet long; width of vein 12 inches to three feet. The quartz shows free gold, associated with iron pyrite, also some tellurium is present. At 115 feet below this tunnel, a crosscut tunnel has been driven N. 60° E., 300 feet to vein, with drift on the vein 35 feet north.

The Bonanza vein outcrop can be traced for 800 feet on surface. The hanging wall of this vein is composed of hornblende schists, and

the footwall is a diorite porphyry. The west vein has been developed by a 75-foot tunnel on the north slope of the ridge. Vein averages 12 inches in width and is said to carry high values in gold. Ore milled from the different workings yielded $8 to $12 per ton. Owner developing property.

Enterprise Mine, in Secs. 4 and 5, T. 35 N., R. 11 W., 7½ miles north of North Fork, in Trinity Forest Reserve. Owner, Enterprise Gold Mining Company of Boston, Massachusetts. Geo. S. Fenwick, secretary. Comprises 160 acres; the first claim, Lone Jack, was located in 1884, and the mine has been operated more or less continuously ever since.

The property is at present under lease to W. R. Biglow of Weaverville.

The Enterprise vein has been developed by several tunnels, one being 1400 feet long; and 3000 feet of drifts and crosscuts. Greatest vertical depth below outcrop is 500 feet.

Three pay shoots of ore have been developed, 900, 300 and 300 feet in length, with an average width of 14 inches; the vein strikes northeast and southwest; dip from 10 to 40 degrees northwest, diorite walls.

Equipment—Machine drills, compressor plant, small electric plant, 10-stamp mill run by water power. Twelve men employed. Production to date $500,000.

Golden Chest Mine in Sec. 9, T. 35 N., R. 11 W., 10 miles northeast of North Fork. Comprises two claims: Golden Chest, Ida Elmore. Henry Behrman and John Boise of Weaverville, owners. Vein strikes N. and S., dip 70 degrees east. Width 12 inches to four feet. Elevation 3000 feet.

Development—Two tunnels, upper tunnel 160 feet, lower tunnel 300 feet. Five-stamp mill, on East Branch of the East Fork. Production $9,000. Idle.

North Star Mine in Sec. 32, T. 35 N., R. 11 W., eight miles north of North Fork, in Trinity Forest Reserve. Owner, North Fork Mining Company. Comprises 160 acres, located in 1884. Eight veins in all, being an extension of the Enterprise lode, strike northwest and southeast, dip S. 30° W.; length of ore shoot 300 feet, width of vein 4 feet. Walls are quartz porphyry. A 950-foot tunnel, drifts and stopes comprise several hundred feet of development work; greatest depth below outcrop 400 feet. Ten-stamp mill. Said to have produced $200,000. Idle at present.

Ozark Mine in Secs. 4 and 9, T. 34 N., R. 11 W., 5 miles north of North Fork. Owner, R. G. Reid. Comprises 40 acres. Development—tunnel 420 feet, 500 feet of drifts. Width of vein two feet. In slate-ore, shoots were short. Ore free-milling and high grade. Produced about $60,000. Idle.

Yellow Aster Mine in Secs. 29 and 21, T. 35 N., R. 11 W., 9 miles northeast of North Fork. Owner, East Fork Developing Company. Comprises 40 acres, located in 1905. Two tunnels, 135 and 170 feet, also 45-foot shaft. Ore free-milling and good grade. Walls are dolomite, and hornblende schists; fissure vein. Idle.

The Yellowstone Mine in Sec. 32, T. 35 N., R. 11 W., eight miles north of North Fork. Comprises eight claims. The main veins are

North Star and Yellowstone. The former is four feet wide, and courses north and south, dips about 45 degrees west, between granite and greenstone walls. Developments consist of crosscut tunnel 400 feet long with drift south on the Yellowstone vein 200 feet, with an upraise to surface. There are four tunnels on the property but all were caved at present writing. One man is driving a new tunnel.

Yellow Jacket Mine in Sec. 10, T. 23 N., R. 11 W., 10 miles northeast of North Fork. Development consists of two tunnels, 100 feet and 260 feet. Pocket mine. Idle.

PROPOSED METHOD OF MINING OIL SANDS

And the Recovery of Oil Therefrom by Flotation Methods.

By M. A. Newman.

These notes are presented in the hope of being of interest to the public, as showing the possibilities of the saturated oil sands of California. The data were obtained from the officials of the California Oil Mining Corporation. The experimental tests were made by the Southwestern Engineering Company of Los Angeles, and the analytical work by the Smith Emery Company. On the results obtained so far, the company feels encouraged to erect a 300-ton flotation plant to test in a large way the merits of this oil sand deposit and if this proves commercially successful, to enlarge same to a 1000-ton per day capacity.

Whenever reference is made to oil sand in California, many otherwise well informed persons have in mind the oil shale about which so much has been written as constituting the world's ultimate oil supply.

Some of California's largest operating oil companies have secured control of thousands of acres of oil shale ground in Colorado, Utah, Nevada, and elsewhere, located in almost inaccessible mountains, miles away from transportation. Many highly trained scientists are devoting their energies to the working out of an economical and practical method for the recovery of the oil from these shales. So far, their efforts have been without marked success.

Here in California, lying along main line railways, paved state highways, near refineries, and in some instances with oil pipe line and fuel gas line at hand, are found large deposits of saturated oil or tar sands, equal or exceeding in oil content the richest of oil shales.

One of these oil sand deposits is under lease to the California Oil Mining Corporation, a Maryland corporation, located about five miles south from San Luis Obispo, California, the property consisting of about 500 acres. For more than six months, this company has been doing development work, driving tunnels, sinking pits and otherwise proving the extent of the deposit, as well as conducting tests to determine the most practical way to save the oil.

Nearly twenty years ago a company engaged in the manufacture of asphalt paving blocks did considerable mining on portions of the property located in what is called North Canyon. Using material for this purpose, they were obliged to confine their mining activities to the face of the outcropping sands. Owing to the high degree of saturation, the mining was confined to shallow openings or workings not more than

thirty feet back from the face. Tradition has it that a shipload of paving blocks, upon reaching the harbor at San Francisco, had become so soft that it was necessary to mine them to get them out of the hold. It is evident that those who then worked this sand failed to realize the extent of the volatile oil therein contained.

This property has an enormous body of Pismo sand lying on the Monterey formation dipping about thirty degrees to the southwest, under the Fernando. Over the greater portion of this lease, generally speaking, between the North and South Canyons, the Fernando has been entirely eroded, leaving the Pismo or oil sand exposed without overburden, over an area one-half mile wide north and south and nearly a mile east and west. The main body appears to be several hundred feet thick. Interbedded with the Monterey, under the main body of Pismo, are thinner but heavily saturated strata of sand. These conditions are in evidence in the North Canyon, where all the mining seems to have been done by those who formerly worked the deposit for asphalt. The same characteristics of formation seem to exist on top of the main deposit of Pismo where it finally dips under the Fernando in the South Canyon. Here, however, the outcrop of the interbedded sands does not show the same degree of saturation as in the North Canyon. However, where the creek cuts through the more impervious strata of Fernando considerable seepage is in evidence. It is estimated that there is an enormous tonnage of saturated sand easily accessible in the main deposit of this property, and tests made on samples from this deposit indicate a yield of as much as a barrel per ton of oil sand.

It is proposed to open up the South Canyon deposit first, at a point having an elevation of 825 feet above sea level. Steam shovels are to be used in mining and, when necessary, steam points are also to be used.

The flotation plant, designed by the Southwestern Engineering Company, is to be erected on the low side of South Canyon, at an elevation of 325 feet above sea level, and but a short distance from the oil sand deposit.

The sand is to be washed through a ground sluice to the plant where it first goes through a double screw log washer. From the log washer it passes through a Cottrel Vibrating Screen, which will remove any small gravel estimated to be about two per cent of the material treated. From the vibrating screen the sand passes through three K. & K. mixers in parallel. These are ten feet long by 26 inches in diameter. From the mixers the material flows to eight K. & K. flotation machines used as roughers. These are also 10 feet long by 26 inches in diameter. From the roughers the flotation oil concentrate is sent to four K. & K. flotation cleaning machines 10 feet long by 26 inches in diameter. From these cleaners the oil concentrate goes to two additional K. & K. cleaners and then to a 24-foot by 10-foot Dorr Thickener. From the Dorr Thickener the concentrate is sent to a dewatering and storage tank. The oil here obtained is to go to a small refinery and current practice methods of refining are to be used to recover the various oil products and asphalt.

The following is an analysis of a sample from one of the tunnel workings, made by Smith Emery Company:

Analysis of Test on Tunnel Sample No. 6.

Oil Sands: (heads to flotation machine)—	
Total mineral oil by extraction	13.15%
Water	2.50%
Determinations, Oil—	
Light oils, below 550° F.	4.00%
Asphalt	96.00%
Light oils, 23.5° Baumé gravity, recovered by a cracking distillation of the asphalt	73.00%
Tails (72% by weight), flotation tails—	
Oil	0.54%

A solvent such as distillate, tops, or 27 plus oil is to be introduced at the log washer. In amount this is to be equal to about 50% of the estimated oil content of the sand. The amount, however, will vary according to the asphalt content. The loss of solvent will be very small, as the total oil loss in the tails is but .54%, the bulk of the solvent being recovered in the refinery and used over again. It was found that hot water aided considerably and a small amount is to be introduced at the log washer.

The total cost per ton of oil sand treated is estimated at 60 cents, 25 cents for mining and 35 cents for treatment, up to the point of refining.

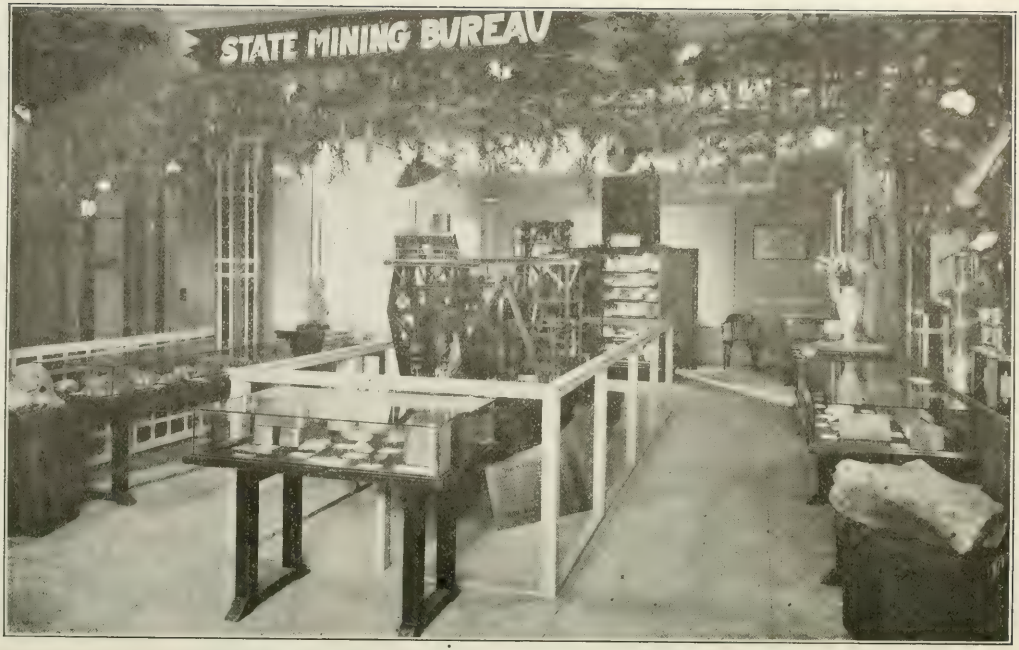
Obviously, the success of this enterprise is mainly dependent on the average oil content per ton of sand in the deposit to be exploited, as the costs of mining, flotation and refining should be susceptible of estimation to within close limits by competent engineers, who are specialists in these various branches.

CALIFORNIA MINERALS EXHIBITED DURING SHRINE CONVENTION.

By Walter W. Bradley.

A California Products Exhibition was maintained in the Exposition Auditorium, San Francisco, during the week of June 12–17, for the attraction and information of visitors to the convention of the Ancient Arabic Order of Nobles of the Mystic Shrine. It was an excellent advertisement and object lesson of California's resources and products, to the many thousands of visitors from all over the United States who thronged into San Francisco during that week.

Representing California's mineral resources, the State Mining Bureau was allotted a generous floor space in one of the most prominent positions. As the State Mining Bureau lacked sufficient funds to finance the undertaking, this was made possible through the courtesy of the Shrine Committee who urged our participation and guaranteed the transportation and other charges incident to the installation. Especial thanks are due Mr. Albert S. Samuels, chairman of the committee, and Mr. Norman H. Sloan of the California Development Association, for their cooperation in making possible this exhibit. We wish also to thank the several companies, individuals, and county boards of



State Mining Bureau Exhibit, at Exposition Auditorium, San Francisco, June 12–17, 1922.

supervisors for their courtesy in lending the specimens and other exhibit material enumerated below.

The two outstanding features of the exhibit were the safe containing gold specimens of approximately $30,000 bullion value, and the gold dredge model. Prominent among the gold specimens shown was the famous Siskiyou County collection, loaned by the Siskiyou Board of Supervisors, and which has taken prizes at a number of fairs and expositions. This contains a fine group of nuggets (one of which is valued at $550), both fine and coarse placer gold, leaf and crystallized lode specimens, and quartz well speckled with the yellow metal. Small grains of placer gold from the Milne Mine at Scott Bar on the Scott River, Siskiyou County, were grouped to form the letters of the word 'Siskiyou.' Small-grain placer gold from the Ludekin hydraulic mine, near Volcano, Amador County, and loaned by Mr. J. W. Preston, Jr., manager of the Winship Estate, was grouped to spell 'Amador.' Mr. Preston also loaned a 51-ounce sample of small-nugget placer gold from the Elephant hydraulic mine at Volcano, Amador County.

Included in the material loaned by the Placer County Board of Supervisors were five pieces of crystallized pocket gold recently purchased for $3,500 by the County from the operators of the Garbe and De Maria mine near Michigan Bluff, Placer County. This was their first public appearance in an exhibition, and they were the subject of much favorable comment. The supervisors are to be congratulated on their foresight in buying these specimens for county exhibit purposes, and thus keeping them from the melting pot. One piece is beautifully crystallized and particularly attractive.

Among the other gold specimens shown in the safe, mention should be made of the following: Crystallized gold in quartz from the Ham & Birney Mine, loaned by Mr. H. H. Sherrard, manager of the Tuolumne County exhibit; free gold in quartz from the North Star Mine, Grass Valley, Nevada County, loaned by the company; a beautiful, crystallized specimen, having roughly an outline resembling a California bear, from the Georgia Hill Mine, Yankee Jim's, Placer County, loaned by Mr. Orman Lutz; crystallized and placer gold from Walsh Bros., Auburn, Placer County; crystallized and leaf gold in quartz, from Quartz Hill, Siskiyou County, loaned by Mr. Geo. C. Noonan; free gold on quartz from the Reid mine, Shasta County, loaned by Mr. B. L. Smith; crystallized gold in quartz from the Sheep Ranch Mine, Calaveras County, loaned by Mr. H. R. Plate; massive gold on a quartz boulder from the Table Rock placer mine, Sierra County, loaned by Mr. D. W. Shanks; also several specimens from the collection in the State Mining Bureau Museum, including crystallized gold from El Dorado, Mariposa, Nevada, Shasta and Trinity counties, a platinum nugget and platinum grains from Trinity County, and an uncut diamond from Cherokee Flat, Butte County.

A painting of James W. Marshall, discoverer of gold in California in 1848, was placed on top of the safe. Facsimiles of a number of California's famous gold nuggets, and facsimile gold bars from the Malakoff hydraulic mine and the Carson Hill mine, were shown in a glass case at the front of the exhibit.

The model gold dredge was loaned by the Yuba Manufacturing Company, and is one of the two working models built by that company for the Panama-Pacific International Exposition in 1915. It is built exactly to scale, and represents one of their 18-cubic-foot bucket boats capable of handling 15,000 cubic yards of gravel per day, several of which are operating in the Marysville district, Yuba County. This model elicited quite as many questions and comments as did the gold exhibit.

Among the structural materials exhibited was a beautifully carved and polished granite vase and plaque, loaned by Mr. Walter Ghetti of the Western Granite Company, San Jose. It is made of the 'silver gray' granite from the Lakeside quarry in San Diego County, now operated by the McGilvray-Raymond Granite Company, and is one of the finest pieces of work of its kind that we have ever seen. This stone is of even, uniform grain and color, and especially adapted to monumental work.

Six glass show cases were filled with specimens of ores and minerals, both metallic and nonmetallic, representing the more than fifty different varieties produced by California commercially. The glass show cases were loaned to the State Mining Bureau through the courtesy of the California Academy of Sciences. The petroleum industry was represented by charts showing the relative production of the several states in 1921, and other data such as: number of wells annually, yield per day, and amount of oil in storage.

The exhibit, both collectively and its individual units, received a great deal of attention and much favorable comment. The amount, variety, and quality of California's mineral resources were continuously the subject of expressed surprise and wonderment.

Following the close of the Shrine Convention, the safe with its gold display was placed on exhibition at the American National Bank for a couple of weeks, in order that the business men of San Francisco might have the privilege of viewing those beautiful products of Nature's laboratory, and that they might know that gold mining is NOT dead in California.

SECRETARY'S OFFICE.

W. W. Thayer, Secretary.

The California State Mining Bureau was created April 16, 1880, by legislative act. In March, 1893, the original act was repealed and an amended act approved and passed by the legislative body. Again on June 16, 1913, a new Mining Bureau Act was approved which became effective August 10, 1913, repealing all former acts, and forming the basic law under which the Bureau now functions.

It is doubtless true that both the mining and lay public have not in the past always recognized the part played by the Bureau in the development of the state's mineral resources. Innumerable inquiries regarding them, originating within and without its borders and in foreign countries, have been answered with ultimate results reflected by a consistent growth in the value of the state's mineral output since the records of production were first compiled by the Bureau in 1887.

It is believed that a better understanding of the economic position occupied by the Bureau will be imparted to the public, whose funds support it, by embodying in the Monthly Chapter a review of the executive activities.

The responsibility for the coördination of effort of each department, to the end that the utmost efficiency may be maintained with the limited and variable appropriations accorded the Bureau by successive legislatures, rests upon the office of Secretary.

Activities referable to that office, such as reports of new maps and publications issued, amount of mail handled, changes and enlargements in offices, changes in personnel of the staff, property and equipment, financial statements, etc., are therefore included herein.

New Publications.

During the month the following Bureau publications have been made available for distribution:

Oil Field Map No. 7, Sunset Oil Field. Revised to May 1, 1922.
Oil Field Map No. 13, Kern River Oil Field. Revised to May 25, 1922.
Oil Field Map No. 14, Coalinga Oil Field. Revised to May 15, 1922.
Oil Field Map No. 15, Elk Hills Oil Field. Revised to June 1, 1922.
Oil Field Map No. 26, Huntington Beach Oil Field. Revised to May 20, 1922.
Summary of Operations, California Oil Fields, March, 1922, Vol. 7, No. 9.
Mining in California, May, 1922, (Monthly) Vol. 18, No. 5.

Distribution of Publications.

The Bureau's publications are constantly in demand, requests for copies coming from all over the United States and foreign countries.

Publications were distributed during the month as follows:

Publications	Number distributed
Report XVII, State Mineralogist	3
Mines and Mineral Resources of Colusa, etc.	1
Mines and Mineral Resources of Del Norte, etc.	6
Mines and Mineral Resources of Imperial, etc.	2
Mines and Mineral Resources of Butte, etc.	3
Mines and Mineral Resources of El Dorado, etc.	3
Mines and Mineral Resources of Monterey, etc.	3
Mines and Mineral Resources of San Bernardino, etc.	3

Publications	Number distributed
Mines and Mineral Resources of Nevada County	3
Mines and Mineral Resources of Plumas County	6
Mines and Mineral Resources of Sierra County	5
Bulletin No. 6, California Gold Mill Practices	3
Bulletin No. 37, Gems, Jewelers' Materials and Ornamental Stones of California	4
Bulletin No. 72, Geologic Formations of California	17
Bulletin No. 76, Mining Laws, United States and California	50
Bulletin No. 78, Quicksilver Resources of California	9
Bulletin No. 85, Platinum Resources of California	7
Bulletin No. 89, Petroleum Resources of California, with special reference to unproved areas	125
Bulletin No. 90, California Mineral Production for 1920	50
Preliminary Report No. 8, Review of Mining in California during 1921	70
Mining in California, (Monthly) Vol. 19, No. 4, April	2300
County Maps and Registers of Mines	10
El Dorado Forest Map	1
Madera Forest Map	2
Placer Forest Maps	3
Shasta Forest Map	1
Sierra Forest Map	3
Siskiyou Forest Map	1
Copper Deposits Map	1
Tuolumne Mineral Map	1
Geological Map of California, mounted	21
Colored Map Accompanying Bulletin No. 89	37
Oil Field Maps	512

Mails and Files.

The Bureau maintains in addition to its correspondence file a mine report file which includes reports on some 7500 mines and mineral properties in California. Also there is available to the public a file of the permits granted to mining and oil corporations by the State Commissioner of Corporations.

During the month 735 letters were received and answered. They are practically all requests for information and the inquiries cover all phases of prospecting, mining and developing mineral deposits, reduction of crude minerals and marketing of refined products.

Drafting.

The Bureau maintains an up-to-date drafting department, where topographic and geological maps, tracings, oil well logs, and oil field maps are prepared.

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Statistician and Curator.

STATISTICS.

California produces commercially at least fifty different mineral substances, with a total annual value of nearly $250,000,000. There are several thousand operating properties, including mines, quarries, oil and gas wells, mineral springs, gravel pits, mills, and smelters.

Some data relative to 1921 production were given in the April and May issues of 'Mining in California,' and additional substances are covered herein. As we still lack reports from a few operators it is not yet possible to compile complete figures for last year, though nearly six months have now elapsed since its close. We would respectfully urge promptness upon all those interested in the development of California's mineral resources, to the end that production figures may be published at an earlier date. Statistics lose much of their value if late.

BORAX.

Bibliography: State Mineralogist Reports III, X, XII, XIII, XIV, XV, XVII. Bulletins 24, 67.

Borax was first discovered in California in the waters of Tuscan Springs in Tehama County, January 8, 1856. Borax Lake, in Lake County, was discovered in September of the same year by Dr. John A. Veatch. This deposit was worked in 1864–1868, inclusive, and during that time produced 1,181,365 pounds of refined borax. This was the first commercial output of this salt in the United States, and California is still today the only American producer of borax.

Production from the dry lake 'playa' deposits of Inyo and San Bernardino counties began in 1873; but it was not until 1887 that the borax industry was revolutionized by the discovery of the colemanite beds at Calico, in San Bernardino County. These have since been worked out, and the output for a number of years has been coming from similar beds in Inyo and Los Angeles counties. In 1920 San Bernardino County again entered the field with shipments of such ore from near Daggett. The colemanite deposits of Ventura County are at present unworked, owing to lack of transportation facilities.

During 1921 there was reported a total output of 50,136 tons, valued at $1,096,326, compared with 127,065 tons, valued at $2,794,206 in 1920. As in 1919–1920, this also includes some refined borax made from the brine of Searles Lake, in San Bernardino County. The considerable decrease from the 1920 figures is due to the lower prices prevailing during 1921.

Colemanite is a calcium borate, and the material mined is mostly shipped to eastern chemical plants for refining. Refined 'borax' (sodium tetraborate) is used in making the enameled coating for cast-iron and steel-ware employed in plumbing fixtures, chemical equipment,

and kitchen utensils. It is also a constituent of borosilicate glasses which are utilized in making lamp chimneys, baking dishes, and laboratory glassware. Other important uses of borax are in the manufacture of laundry and kitchen soaps, in starch, paper sizing, tanning, welding, and in the preparation of boric acid, which is employed as an antiseptic and in preserving meats.

Total Production of Borax in California.

The total production of borax in California is shown in the following table:

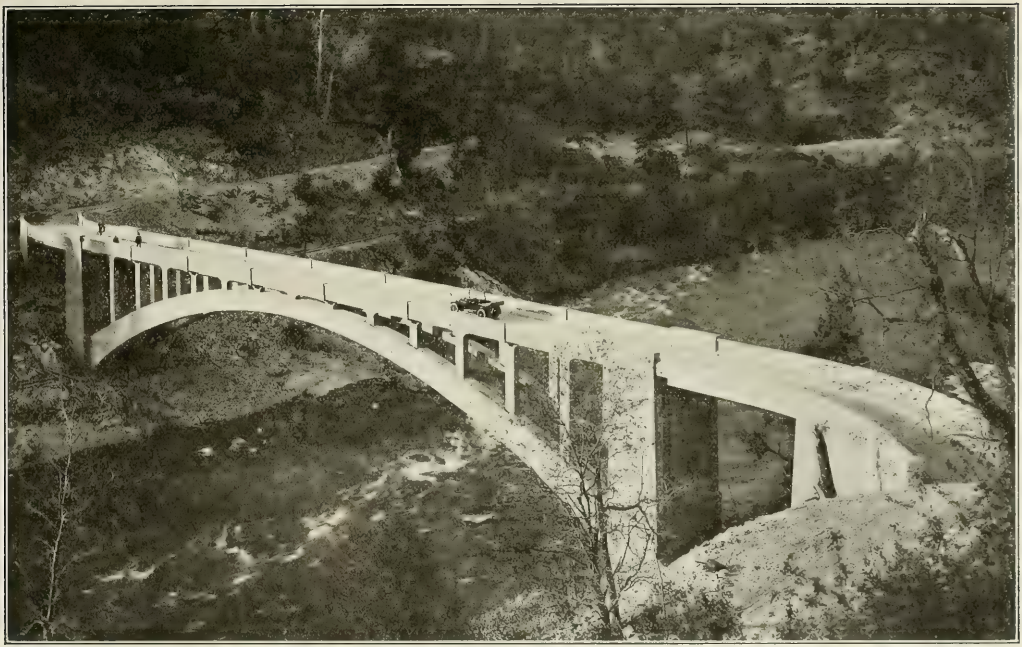
Year	Tons	Value	Year	Tons	Value
1864	12	$9,478	1894	5,770	$807,807
1865	126	94,099	1895	5,959	595,900
1866	201	132,538	1896	6,754	675,400
1867	220	156,137	1897	8,000	1,080,000
1868	32	22,384	1898	8,300	1,153,000
1869			1899	20,357	1,139,882
1870			1900	25,837	1,013,251
1871			1901	22,221	982,380
1872	140	89,600	1902	[a]17,202	2,234,994
1873	515	255,140	1903	34,430	661,400
1874	915	259,427	1904	45,647	698,810
1875	1,168	289,080	1905	46,334	1,019,158
1876	1,437	312,537	1906	58,173	1,182,410
1877	993	193,705	1907	53,413	1,200,913
1878	373	66,257	1908	22,200	1,117,000
1879	364	65,443	1909	16,628	1,163,960
1880	609	149,245	1910	16,828	1,177,960
1881	690	189,750	1911	50,945	1,456,672
1882	732	201,300	1912	42,135	1,122,713
1883	900	265,500	1913	58,051	1,491,530
1884	1,019	198,705	1914	62,500	1,483,500
1885	942	155,430	1915	67,004	1,663,521
1886	1,285	173,475	1916	103,523	2,409,375
1887	1,015	116,689	1917	109,944	2,561,958
1888	1,405	196,636	1918	88,772	1,867,908
1889	965	145,473	1919	66,791	1,717,192
1890	3,201	480,152	1920	127,065	2,794,206
1891	4,267	640,000	1921	50,136	1,096,326
1892	5,525	838,787			
1893	3,955	593,292		1,273,925	$43,859,685

[a]Refined borax.

CEMENT.

Bibliography: State Mineralogist Reports VIII, IX, XII, XIV, XV, XVII. Bulletin 38.

Cement is the most important single structural material in the output of the state. During 1921, there was produced a total of 7,404,221 barrels, valued at $18,072,120, a new high record for California, being an increase both in quantity and value over the record figures of 1920. As in the preceding year, the output came from nine operating plants in seven counties. The average value, reported, increased from $2.23 per barrel in 1920, to $2.44 in 1921.



Concrete state highway bridge over Pit River, near Kennett, Shasta County, California. This reinforced concrete arch span is the longest in the state—242 feet. Photo by courtesy of Standard Oil Bulletin.

The cement industry is so distributed in California that it is not possible to apportion the details of production to the counties in which the plants are located without making private business public. With the exception of San Bernardino, no county has more than one cement plant. The three operating plants in San Bernardino County, in 1921, made a total of 1,964,926 barrels of cement, valued at $4,633,437; the balance coming from a single plant in each of the following counties: Contra Costa, Kern, Riverside, San Benito, Santa Cruz and Solano.

'Portland' cement was first commercially produced in California in 1891; though in 1860 and for several years following, a natural hydraulic cement from Benicia was utilized in building operations in San Francisco. The growth of the industry became rapid after 1902; since which time cement has continued to be an important factor in the industrial life of the state. Although the total cement figures, to date, are not of the same magnitude as those for gold and petroleum, it is interesting to note that the value of California's cement yield in 1920–1921 exceeded the value of the gold output in both those years.

According to reports of the U. S. Geological Survey, California ranked third as a cement producer in 1920, being surpassed by Pennsylvania with 28,365,000 barrels, and Indiana with 10,700,000 barrels. The 1921 data are not yet at hand.

Annual production of cement in California has been as follows:

Year	Barrels	Value	Year	Barrels	Value
1891	5,000	$15,000	1907	1,613,563	$2,585,577
1892	5,000	15,000	1908	1,629,615	2,359,692
1893			1909	3,779,205	4,969,437
1894	8,000	21,600	1910	5,453,193	7,485,715
1895	16,383	32,556	1911	6,371,369	9,085,625
1896	9,500	28,250	1912	6,198,634	6,074,661
1897	18,000	66,000	1913	6,167,806	7,743,024
1898	50,000	150,000	1914	5,109,218	6,558,148
1899	60,000	180,000	1915	4,918,275	6,044,950
1900	52,000	121,000	1916	5,299,507	6,210,293
1901	71,800	159,842	1917	5,790,734	7,544,282
1902	171,000	423,600	1918	4,772,921	7,969,909
1903	640,868	968,727	1919	4,645,289	8,591,990
1904	969,538	1,539,807	1920	6,709,160	14,962,945
1905	1,265,553	1,791,916	1921	7,404,221	18,072,120
1906	1,286,000	1,941,250			
			Totals	80,491,352	$123,712,916

CHROMITE.

Bibliography: State Mineralogist Reports IV, XII, XIII, XIV, XV, XVII. Bulletins 38, 76. Preliminary Report 3, U. S. G. S., Bull. 430. Min. & Sci. Press, Vol. 114, p. 552.

Chromic iron ore, or chromite, to the amount of 312 short tons of all grades (or 347 tons, recalculated to a basis of 45% Cr_2O_3), valued at $6,870 f.o.b. shipping point was sold in California during the year 1921. There were but three producers who reported sales last year, compared with the high mark of 236 in 1918, since which year the number has steadily decreased, owing to importations of foreign ore which can be landed at the consuming centers cheaper. The ore

shipped in 1921 analyzed from 43% to 56% Cr_2O_3, and brought from $15 to $25 per ton. The principal production was in San Luis Obispo County and was utilized by the U. S. Refractories Company in the manufacture of chrome fire-brick. There was also a small output from Placer and Siskiyou counties.

Occurrence.

Until 1916, when some shipments were made from Oregon and smaller amounts from Maryland, Wyoming and Washington, practically our only domestic production of chromite for many years came from California. From 1820 to 1860 the deposits in Pennsylvania and Maryland supplied the world's consumption.

Chromite is widely distributed in California, the principal production, thus far, having come from El Dorado, San Luis Obispo, Del Norte, Shasta, Siskiyou, Placer, Fresno, and Tuolumne counties. In 1918 a total of 29 counties contributed to the state's output. There are two main belts in California yielding this mineral, one along the Coast Ranges from San Luis Obispo County to the Oregon line, including the Klamath Mountains at the north end, and the other in the Sierra Nevada from Tulare County to Plumas County. Chromite occurs as lenses in basic igneous rocks such as peridotite and pyroxenite, and in serpentines which have been derived by alteration of such basic rocks. For the most part, so far as developments have yet shown, the lenses have proven to be small, relatively few of them yielding over 100 tons apiece. A notable exception to this was the deposit on Little Castle Creek, near Dunsmuir, from which upwards of 15,000 tons was shipped before it was exhausted. Deposits worked in Del Norte County during 1918 promised well for a large tonnage. On the whole the orebodies in the northwestern corner of the state appear to average larger in size than the chromite lenses in other parts of California.

Concentration became an accomplished fact in several localities, thus utilizing some of the disseminated and lower-grade orebodies which have been found. In fact, an important part of the 1918–1920 production came from this source.

Economic Conditions.

Chromite is one of several of California's minerals most affected by the economic conditions brought about by the European war. The major portion of our domestic requirements for chrome is for consumption in the steel mills of the East. Formerly, most of that used was imported from Rhodesia and New Caledonia, and they are still, with the addition of India, the more important sources. The reports of the U. S. Department of Commerce show the foreign imports of chromic iron for the eight years 1913–1921, inclusive, to have been 49,772; 75,455; 115,886; 72,063; 100,142; 61,404; 150,275 and 81,836 long tons, respectively. The average price of imports in 1921 was $8.00 per ton.

The major consumption of chromic ore is for its use as a refractory lining in smelting furnaces for steel and copper. A smaller portion is used in the preparation of ferro-chrome for chrome-steel alloys.

Some of the California product in 1916–1918 was converted into ferrochrome in the electric furnaces of the Noble Electric Steel Company at Heroult, California, and some of it was similarly reduced in electric furnaces at Niagara Falls, New York. A small amount of high-grade ore was utilized in preparation of chromates for tanning.

The War Mineral Relief Commission is still working on the adjustment of claims for chromite mined in 1917–1918, an amendment to the Dent Bill having been passed by Congress in November, 1921.

Total Chromite Production of California.

Production of chromite in California began, apparently, about 1874, principally in San Luis Obispo County. There was considerable activity from 1880 to 1883, inclusive, and a total of 23,238 long tons (or 26,028 short tons), valued at $329,924 was shipped from that county up to the beginning of 1887. Some ore also was shipped from the Tyson properties in Del Norte County. The tabulation herewith shows the output of chromite in California, annually, including the earliest figures so far as they are available. The figures from 1887 to date are from the records of the State Mining Bureau:

Year	Tons	Value	Year	Tons	Value
1874–1886 (San Luis Obispo Co.)	26,028	$329,924	1904	123	$1,845
1887	3,000	40,000	1905	40	600
1888	1,500	20,000	1906	317	2,859
1889	2,000	30,000	1907	302	6,040
1890	3,599	53,985	1908	350	6,195
1891	1,372	20,580	1909	436	5,309
1892	1,500	22,500	1910	749	9,707
1893	3,319	49,785	1911	935	14,197
1894	3,680	39,980	1912	1,270	11,260
1895	1,740	16,795	1913	1,180	12,700
1896	786	7,775	1914	1,517	9,434
1897			1915	3,725	38,044
1898			1916	48,943	717,244
1899			1917	52,379	1,130,298
1900	140	1,400	1918	73,955	3,649,497
1901	130	1,950	1919	*4,314	97,164
1902	315	4,725	1920	1,770	43,031
1903	150	2,250	1921	347	6,870
			Totals	241,911	$6,404,493

*Recalculated to 45 per cent Cr_2O_3, beginning with 1919.

MUSEUM.

The Museum of the State Mining Bureau possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the first five of such collections located in North America; and contains not only one or more samples of most of the known minerals found in California, but many specimens from other states and foreign countries as well.

Aside from its purely educational features, the Museum daily attracts throngs of tourists and travelers, and furnishes visual evidence of the immense mineral resources of California. The State Mining Bureau supplies a collection of forty typical minerals and ores, approximately labeled, to any public school in the state upon request.

Mineral specimens suitable for exhibit purposes are solicited and their donation will be appreciated by the State Mining Bureau, as well as those who utilize the facilities of the collection.

Among the specimens received recently, and catalogued for the Museum, are the following:

19654. *Dumortierite* (a basic aluminum silicate). From Palo Verde Mountains, Riverside County, by M. M. Larsen, Colton, Cal.

19656. *Calcite*. A change by paramorphism of Aragonite to Calcite. Calcite with a pseudohexagonal form of aragonite; the result of repeated twinning. Also penetration twins. From New Mexico, by Henry E. Wood, Lewistown, Montana.

19657. *Gold* (Au). Crystallized arborescent form in 'clay' or gouge material. From Mustang Extension Mine, Manhattan, Nevada, by A. E. Smith, Sacramento, Cal.

19658. *Phyllite* or *Hydro-Mica Schist*. Mainly aluminum silicate and silica with sericite (fine white mica). From 25 miles northeast of Bishop, Inyo County, Cal., by W. P. Yaney, Bishop.

During the month a total of 487 visitors signed their names on the Museum register, and in addition there are many others daily who fail to take note of our request for their signatures.

LABORATORY.

FRANK SANBORN, Petrologist.

A total of 317 samples were received and determined during the thirty-day period covered by this report, indicating that a healthy interest will probably be taken in prospecting during the summer months.

Samples submitted were of great variety, ranging from rare-earth metals to phosphate rock. The available supply of the latter, however, is limited for the present, being a fragment of rock that was blown out of an oil well in Kings County, from a depth of 500 feet. The mineral is a hydrous phosphate of lime and iron, apparently calcioferrite.

A list of those of possible value, judged from the sample submitted only, is appended.

The Bureau will supply the name and address of the party who sent in any sample listed, upon request, if the reference number is given.

05–173 Vanadinite (lead-silver ore).
05–174 Kalinite (potash alum).
05–175 Clay; burns white.
05–176 Manganese oxide.
05–177 Talc; foliated.
05–178 Black sand; contains platinum group metals.
05–179 Quartz; some lead carbonate present.
05–180 Jet.
05–181 Asbolite (hydrated oxide of manganese and cobalt).
05–182 Feldspar.
05–183 Ulexite.
05–184 Copper ore; good grade, some silver and gold present.
05–185 Mirabilite (sodium sulphate).
05–186 Uranium phosphate (slightly radioactive); also red oxide of iron (paint pigment).
05–187 Halotrichite (an iron-aluminum alum).
05–188 Phyllite or hydro-mica schist.
05–189 Iron Oxide (red ochre), a paint pigment.
05–190 Quartz with copper and some gold and silver.

LIBRARY.

E. Cooney, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received during the month, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the State are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geol. Survey Water Supply Paper No. 477. Surface Water Supply of the United States, 1918. Part VII: Lower Mississippi River Basin. By Nathan C. Grover, Robert Follansbee and Rodger C. Rice.

U. S. Geol. Survey Mineral Resources:

Fuel Briquets in 1921. By W. F. McKenney.

Chromite in 1921. By Edward Sampson.

Gold, Silver, Copper, Lead and Zinc in the Eastern States in 1921. By J. P. Dunlop.

U. S. Bureau of Mines Reports of Investigations:

Serial No. 2341—Smokeless Fuel for Salt Lake City. By G. St. J. Perrott (Associate Physical Chemist, United States Bureau of Mines), and H. W. Clark (Chief Deputy Smoke Inspector, Salt Lake City).

Serial No. 2342—Survey of Pacific Coast Petroleum Products. By Earl C. Lane (Assistant Chemist, United States Bureau of Mines).

Serial No. 2343—Bibliography of Articles relating to the Preservation of Mine Timber. By R. R. Horner (Mining Engineer).

Serial No. 2344—Recovery of Gasoline from Uncondensed Still Vapors. By D. B. Dow (Petroleum Engineer, United States Bureau of Mines).

Serial No. 2345—The Economic Relation of Accidents and Preventable Diseases to the Coal-Mining Industry. By Arthur L. Murray (Surgeon, United States Bureau of Mines).

Serial No. 2346—Acetylene as a Precipitant for Cyanide Solutions. By John Gross (Metallurgist, United States Bureau of Mines).

Serial No. 2347—Garnet. By Raymond B. Ladoo (Mineral Technologist, United States Bureau of Mines).

Serial No. 2348—Recent Articles on Petroleum and Allied Substances. Compiled by E. H. Burroughs (Bibliographer, United States Bureau of Mines).

Serial No. 2349—Fatalities at Coal Mines in March, 1922. By W. W. Adams (Statistician, United States Bureau of Mines).

U. S. Coast and Geodetic Survey:

Serial No. 165—Special Publication No. 74. Utah. Washington Arc of Precise Triangulation. By V. Hodgson (Assistant Chief, Division of Geology).

U. S. Bureau of Standards, Technologic Papers:

Bulletin No. 207—Manufacture and Properties of Steel Plates Containing Zirconium and Other Elements. By George K. Burgess (Physicist), and Raymond W. Woodward (Physicist).

Bulletin No. 208—Weighing by Substitution. By C. A. Briggs (Associate Physicist) and E. D. Gordon (Associate Physicist).

Kentucky Geological Survey:

Conservation of Natural Gas in Kentucky. By Willard Rouse Jillson.

Michigan Geological and Biological Survey; Bulletin No. 31—Biological Series 6, Miscellaneous Papers on the Botany of Michigan. By C. K. Dodge.

Geological Survey of Ohio; Bulletin No. 24, Fourth Series, Geology of Wayne County. By G. W. Conrey.

Bulletin No. 23—Fourth Series, Geology of Camp Sherman Quadrangle. By J. E. Hyde, Bureau of Topographic and Geological Survey, Commonwealth of Pennsylvania.

Bulletin No. 6—River and Creek Coal in Eastern Pennsylvania. By C. W. Webbert.

Bulletin No. 9—Future Use of Raw Coal. By George H. Ashley.

Bulletin No. 38—Coal Beds in Armstrong County, Pennsylvania. By J. D. Sisler.

Bulletin No. 39—Coal Reserves in Armstrong County, Pennsylvania. By John F. Reese.

Bulletin No. 40—White Clay Deposits at Saylorsburg, Munroe County, Pennsylvania. By Frederick B. Peck.

Bulletin No. 42—Coal Beds in Jefferson County, Pennsylvania. By J. D. Sisler.

Bulletin No. 10—South Dakota Geological and Natural History Survey. The Possibilities of Oil in South Dakota. By Roy A. Wilson.

Canada Department of Mines, Geological Survey:

Bulletin No. 34—Physiography and Glacial Geology of Gaspe Peninsula, Quebec. By A. P. Coleman.

Summary Report 1921, Part C.

Canada Department of Mines, Victoria Memorial Museum:

Bulletin No. 36—Biological Series No. 8—Land Snails from the Canadian Rockies. By Stillman Berry.

Memoir 126—No. 4—Biological Series—A Botanical Exploration of the North Shore of the Gulf of St. Lawrence, Including an Annotated List of the Species of Vascular Plants. By Harold St. John.

Ontario Department of Mines, Thirteenth Annual Report; Vol. XXX, Part V, 1921.

South Australia Department of Mines; Geological Survey of South Australia:

Bulletin No. 9—The Iron Ore Resources of South Australia. Mining Review for the Half Year Ended December 31, 1921.

Secretaria De Industria Comercio Y Trabajo, Boletin Minero, Tomo XIII, Numeras 2–3. Mexico.

Societies and Educational Institutions.

University of California—Bulletin of the Department of Geological Sciences, Vol. 13, No. 5. The Briones Formations of Middle California. By Parker D. Trask.

Genesis of the Ores of the Cobalt District, Ontario, Canada, Vol. 13, No. 7. By Alfred R. Whitman.

A Marsupial from the John Day Oligocene of Logan Butte, Eastern Oregon, Vol. 13, No. 8. By Chester Stock and Eustice L. Furlong.

Quarterly of the Colorado School of Mines, April, 1922.

The Science Reports of the Tohoku Imperial University, Sendai, Japan.

OFFICIAL PUBLICATIONS RECEIVED—Continued.

Societies and Educational Institutions—Continued.

Canadian Institute of Mining and Metallurgy, Monthly Bulletin, June, 1922.
Mining and Metallurgy, May, 1922.
American Mining Congress, General Bulletin No. 21, Special Information Service, Washington, D. C.
Mining and Metallurgical Society of America, Bulletin No. 154, March and April, 1922.
Proceedings of the United States National Museum, Vol. 13.
Institution of Mining and Metallurgy Bulletin, May, 1922.
Journal of Geology, April–May, 1922.
Economic Geology, May, 1922.
Memorias De La Real Academia De Ciencias Y Artes De Barcelona, Spain:
Escolecita De Estopanyo (Huesca.), Vol. XVI, Num. 12. By F. Pardillo.
La Evulucion Moderna De La Locomotora Su Estado Actual, Su Probable Fututo, Vol. XVI, Num. 13. By Ilmo. Sr. D. Jose Serratt Y Bonastre.
Prodromus Lichenum Europeorum Fruticulosi Et Foliacei. Adjuntis Tabulis Analiticis Specierum, Cum Ominum Varietatum Formarumque Descriptione, Vol. XVI, Num. 14. By H. Olivier.
Monografia De Los Phoridos De Las Islas Canarias, Vol. XVII, Num. 1.
Contribucion A La Paleontologia Del Cretacico De Cataluna, Vol. XVII, Num. 2. By Ilmo. Sr. D. Luis Mariano Vidal.
Arundo Donax—L., Vol. XVII, Num. 3. By Excmo. Sr. D. Carlos De Camps, Marques De Camps.
La Intromision Del Academismo Y Yl Modernismo En Las Escuelas De Arte, Vol. XVII, Num. 4. By Sr. D. Felix Mestres Y Borrell.
Orientacion Actual De La Meteorologia Catalana, Vol. XVII, Num. 5. By Dr. D. Eduardo Fontsere.
Mis Excursiones Cientificas Del Verano De 1919, Vol. XVII, Num. 6. By R. P. Longinos Navas, S. J.
Calculo De Los Calores De Formacion Segun Las Vibraciones Infrarojas De Extincion; Ensayo Sobre El Mecanismo De Las Acciones Catalificas, Vol. XVII, Num. 7. By M. Charles Henry.
Las Ceras Kiturgicas. Estudio Quimico. Vol. XVII, Num. 8. By R. P. Dr. Eduardo Vitoria, S. J.

Books.

Year Book of the American Bureau of Metal Statistics—Second Annual Issue, 1921.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

Architect and Engineer, San Francisco.
Arizona Mining Journal, Phoenix, Arizona.
Asbestos, Philadelphia, Pennsylvania.
American Petroleum Institute, New York.
Chemical Engineering and Mining Review, London, England.
Cement, Mill and Quarry, Chicago, Illinois.
Engineering and Mining Journal-Press, New York.
Financial Insurance News, Los Angeles, California.
Hercules Mixer, Wilmington, Delaware.
Journal of Electricity and Western Industry, San Francisco.
Metallurgical and Chemical Engineering, New York.
Mining and Oil Bulletin, Los Angeles.
Mining and Engineering Record, Vancouver, B. C.
Oil Weekly, Houston, Texas.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil Paint and Drug Reporter, New York.
Oil Trade Journal, New York.
Oil Age, Los Angeles.
Oil News, Galesburg, Illinois.

Petroleum Record, Los Angeles.
Petroleum Refiner, Kansas City, Missouri.
Petroleum Age, New York.
Petroleum World, Los Angeles.
Queensland Government Mining Journal, Brisbane, Australia.
Rock Products, Chicago, Illinois.
Southwest Builder and Contractor, Los Angeles.
Stone, New York.
Salt Lake Mining Review, Salt Lake City, Utah.
Standard Oil Bulletin, San Francisco.
Safety News, Industrial Accident Commission, San Francisco.
The Record, Associated Oil Company, San Francisco.

Newspapers.

The following papers are received and kept on file in the library:
Amador Dispatch, Jackson, Cal.
Arkansas Oil and Mineral News, Hot Springs National Park (Arkansas).
Bakersfield Morning Echo, Bakersfield, Cal.
Blythe Herald, Blythe, Cal.
Bridgeport Chronicle-Union, Bridgeport, Mono Co., Cal.
California Oil World, Los Angeles, Cal.
Colusa Daily Sun, Colusa, Cal.
Daily Midway Driller, Taft, Cal.
Del Norte Triplicate, Crescent City, Cal.
Exeter Sun, Exeter, Cal.
Georgetown Gazette, Georgetown, Cal.
Gateway Gazette, Beaumont, Cal.
Gilroy Gazette, Gilroy, Cal.
Goldfield News, Goldfield, Nevada.
Guerneville Times, Guerneville, Cal.
Humboldt Standard, Eureka, Cal.
Healdsburg Enterprise, Healdsburg, Cal.
Inyo Independent, Independence, Cal.
Inyo Register, Bishop, Cal.
Lake County Bee, Lakeport, Cal.
Mountain Messenger, Downieville, Cal.
Mariposa Gazette, Mariposa, Cal.
Mining and Financial Record, Denver, Colo.
Mountain Democrat, Placerville, Cal.
Nevada Mining Press, Reno, Nevada.
Oroville Daily Register, Oroville, Cal.
Oatman Mining Press, Oatman, Arizona.
Oregon Observer, Grants Pass, Oregon.
Plumas National Bulletin, Quincy, Cal.
Plumas Independent, Quincy, Cal.
Placer Herald, Auburn, Cal.
Petroleum Reporter, Etna Mills, Cal.
Sacramento Union, Sacramento, Cal.
San Diego News, San Diego, Cal.
Santa Barbara Daily News, Santa Barbara, Cal.
Stockton Record, Stockton, Cal.
Shasta Courier, Redding, Cal.
Siskiyou News, Yreka, Cal.
Siskiyou Standard, Fort Jones, Cal.
Sunset Journal, Sunset District, San Francisco, Cal.
Tuolumne Prospector, Tuolumne, Cal.
Ventura Daily Post, Ventura, Cal.
Weekly Trinity Journal, Weaverville, Cal.
Western Sentinel, Etna Mills, Cal.

PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of consumers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

Sufficient publicity has not heretofore been given to this feature of the Bureau's work, but in 'Mining in California' a suitable medium is provided for current inquiries of this nature, and, therefore, written or verbal inquiries that come to the attention of the Bureau are summarized in each issue.

The name of the product wanted or offered, only, is published; the name of the owner of the deposit, or buyer, and other details being supplied upon request.

In writing, the reference number of the item should be given.

Mineral Products or Deposits for Sale.

02-82 Free-gold property; sell, bond or lease; good values; in San Bernardino County.

02-83 Gold quartz property; three claims, two ledges, good values; in Plumas County.

02-84 Gold channel property; tapped by 450-foot, double-compartment incline. Gravel washes $4.00 per ton, without crushing.

02-85 Ochre; large deposit within five miles of railroad.

02-86 Diatomaceous earth; deposit or tonnage.

02-87 Volcanic ash deposit; pure white, fine-grained; two and one-half miles from railroad.

02-88 Marble deposit; 165 miles from San Francisco, five miles from railroad on good auto road.

02-89 Equity in thirty-five-year lease on 2500 acres promising drift-mining prospects in eastern Placer County. Known channels, not opened; camp buildings and tools.

02-90 Three groups of drift mines in Placer County; several thousand acres. One group opened and ready to mine; probably three-fourths mile of channel. Has steam boiler, compressor, pumps, houses. Sale account of death.

02-91 Drift mining property; about 1 mile of channel, Yuba County, near Bullard's Bar. Price and terms reasonable.

02-92 Washed and screened sand; good quality, sharp and clean, for concrete and plaster. On Northwestern Pacific Railroad.

02-93 Asbestos deposit.

Mineral Products or Deposits Wanted.

03–72 Feldspar and clays. Eastern company contemplating building plant in California.
03–73 A property producing a heavy crude oil, not over 14° Bé.
03–74 One or two tons of scheelite as nearly pure as possible.
03–75 Gypsum for fertilizer; deposit or tonnage.
03–76 Galena; cubic crystals for radio work.
03–77 Block pumice; deposit or tonnage.
03–78 Mill-grade asbestos; for stucco.
03–79 Manganese ore; tonnage.
03–80 Glass sand; deposit.
03–81 Cobalt ore; deposit.
03–82 Manganese ore; tonnage.
03–83 High grade manganese ore.

EMPLOYMENT SERVICE.

Following close upon the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

The Bureau contemplates registering technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

A list of applicants for positions and 'positions open,' received by the Bureau during each 30-day period preceding the date of publication of the Monthly Chapter is carried in each issue.

Each notice is designated by a key number, and communications sent to the Bureau in reply to any notice will be forwarded to the proper party without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau, to avoid possible loss.

Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

01–15 Mining engineer. Technical graduate. Eleven years' experience. Present position chief engineer, large gold mining company. Age, 34; married. References. Salary wanted $3000.

01–16 Civil or hydraulic engineering. Twenty years' experience, railroad, mining, public-service, hydro-electric and municipal investigations and designing. Age 45; married. References.

01–17 Assayer, chemist, metallurgist or anything connected with smelting operations. Thirteen years' experience as assayer, chemist, sintering-machine foreman, blast-furnace and lead-refinery foreman and superintendent of smelter and refinery; Mexico and California. Age 37; married. References.

01–18 Plane table man. Two years' experience as instrument man, in oil field work. Age 25; single. References. Salary wanted $125.

01–19 Engineering office work. Three years' experience, rodman, transitman and office computation and plotting; reclamation and highway work. Mining engineering student. Junior year completed. Age 23; single. Salary wanted $125.

01–20 Oil lease superintendent. Four years' general lease work; nine years' lease foreman with drilling experience. Can handle men, tools and machinery. Age 42; married. References. Salary wanted $250.

JULY, 1922

REPORT XVIII OF THE STATE MINERALOGIST

DISTRICT REPORTS OF MINING ENGINEERS.

In 1919–1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each divison working out from a local branch office.

This move brought the Bureau into close personal contact with operators, but did not materially shorten the time between the gathering of data in the field and their publication in the Report of the State Mineralogist at the end of an annual or biennial period.

Mining activities and development noted by district engineers in their respective fields are now embodied in monthly reports published in each issue of 'Mining in California,' thus making these data available within a maximum period of thirty days, and the Monthly Chapter as far as possible a compendium of current mining progress throughout the State.

The counties included in each field division and the location of the local offices are shown on the accompanying outline map of the State. (Frontispiece.)

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the State's oil fields is included under this heading.

REDDING FIELD DIVISION.

W. B. Tucker, Mining Engineer.

Del Norte County.

The gold quartz strike reported recently from Takilma, Oregon, is really in Del Norte County, three miles across the state line.

The owners are *J. C. Gaither* and *Chas. Reed.* In hydraulicking, two quartz veins carrying high values in gold were uncovered. Width of veins is from 8 inches to 3 feet.

The *Monkey Creek Mining Company* is going to move its stamp mill to Baker Flat, a mile west of Monumental. The mill is to be run by water power secured from Shelley Creek.

Modoc County.

It is reported that there is renewed activity in the High Grade District. The control of the *Big Four mines* has been acquired by Matt. J. Holt. The *Sunshine group* of mines are to be worked under lease by new interests.

Lassen County.

E. Johnson of Leavitt reports the discovery of vein of coal in Willow Creek Valley. He has located 160 acres.

Shasta County.

The *West End Mine,* near Whiskey-town, has been unwatered, and the 100-foot shaft retimbered. A new head-frame is being installed

preparatory to starting development work. Four men are employed. Walter Parsons, Superintendent.

The *Gold Leaf Mine*, which is situated four miles west of Redding, in the Shasta Mining District, is to be reopened by Ira Judson Coe of San Francisco.

There is a vertical shaft 400 feet deep on the property.

The *Sybel Mine* in French Gulch District is producing some high grade rock from the lower levels. The 5-stamp mill is operating continuously. Fifteen men are employed.

The *Niagara Mine*, adjoining this property, is being developed by the same company. Harry Thompson, Manager.

The *Black Diamond Group* of claims, situated four miles west of Redding, in Sec. 5, T. 31 W., R. 18 W., Shasta Mining District, is being developed by the owner, T. S. Callender of Redding. There are two systems of veins on the property; one strikes north 60° west, dipping 60° south, the other strikes north and south and dips 80° east. The country rock is meta-andesite, with intrusions of alaskite porphyry. A number of shafts have been sunk on the property, from 10 to 50 feet deep.

George W. Boswell has made a rich strike on his *Last Chance* mines.

L. W. Vaughn of Atwater, Merced County, has located six copper claims on a large ledge he discovered on the north side of Pit River about 20 miles north of Copper City, in what is called the Canyon Creek Mining District. The locations are named: Bertagua, Live Oak, Bagley Mountain, Last Chance, Southern Copper and Atwater.

The *Bell Cow Mine*, situated near Harrison Gulch, and owned by Frank A. Greene and associates, of Redding, has been taken under option by Chicago interests, represented by W. S. Robinson and McCoy of Chicago. It is stated that development work will be started on the property in the immediate future.

Frank Walker took out four and three-eighths pounds of gold, worth $1,000, from a pocket that he discovered on his claim on the Middle Fork of Salt Creek, in Shasta Mining District, four miles west of Redding.

The *Mountain Copper Company* received $16,410 and the *Balaklala Copper Company* $5,877 to satisfy judgments given in the United States District Court in March, 1921, on account of excessive assessments made in 1919. The Board of Supervisors gave the Mammoth Copper Company and the Mountain Copper Company a large reduction in the assessment on their mines this year. The valuation of the Iron Mountain mine was reduced from $350,000 as returned by the assessor, to $235,000. The assessment of the Mammoth group of mines was reduced from $275,000 to $185,000 and the valuation of the Mammoth's Sutro mine was cut from $40,900 to $26,000.

Stock Asbestos Mines, which are situated in Secs. 1, 2, 3, 4, 33 and 34, T. 37 and 38 N., on Miers Creek, and about five miles west of Sims Station, are being developed.

The country rock is serpentine through which numerous dikes of diorite and gneiss have been thrust. This serpentine belt carries chrysotile asbestos, both slip and cross fibre, and amphibole and moss

fibre of all kinds. Extensive exposures of both chrysotile and amphibole variety of asbestos have been discovered. Four men are employed in development work. Development operations are under the supervision of Chas. H. Spinks, of Berkeley, H. E. Stock of San Francisco, owner.

Reference: State Mineralogist's Report XIV, pp. 752–755.

Siskiyou County.

At the *Jefferson Consolidated Mine* on the East Fork of the Salmon River near Cecilville, three giants are under operation on the Middle River bar.

J. L. Garrett and associates have taken over the *Flag Mine* in the Humbug district, northwest of Yreka. They have been operating the property for several months.

The *Eliza Mine* is being operated by O. A. Lawson of Humbug, who has a crew of men on development. This property is two miles west of Humbug.

The *Roosevelt Mine,* on Jack Davis Gulch, a tributary of the Ukonon, and south of Happy Camp, is being operated by the *High Light Mining and Milling Company* of New York.

The *Ida May Quartz Mine* on Eddy's Gulch between Cecilville and Sawyer's Bar, is being operated by A. J. Ball.

The *Mountain Laurel Quartz Mine* and mill situated in the same district is operated by Fred Gowing and associates of San Francisco.

Trinity County.

Gold dredging on the Trinity River is in a more or less stationary condition.

Two new dredges are under construction, one is being erected by *L. Gardella* of Oroville, California, on a bar on the south side of the river, a mile and a half below Lewiston.

The other dredge is being erected by the *Lewiston Dredging Company* at the Martin ranch above Lewiston. A pit has been excavated, derrick and machine shop erected, and the hauling of the machinery from the Valdor dredge is under way. The area to be dredged is approximately 700 feet wide and a mile long.

The *Valdor dredge* is being dismantled and its parts will be used in construction of the new dredge. The only dredge in operation is the 11 cu. ft. boat of the *Trinity Gold Dredging Company,* who are operating five miles above Lewiston. The *Pacific Dredging Company,* a subsidiary of the Yukon Gold, has shut down and will dismantle its all-steel dredge at Carrville, preparatory to shipping it to the Federated Malay States for use in tin dredging.

The *Estabrook dredge* which has been shut down for a considerable period may be started in several months.

The *Shasta Dredging Company,* who have one 5-cu. ft. Bucyrus dredge in operation on Cottonwood creek near Gas Point, Shasta County, have bonded the Von Matre ranch near Minersville on the Trinity River. Drilling operations are now under way prospecting the ground.

The *Gold Leaf Mine,* which is situated between Trinity Center and Delta, is being developed by Bert Bassham, Ban Jenkins, and Eric Peterson of Trinity Center.

There is much activity in the platinum belt along Hayfork Creek, in the vicinity of Wildwood. Twenty to thirty miners are working and the creek is staked out in claims for a distance of five or six miles.

The *Trinity Mohawk Group* of mines, situated on the south slope of the Trinity range of mountains, between Mooney and Little Papoose gulches, is being developed by James King of Redding. The property is 15 miles northwest of French Gulch.

AUBURN FIELD DIVISION.

C. A. Logan, Mining Engineer.

Amador County.

On the Mother Lode in Amador County more large gold mining companies are in operation than in any other county of the State, and the total investment in properties is greater than elsewhere in California, although the present total gold production is not yet equal to that of Nevada County. Conditions are improving and some reductions in operating costs are reported. Several companies are carrying on developments in their lower levels. The Central Eureka is not milling ore at present on account of work in the shaft. A new venture that is being watched with great interest is the rehabilitation of the Moore Mine. The principal production now is from the Argonaut and the Kennedy Mines, and the Plymouth Mine.

Argonaut Mine. This mine is opened now to an inclined depth of 4800 feet and has taken, at least temporarily, from the neighboring Kennedy the title of the deepest gold mine in the United States, the 4800 level being about 4123 feet deep vertically. Stoping is going on from the 4650 and 4800 ft. levels. The vein continues of good width in the lowest stopes, which are carried several hundred feet, with the vein averaging about 20 feet in width and consisting of solid quartz and ribbon rock. Stopes are timbered with heavy square sets and filled with wall rock from crosscuts.

Encouraging results are reported from work at the south faces, where a wide vein of quartz, said to be of milling grade is being followed into territory beyond the former south boundary of the ore shoot, as previously shown in the levels above. The Argonaut Mine has only one vein, as far as shown by developments, and for many hundred feet have been working upon one ore shoot. The mill is handling about 270 tons of ore a day and a crew of 180 men are employed.

This company is at present involved in litigation with the Kennedy company, a suit having been filed by the latter for $500,000 for alleged losses as the result of fire and water when the mines had to be flooded in 1920. The Argonaut company has filed a cross suit for $800,000 and both sides are at present devoting attention to preparation of their cases.

Bunker Hill Mine employs at present a crew of about 50 men. No new sinking has been done, the present depth being 3440 feet, which was reached in a winze from the 2800 level. Search at present is for richer ore bodies than the schist ore, which is low grade. The mill is

being operated part time. The present management is interested in finding, if possible, more ore in the slate.

Central Eureka Mining Company has suspended production during extensive improvements to the plant and shaft. A new steel headframe has been completed and 53-lb. T-rails are being laid in the shaft at present. When this work is finished the shaft will be in such condition that a greatly increased tonnage per day can be hoisted. Operations were previously hampered on account of the old strap iron rails and the small skips. The work will be completed and the mill again in operation probably before the first of September.

Prospecting work in the South Eureka by the Central Eureka Mining Company has not yet revealed any important new ore bodies, according to Albion S. Howe, Superintendent.

Fremont Mine. Prospecting and development are still being continued with a crew of about 20 men. The Fremont shaft is now 2900 feet deep. No ore has been crushed by the present company, the mill having been idle since 1918.

Kennedy Mine. Only two levels are said to be accessible in the Kennedy Mine at present—the 3900 and 4050. No shaft sinking has been done since the mine was unwatered last year. The Kennedy has been working two veins, which in the deeper levels appear to be converging both downward and to the south; in the adjoining Argonaut workings only one vein has been stoped and none of the other contacts or fissures have revealed ore where shown by crosscuts.

Enough ore is being hoisted at the Kennedy to run the 100-stamp mill at about one-half capacity. The plans of the management for development have been interrupted by the pending lawsuit with the Argonaut.

Moore Mine. This property, a mile south of Jackson, is of interest to many of the residents of that town who have supplied funds for the rehabilitation of the mine. It had been idle about 35 years when the present company started work August 1, 1921. They have issued 2,250,000 shares of stock and have realized $153,750. About 300 acres of land are controlled, with a maximum length of three-fourths of a mile north and south and a width of one mile.

The old shaft and other workings have been reopened. The shaft was caved full to the water level, at about 100 feet, but when cleaned out it was found that the old spruce timbers below that point were in good shape and few needed replacing. The 500 level drift was run on the black slate fissure and was caved full. This was reopened at great expense. The shaft dips east 52 degrees and has a course north 26 degrees east. There are levels at inclined depths of 106 ft.; 169 ft.; 344 ft. (fourth) and 435 ft. (fifth). Since reopening, the shaft has been continued about 100 feet up to July 10th, and a level called No. 6 is soon to be started. According to H. G. Perry, General Manager, the ore shoot opened in the old works on 4th level is about 90 feet long as far as present development shows. He believes that between 4th and 5th levels a fault threw the upper part of ore shoot 75 feet into the footwall. On the 5th level the pay vein has been opened for 120 feet. Samples taken and assayed by Perry in this distance indicate from 4 to 12 feet of rich ore, the assays running as high as $65 a ton. There has

been no systematic sampling of the mine by an outside engineer, nor have any mill runs been made, but much of this rock shows finely divided free gold. The ore pinches to a wedge on the west end and in the east face shows 4 feet wide. It is a vein of solid quartz showing ribbon structure. It does not lie in the main fissure, but occupies a fissure striking nearly due east into the hangingwall schist, which itself, near the vein, appears to carry some gold, but has not been opened enough to show whether or not it will make an ore body.

The main fissure in the black slate was explored in the old works on 5th level by a drift 400 feet long in heavy slate, which is said to show no ore here. At its north face a crosscut of about 60 feet eastward through the slate shows in its face the hard greenstone.

A mill of twenty 1200-lb. stamps is being built. Foundations for it have been completed and timbers were being framed at time of visit, July 10th. It is thought it will be ready to run by September. Standard Mother Lode practice will be followed, concentrating to be done on 12 six-ft. Frue vanners. An inclined tramway 500 feet long will lead from the hoist to the mill and ore will be delivered in 2½-ton side dump cars, dumping automatically in the mill bins which will have a capacity of 500 tons. A 100-horsepower hoist, with a depth capacity of 3000 feet, is planned. Electric power will be furnished from the Electra power line which passes nearby.

For impounding mill tailing a reinforced concrete dam 360 feet long and 25 feet high has been built. This is 30 inches thick at the bottom, 15 inches thick at the top, with a buttress every 15 feet.

Following are estimated costs of some items of the surface plant and cost of reclaiming underground workings, as given by the general manager:

Cost of buildings, equipment, labor and supplies to reclaim mine workings, including second-hand compressor of 500 cu. ft. capacity	$35,000 00
20-stamp mill erected, ready for use	35,000 00
Concrete tailing dam, complete	5,000 00
Hoist and motor (100 h.p.)	6,000 00

The company was promoted by Geo. F. Snyder of San Francisco, president; Wm. G. Snyder, vice president, and Horace G. Perry, general manager, of Jackson.

Treasure Mining Company. The mill on this property is idle at present, pending the development of more ore. The workings have reached a depth of 2900 feet. The ore here is the grey schist sulphide ore, which is a replacement deposit as distinguished from the quartz veins and stringers of the slate zone. It is of lower grade than the latter as a rule and under recent costs has been workable at a small margin of profit. The Treasure mill, described in a previous report, differs from others on the Lode, Hardinge mills being used in place of stamps. It is anticipated that development underground will soon justify resumption of milling.

The old *Penolay Ranch Mine* at Jackson Gate has been leased by J. Muller. It is a prospect opened at present to a depth of ninety feet, which has lain idle for a great many years. Muller plans a five-stamp mill.

The *Plymouth Mine* continues in steady operation and remains one of the three principal producers of the county. There is a total force of about 150 men employed at present. Development of good ore has lately been reported from the 3700-ft. level. The Plymouth is at present the northernmost mine in operation on the Lode as far as production is concerned, although some work has been started lately looking to the reopening of old properties near Plymouth.

West Side prospect, two miles west of Jackson in the diabase, is being opened by Geo. S. Downing and associates of Jackson. A shaft has just been started to prospect a rich narrow vein. The claim is south of the old Monteriehard Mine.

El Dorado County.

Geo. V. Sinclair has begun work on the dump material at some of the old mines at Georgia Slide, near Georgetown.

The *Gold Bug* property near Georgetown has been leased to J. B. Kelliher, Wm. Hennesse, and Wm. Lockridge and work is now going on.

Some prospecting is being done at the old *Mt. Pleasant Mine* near Grizzly Flat.

Goodwin & Luster are running 2 stamps on the *Red Wing Mine* which is a short distance south of the old Union Mine, between El Dorado and Nashville. This mine is opened by adits.

The *Vandalia Mine*, 4½ miles southwest of Shingle Springs, is reported to have been leased recently. This mine is on a deposit of sulphide ore formed by the replacement of the country rock. It was operated for several years prior to 1900. The ore carries about 5% of sulphides.

Von Kolsch & Moore are opening a prospect 4 miles easterly from Georgetown and have milled a few tons of ore in a small mill.

Placer County.

Eagle Gold Mining and Milling Company of Delaware and Los Angeles has made part payment on a quartz claim owned by Wm. M. Bree in Sec. 2 and 3, T. 15 N., R. 11 E., on the North Fork of American River, a mile and a half upstream from the mouth of Humbug Creek. They have also made a number of locations nearby on which no work has been done yet. On the Bree claim there is a crosscut about 57 feet through the footwall, to the vein which has been drifted upon for 27 feet and which shows 4 feet of solid quartz at the face, with a black slate footwall and grey schist hangingwall. The vein strikes a little west of north. Half a ton of ore has been sent out for a test. Random assays are said to show from $2 to $20 a ton from the surface of the vein. There is an old inaccessible adit on the claim, but the length of this is uncertain. The nearest active mine is the Pioneer, about 2 miles southwest.

W. D. Chambers and associates of San Francisco are reopening the *Centennial Mine* on the west side of Duncan Hill, 2 miles southwest of Auburn. Chambers has reached the level of the old adit workings through a shaft about 175 feet deep and reports that considerable ore

left in sight by the last operators gives very encouraging assays. The same people have a bond on the adjoining *Conrad Mine* which is on a vein parallel to the Centennial. Both mines have been worked to a depth of 180 feet and made considerable production, but have been idle for about 30 years. They were opened through a series of adits and shallow shafts. A small stamp mill is planned.

Pioneer Mining Company has just finished a run of several months at their *Pioneer Mine* on the south side of the canyon of North Fork of American River, near Damascus. About 4000 tons of ore from the Lynn vein have been crushed during this last run. This vein runs from 4 to 7 feet in width in most places, and is composed of good looking ribbon rock. It has been worked so far to a depth of 1450 feet by adits driven from the side of the canyon, and by a winze sunk from the lower adit. No. 3 crosscut adit cuts the Pioneer vein at a distance of 390 feet, and Lynn Vein at a distance of 1400 feet from the portal and a depth of 700 feet. It is run 2525 feet on the Lynn vein. No. 7 adit is a crosscut 2800 feet long to the Lynn vein and from this level the vein has been drifted upon for 1475 feet. The winze from No. 7 is 242 feet deep, showing the vein to be from 2 to 9½ feet wide on the bottom level, where it has been drifted for 225 feet. The winze workings are now full of water. Some large stopes have been worked, many from 200 to 300 feet long, and from No. 4 to No. 3 the vein has been stoped for a length of about 1000 feet, showing in most places there a width of 2 to 5 feet of low and medium grade ore. Recent stoping has been for a length of 200 feet between No. 5 and No. 4. There was some ground stoped from the 80-foot winze level for a length of 250 feet to fifty feet above No. 7, but this was done some years ago and is about all that was mined below No. 5. There are a number of blocks of ground about No. 7 that will probably be mined, as the assays indicate probable ore. All this work has been upon the Lynn vein, the Pioneer vein having received no attention below No. 3 adit. A strong dike accompanies the Lynn vein and is a favorable indication for the persistence of the deposit. The vein strikes N. 32 degrees W. and dips N.E. about 70 degrees.

From No. 7 (elevation 3050 feet) the ore is sent by tram to the mill, a distance of 1128 feet and about 550 feet lower. The mill, built in 1888, contains a 9″x12″ breaker, twenty 1050-lb. stamps and six 4-ft. belt vanners. It has a capacity of 60 tons a day, but is about worn out. The company is planning at present to replace it with a modern plant, and may possibly replace the stamps with Hardinge mills. There is a cyanide plant with a capacity of one ton a day for working the concentrates, which make up about 2½ per cent of the ore and are worth about $50 a ton. The ore milled at the Pioneer at different times has ranged from $3 to $16 a ton. The mill lately has been operated by electricity, but at one time work was done much cheaper with water power.

Work has been resumed during the month at the *Rawhide Mine* on the North Fork of North Fork of American River, 3 miles from Towle.

SAN FRANCISCO FIELD DIVISION.

C. McK. Laizure, Mining Engineer.

Madera County.

Much of the gold mining record of Madera County is now a matter of history that began in '49. Previous to 1893, what is now Madera County was a part of Fresno County and production was accordingly credited to the latter. The total amount, from 1880 to 1892, inclusive, so credited was $1,350,000. The gold production of Madera County in 1893 was valued at $150,696. Since that time it has gradually decreased. In 1921 there were five producers, sixty-nine tons of ore were worked, and $1,053 in gold produced.

Although activities have greatly decreased, there remains plenty of evidence that all of its mining history has not been written. It is true that many of the 'mines' are now cattle ranches, and also that much of the land is being rapidly taken up under the 640-acre stock-raising homestead act.

Such conditions are not conducive to prospecting and act as a detriment to the mining industry, nevertheless activities have continued in a limited way, and are again slowly reviving in this county, as in most other gold mining sections of the State.

A trip through the principal mining section, including the old camps of Grub Gulch, Raymond, Coarse Gold, O'Neals, North Fork, and Hildreth revealed conditions at the mines described in Report XIV of the State Mineralogist, as noted below. A number of properties not mentioned in the above report are also described.

Gold Mines.

Abby. Idle. The 10-stamp mill formerly on this property has been wrecked and sold.

Ackers. Idle.

Baker Gold Mining Company. Idle.

Balfron. Abandoned.

Butterfly. This is now a part of the Savannah Group (patented), owned by Maxfield and Lisby of Fresno, and Mark Sullivan. Idle.

Caledonia. Idle. Owner, O. B. Allen, Oakhurst, California.

Canary. Assessment work only. Owner, John Day, Woodland, California.

Colorado. Assessment work only.

Crystal Springs. Abandoned.

Daisy. Idle.

Diana. Abandoned.

Empire. Idle.

Enterprise. Property recently sold to Boston people. It was worked some in 1921. Idle at present.

Five Oaks. This group is now known as the Carnation and is a part of the Kroromick Mining Company's holdings.

Flying Dutchman or *Hoboken.* Abandoned.

Freda. Idle.

Gambetta. Owner, Walter Starr, San Francisco, California. It has been idle the past four years.

Golden Road. Abandoned.

Hanover. Idle.

Hawkeye. Same as the Colorado. Assessment work only.

High Grade. Assessment work only.

Hoboken: (See Flying Dutchman.)

John W. Coats. Same as the Enterprise.

Josephine. Idle.

Kroromick Mining Company. (See Texas Flat.)

Lady Ellen. Idle.

Lucky Bill. Considerable work has been carried on at the Lucky Bill during the last year or two and it has been bonded several times. John Morrison, owner, Eureka, California.

Melvin, Mountain Lilly and *Mary.* These properties are now a part of the Kroromick Mining Company's holdings.

McKenzie-Minturn Mine. Idle.

Millenium. Idle.

Morning Star. Idle.

Mountain View. Idle; cattle ranch.

Mud Springs. This properly is now owned by James Mussel of O'Neals. It is under bond to the Italian-American Mining Company, and development work has been carried on for the past three months; retimbering, etc. A new Lane mill has been put in place at the mine.

New Citizen. Same as Pure Gold.

Pure Gold Mining Company. Defunct.

Quartz Mountain. Defunct.

Ragesdale. Idle.

Savannah. Patented. Idle.

Starbuck. Now known as the *Hornets Nest.* Owned by Thos. S. Baker of O'Neals and Mrs. S. A. Wilson, 920 H street, Sacramento. A drainage tunnel, now in 120 feet, is being run and will soon tap the workings. A general sample from surface showings assayed $78.55 in free gold. It is equipped with an arrastra in which the ore will be treated.

Starlight Group. Idle.

Texas Flat. Now known as the Kroromick and owned by the Kroromick Mining Company, H. A. Krohn, president, Coarse Gold; Philip Rowe, vice president and treasurer; Maurice McMicken, secretary, home office, Colman Building, Seattle, Washington. Operating office, Coarse Gold.

Property includes the Texas Flat, Mountain Lilly, Waterloo, Consolidated Four, and Five Oaks Group. Since the last report the shaft has been sunk 200 feet. Level No. 4 is now in 1100 feet and No. 5 is in 1250 feet.

Workings are now down 1200 feet (7th level), where the vein, which is five feet in width and of good milling grade, has been drifted on for 900 feet. This drift is being continued. A streak of high-grade was recently cut that showed wire-gold in the quartz. The gold is light colored and low-grade, being worth about $13 per ounce. Development work has been carried on continuously by contract at $5 per foot. The mine does not make enough water for milling purposes, and there is a scarcity of water in the summer.

The management figures 250,000 tons of $12 ore blocked out, and will start the mill as soon as water is available, with the expectation of making a run of several years at least.

Volcano No. 1. Idle for many years.

Washington. Abandoned.

Waterloo and *Consolidated Four.* See Texas Flat.

Zulu. Abandoned.

Silver-Lead Mines.

Star Mine. Idle. Property is in litigation.

Granite.

McGilvray-Raymond Granite Company. This company is employing 100 men and is increasing the force as fast as help can be secured. It is operating on the 'American plan' and the force is now composed almost entirely of Americans in contrast to the Italians and Scotchmen who formerly did much of the carving. The company has recently supplied stone for the Anglo London Bank and Federal Reserve Bank buildings in San Francisco and for the extension to the State Capitol at Sacramento. Contracts for one and a quarter million dollars worth of work are on hand, and the outlook is good for continued and increasing activity.

Raymond Granite Company. F. E. Knowles, president; H. L. Knowles, vice president; E. L. Knowles, secretary and treasurer. Office 3 Potrero avenue, San Francisco; J. P. Graham, superintendent at quarry.

Company is employing an average of 175 men. American plan. Stone cutters are paid $8 per day and quarrymen $6. Sullivan drill sharpeners have been installed and electric power is used throughout. The company has recently furnished granite for the new State Building in the Civic Center, San Francisco, and for the Standard Oil Company's Building, San Francisco. The outlook for the year is good.

The following properties have not previously been of record:

Silver-Lead.

Albino Mine. Owner, H. A. Krohn. Coarse Gold. One claim, located on the head waters of Minaret Creek just below the Buttes. There is a road to Mammoth, the nearest town, and then a ten-mile trail to the property. The claim is situated just on the edge of the timber line at an elevation of about 9500 feet. Water is plentiful. The deposit was discovered in 1878 and has been held by the present owner for the past twenty years. Country rock is granite, diabase, limestone and porphyry. The deepest shaft is twenty feet, but the ore body has been trenched for four hundred feet in width with galena showing all the way. A general sample of the croppings showed silver 18.2 oz.; lead 37%; nickle 1%; copper 9%; gold $2.07.

Silver Horde. Owner, B. Manners, North Fork. Property consists of ten claims discovered in 1908. Located on unsurveyed land in the North Fork Mining District just north of the Minarets. At present Friant is the nearest railroad point, but the Minarets and Western Railroad (under construction) will bring rail transportation facilities

much nearer. There is an auto road to Soda Meadows, thence a ten-mile trail to the group. The property lies at an elevation of 8500 feet, with easy grades. Good timber can be obtained within one-half mile and water is available, under 1000-foot head, if desired. The deposit is in the metamorphic area with granite two and a half miles to the west. Slates and volcanics comprise the country rock. There are three large and two small veins proved for 6000 feet in length. The strike is N.E.-S.W. and dip about 80°. The greatest depth opened up is fifty feet, the vein being twenty-two feet wide where exposed. It carries lead, silver, gold and copper. The principal value is in the silver, assays running from forty to three hundred ounces per ton. About two thousand dollars has been expended to date in development. Equipment consists of prospector's outfit and hand tools only. Tellurides, and tungsten in the form of wolframite, are reported to occur in this vicinity.

Gold Mines.

Eagle Mine. Owners, Noble and H. C. Melvin, Coarse Gold. Property located in the Potter Ridge Mining District on Deadwood Gulch, about three miles northwest of Coarse Gold. Raymond, the nearest railroad point, is seventeen miles distant by good road. There are two claims known as Eagle No. 1 and No. 2. Elevation 2600 feet. Scrub oak and pine cover the claims and there is plenty of water. The lead was a blind one, only discovered in 1921, although early-day placer operations had been carried on almost to the deposit. Country rock is schist and slate (Calaveras?). The ore-body consists of a mass of quartz stringers twenty to twenty-five feet in width with talc gouge, the quartz carrying free gold. It strikes N.W.-S.E. and dips almost vertical. Proved on the surface for three thousand feet. Development consists of a shaft thirty feet in depth and a 75-foot drift on the vein. Hand tools are used. The mine is equipped with an arrastra of 6-ton capacity driven by gas engine. Two men are working.

Logan Mine. This is an old property consisting of one unpatented claim recently acquired by Dr. Wyckoff et al. of Los Angeles, and it is reported that work will start soon. The workings are flooded. There are two connected shafts, said to be one hundred and two hundred feet in depth, respectively. The deposit consists of a quartz vein in granite. The gold is free. The property is on the River Route from Madera to Coarse Gold, just above Langdonville. Raymond, the nearest railroad point, is fourteen miles distant.

Stayton Mining Company. Property consists of four claims, two patented and two unpatented, in Secs. 8 and 9, T. 8 S., R. 20 E., in the Potter Ridge Mining District. Raymond, the nearest railroad point, is nine miles westerly by good road. The claims lie at an elevation of sixteen hundred feet and are covered with scrub oak and pine. There is plenty of water. The property is an old one, reopened by the present owners in 1915. There are two veins in granite country rock. The strike is E.-W. and dip 30° to 45° south. Veins are from six inches to one foot in width and carry auriferous pyrite with free gold near the surface. Development consists of a 90-foot incline shaft and two levels

driven forty and fifty feet, respectively. Equipped with gas-engine hoist, 2-stamp mill and concentrator. Hand tools are used in mining. Three men working.

Sunshine Mine. One claim owned by F. M. Ackley of O'Neals, who works alone. There is a road to within one mile, then a trail. Situated in Sec. 5, T. 10 S., R. 22 E. Friant is the nearest railroad point, and O'Neals the nearest town. Water can be obtained the year round from three springs. Deposit consists of quartz vein one to five feet in width carrying free gold. Greatest depth on vein thirty feet, in tunnel. The owner has thirty-five tons of ore out ready to mill.

Small and intermittent mining operations are carried on by many individuals in the county in the hope of finding a pocket. In most cases the veins are scarcely more than stringers but they pan freely and occasionally develop a pocket.

T. J. Jordan of O'Neals has an arrastra run by water power on the San Joaquin River below Hildreth, where he is working a claim. John H. Morris and J. H. Downey of O'Neals are also working single claims and Marion Markle of O'Neals has three claims on Quartz Mountain, one mile from the North Fork highway, on which there are small veins carrying free gold.

LOS ANGELES FIELD DIVISION.

M. A. Newman, Mining Engineer.

Kern County.

Mojave Mining District. This district is three miles south of the town of Mojave. For the last few years, the district has been a negligible factor in the production of gold. The high cost incident to the world war resulted in an almost complete paralysis of what little work was being prosecuted in the district. The production of the district runs into several millions, as the records of the old Exposed Treasure and Queen Esther mines will prove. A few of the old-timers continued to have faith in this district, and it appears that their faith was justified, for several months ago an entirely new vein was discovered by Mr. Percy Wagman. This property has been acquired by what is known as the *Yellow Dog Mining Company,* from Messrs. J. Withers, P. Wagman, and B. Fisher. A quarter interest in the company has recently been bought by strong financial interests of Los Angeles, represented by Mr. Ellis Mallery. The property consists of eight claims, known as the Yellow Dog No. 1, No. 2, No. 3, No. 4, No. 5, and No. 6, and the Francis H. No. 1 and No. 2. These claims all lie in Secs. 29 and 32, T. 11 N., R. 12 W., S. B. M. It appears that about twenty years ago, a spar vein 8 to 10 feet wide carrying some manganese was located, and a small amount of development work in the way of shafts sunk on the vein to a depth of 20 to 60 feet was done. The assays of samples taken from these workings, however, ran extremely low, $2 to $3 a ton, and the owners therefore suspended all further work. It now appears that what was taken as the hangingwall by the old owners has proven to be the wall of the quartz vein discovered by Mr. Wagman, and this has been found to run for over 500 feet alongside of the old spar vein.

Like the great Premier Mine of British Columbia, a few dollars spent on crosscutting would have revealed this ore body to the old owners. Several samples taken over a width of 43 feet are reported by the owners to have given the following results: 9 ft. of spar vein, $2.93; 34 ft. of quartz vein, sampled in 5-ft. sections, averaging better than $25 gold value per ton.

The vein courses approximately north and south with a dip of about 60 degrees to the west. It appears to have all the earmarks of making a mine of real importance, and again bringing the Mojave District to the attention of the mining world.

San Bernardino County.

Monumental Mining District. This district derives its name from Monumental Peak. This peak is approximately ten miles north of Parker, Arizona, and eight miles west of the Colorado River, in the Whipple Range of mountains.

Copper Basin Consolidated Mines Company. This company owns nine claims, or 180 acres, in the Monumental Mining District, about fifteen miles northerly from Parker, Arizona. The low hills comprising the basin have an elevation of about 1000 feet above sea level.

The entire region seems to have been covered by a basalt flow at one time, but this to a considerable extent has been eroded. Underlying the basalt are found rhyolites, quartz porphyries, and diorites. The quartz porphyry and diorite occur in wide dikes and cover the entire surface of these claims. They strike north and south and dip from vertical to about 45 degrees easterly. The ledges have the same strike and dip as the dikes, and to a depth of about 100 feet the ore occurs as a copper carbonate, the oxide of copper also occurring in places. Two well defined zones of mineralization occur in the porphyry. One has a width of 5 to 40 feet, and can be traced for about 2000 feet.

The ore is developed by open cuts, tunnels and shallow shafts. One shaft is down 100 feet and at the bottom shows a vein 8 feet wide of 5% copper. This shaft is now in sulphide ore consisting of chalcopyrite, pyrite and Bournite. The shaft was sunk on the dip of the vein, which is about 45 degrees. About 600 feet from this shaft is another vein on which a vertical shaft 80 feet has been sunk and the bottom just appears to be entering a sulphide zone. Assays running 10% copper have been obtained from the bottom of the shaft. Tests which have been made by the Southwest Engineering Company of Los Angeles on the sulphide ore indicate that the flotation process could be used for the recovery of the copper.

Mr. J. S. Curtis is president of the company, which has offices at 710 Lankershim Building, Los Angeles.

Rincon Mines Company. This company owns 28 claims in the Monumental Mining District, about 25 miles north of Parker, Arizona, near the Colorado River. These 28 claims are divided into five groups, as follows: The Rincon Copper Group, 12 claims; the Rincon Placer Group, two claims; Hematite Gold Group, four claims; Klondike Group, five claims; Owl Group, five claims.

The Rincon Group millsite and mill are on the banks of the Colorado River.

The Klondike Group is situated four miles to the northwest of the Rincon Group, and the road to same from the Rincon will pass by the Hematite Group.

The Owl Group lies a few miles north from the Rincon Group, a very short distance from the Colorado River.

The Rincon Group consists of rolling hills, composed of porphyry dikes, diorite and monzanite, these formations in places being capped by basalt. There are several veins, all dipping at an angle of about 25 to 30 degrees. The strike of these is east and west, and the dip is to the north. The vein matter is continuous from the highest hill, about three-fourths of a mile from the river upon which it outcrops through all the other hills almost to the mill, and runs through from one gulch to another. The vein has been opened up along the sides of several of these gulches, sufficiently to show conclusively the continuity, and ranges from 18 inches to over 6 feet. The majority of these workings show about three to four feet of copper carbonate ore. Some bornite copper ore has been found in places, and undoubtedly at sufficient depth the carbonates will change to sulphides of copper. Two carloads of ore shipped to the Humboldt smelter gave smelter returns of 5% copper; and $22 gold per ton. A small 25-ton sulphuric acid leaching plant has been erected on the property, to be used as an experimental plant to leach the copper carbonate ores. The ores were simply crushed and leached with sulphuric acid, and the copper precipitated on scrap iron. The large extent of mineralization would warrant the company in developing this Rincon Group more fully, to ascertain the average content of copper and gold, which the ore bodies contain.

The late Murry M. Harris was president of the company, and A. Fritch is secretary, maintaining offices in the Grant Building, Los Angeles.

Randsburg Mining District. The silver-bearing region of this district continues very active, and the thirty or more companies therein are vigorously prosecuting their development work.

The outstanding features of the month were the discovery of a new vein on the 600-ft. level of the Coyote Mine, and reported finding of ore in the Grady shaft, at a depth of 845 ft. The vein found on the sixth level of the Coyote Mine was said, by the company's superintendent to assay 50 to 75 ounces silver per ton.

We have not as yet had a full confirmation of the finding of ore in the Grady shaft. If it be true, it means that the development of the silver section of this district is in its bare infancy.

Ben Hur. The Ben Hur Company of the Divide District of Nevada has acquired what was known as the Dry Wash Claim. This was formerly owned by Heckelrath, Hess, Price and Hammer, who had sunk a shaft 75 ft. deep and had done about 125 ft. of open cut work and trenching on the various veins on this claim. This claim lies west of the so-called 'dyke' of the district. Five to six veins appear to outcrop within its boundaries. The strongest of these is the Ben Hur vein, which averages, where trenched across, 8 ft. The formation is schist, highly silicified.

Under the direction of Mr. A. B. Hall, a shaft $4\frac{1}{2}' \times 8'$ in the clear has been sunk to a depth of 125 ft. and he anticipates cutting the vein in this shaft at a depth of 200 ft. Assays running 5 to 6 ounces of

silver have been obtained from some of the open cuts and trenches. From the personal inspection which the writer made of this property he was strongly impressed by the very competent manner in which this claim was being explored.

California Rand Silver, Inc. The following has been abstracted from the company's June report:

The company declared dividend No. 30 of 2 cents a share, representing a distribution of $25,600 for the month. This makes a total of 54 cents per share since January 1, or total dividends for this year, to date, of $691,200.

A fair body of ore of a shipping grade has been discovered on the sixth level north. The work of extending the drifts on the seventh and ninth levels is being pushed with the hope of encountering the same ore found on the sixth level north.

On the eighth level in 806 drift a great body of milling ore has been opened up. The ledge here is from 4 to 10 feet wide and has been explored for a distance of 250 feet.

On the ninth level south, in drift 913, which has yielded a large amount of shipping ore, an extension has developed 4 to 12 feet of milling ore.

EXTRACTION AND PROGRESS.

Ore to mill	4178 tons
Ore to smelter	1102 tons
Waste	2382 tons
Total footage for month	1242 feet

MILL REPORT.

Total ore milled	4178 tons
Average heads, gold	$1 48 per ton
Average heads, silver	14 47 per ton
Average tails, gold	50 per ton
Average tails, silver	1 10 per ton
Per cent extraction, gold	72 90 per ton
Per cent extraction, silver	92 40 per ton
Per cent extraction, total	90 80 per ton
Recovery, per ton	14 71
Total recovery on 4178 tons	61,483 44
Average concentrate value per ton	278 00
Tons concentrates produced at $278	221 16

The company has developed a water supply at Teagle Springs of 30,000 gallons per day. A 12,000-ft. pipe line will be installed to convey this water to the mill, thereby effecting a saving of $45 per day.

Vanadium Gold Co. This company has acquired what was formerly known as the Louisiana-California Mining Co., located 8 miles north of the town of Goffs. The property consists of 10 claims or 194 acres and was discovered in 1902 and worked till 1908, when it was sold to the Laiser Rae Company. In 1911, it was taken over by the Louisiana-California Mining Company, and, in 1912, by the present company. The claims are located at an elevation of 3600 feet, on a low rolling range of mountains.

The vein is of typical quartz type, outcropping strongly across the surface of the claims, and carries gold, silver and vanadium values.

It is opened by a series of incline shafts, the deepest of which is 900 feet. A 100-ton concentration plant was erected by the old com-

pany, power being furnished by gas engines for both mine and mill. Distillate and tops have been used as fuel.

The present company for the last eight months has been developing and blocking out ore, putting in raises and ore chutes and getting ready for active operations. Scarcity of water has been one of the drawbacks in times past, so the present company is developing an additional water supply to enable the mill to run both day and night.

The following are the officers of the company, having head offices at 310 S. I. Ferry Terminal, New York City: President, L. C. Butler; Secretary, A. E. Post; General Manager, H. W. Evans.

OIL FIELD DEVELOPMENT OPERATIONS.

R. E. Collom, State Oil and Gas Supervisor.

From June 10, 1922, to and including July 8, 1922, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well	Field
KERN COUNTY:					
Belridge Oil Co.	34	30	24	17	Elk Hills
Belridge Oil Co.	34	30	24	3	Elk Hills
Pan American Petroleum Co.	6	31	25	3-B	Elk Hills
Pan American Petroleum Co.	2	31	24	14-F	Elk Hills
A. W. Hunt	2	29	28	5	Kern River
A. W. Hunt	2	29	28	6	Kern River
Revenue Oil Co.	4	29	28	22	Kern River
Union Oil Co.	11	28	27	6	Kern River
Associated Oil Co.	34	31	23	93	Midway
Brookshire Oil Co.	24	31	22	9	Midway
C. C. M. O. Co.	26	31	22	6	Midway
C. C. M. O. Co.	9	32	23	8	Midway
C. C. M. O. Co.	22	31	22	20	Midway
Formax Oil Co.	36	32	23	1	Midway
Honolulu Cons. Oil Co.	6	32	24	69	Midway
Honolulu Cons. Oil Co.	6	32	24	39	Midway
Honolulu Cons. Oil Co.	6	32	24	11	Midway
Pacific Oil Co.	15	32	24	18	Midway
Pacific Oil Co.	35	31	23	33	Midway
Pacific Oil Co.	13	32	24	1	Midway
Pacific Oil Co.	5	32	24	21	Midway
Record Oil Co.	28	31	23	5	Midway
Tumbador Oil Co.	23	31	22	15	Midway
Union Oil Co.	24	31	23	14	Midway
Republic Petroleum Co.	6	11	23	8	Sunset
Tannehill Oil Co.	34	12	24	23	Sunset
P. Welch	18	11	23	2-GP	Sunset
LOS ANGELES COUNTY:					
Barham No. 1	19	4	12	1	Long Beach
Dabney Oil Synd.	29	4	12	11	Long Beach
Dabney Oil Synd.	29	4	12	12	Long Beach
Dabney Oil Synd.	29	4	12	13	Long Beach
Hagar & Deniston	19	4	12	1	Long Beach
Havenstrite & Baker	29	4	12	1	Long Beach
Henderson Petroleum Synd.	20	4	12	1	Long Beach
Henderson Petroleum Synd.	29	4	12	Dodge 1	Long Beach
Hub Oil Co.	19	4	12	1	Long Beach
Metropolitan Petroleum Corp.	30	4	12	1	Long Beach
Mutual Oil Assn.	30	4	12	1	Long Beach
Painted Hills Oil Assn.	19	4	12	1	Long Beach
Petroleum Midway Co., Ltd.	19	4	12	1	Long Beach
Progressive Burnett Oil Co.	30	4	12	1	Long Beach
Shell Co.	30	4	12	2	Long Beach
Shell Co.	29	4	12	4	Long Beach
Shell Co.	29	4	12	1	Long Beach
Shell Co.	29	4	12	3	Long Beach
Shell Co.	29	4	12	Nesa 2	Long Beach
Shell Co.	29	4	12	2	Long Beach
Temescal Oil Co.	19	4	12	1	Long Beach
Union Oil Co.	30	4	12	5	Long Beach
Western Star Oil Co.	29	4	12	2	Long Beach

Company	Sec.	Twp.	Range	Well	Field
LOS ANGELES COUNTY—Cont'd					
Baldwin Stocker Oil Est.	1	2	12	1	Montebello
Union Oil Co.	2	2	12	1	Montebello
C. C. M. O. Co.	9	4	14	2	Redondo
C. C. M. O. Co.	15	4	14	2	Redondo
General Petroleum Corp.	8	4	14	1	Redondo
General Petroleum Corp.	6	3	11	89-A	Santa Fe Springs
General Petroleum Corp.	6	3	11	90	Santa Fe Springs
General Petroleum Corp.	6	3	11	90-A	Santa Fe Springs
General Petroleum Corp.	6	3	11	79-A	Santa Fe Springs
General Petroleum Corp.	6	3	11	86-A	Santa Fe Springs
General Petroleum Corp.	6	3	11	89	Santa Fe Springs
George F. Getty	5	3	11	1	Santa Fe Springs
George F. Getty	6	3	11	1	Santa Fe Springs
Globe Petroleum Corp.	6	3	11	1	Santa Fe Springs
Industrial Oil Synd.	6	3	11	1	Santa Fe Springs
Leonard Jones	6	3	11	3	Santa Fe Springs
P. M. B. Synd.	6	3	11	1	Santa Fe Springs
Peterson Synd.	6	3	11	1	Santa Fe Springs
Petroleum Midway Co., Ltd.	6	3	11	2	Santa Fe Springs
Standard Oil Co.	6	3	11	2	Santa Fe Springs
Standard Oil Co.	6	3	11	1	Santa Fe Springs
Jos. B. Turman Oil Synd.	6	3	11	1	Santa Fe Springs
Twin Bell Oil Synd.	6	3	11	3	Santa Fe Springs
Union Oil Co.	6	3	11	9	Santa Fe Springs
Union Oil Co.	6	3	11	4	Santa Fe Springs
Union Oil Co.	6	3	11	10	Santa Fe Springs
White Star Oil Synd.	6	3	11	1	Santa Fe Springs
Fullerton Oil Co.	22	2	12	1	----------
Union Oil Co.	33	3	13	1	----------
MONTEREY COUNTY:					
Rosebrand Petroleum Co.	12	21	9	1	----------
NAPA COUNTY:					
Sugar Loaf Oil Assn.	-------	8	3	1	----------
ORANGE COUNTY:					
Standard Oil Co.	18	3	10	91	Coyote Hills
Amalgamated Oil Co.	34	5	11	4	Huntington Beach
Amalgamated Oil Co.	34	5	11	5	Huntington Beach
Bell of Montebello Oil Co.	35	5	11	6	Huntington Beach
Globe Petroleum Corp.	34	5	11	2	Huntington Beach
International Petroleum Co.	35	5	11	1	Huntington Beach
Jameson Oil Co.	11	6	11	2	Huntington Beach
Mazdah Oil Co.	11	6	11	1	Huntington Beach
Miley Keck Oil Co.	34	5	11	22	Huntington Beach
Olig Crude Oil Co.	2	6	11	1	Huntington Beach
Shell Co.	34	5	11	5	Huntington Beach
Square Deal Synd.	26	5	11	1	Huntington Beach
Standard Oil Co.	2	6	11	13	Huntington Beach
Standard Oil Co.	2	6	11	14	Huntington Beach
Union Oil Co.	34	5	11	2	Huntington Beach
White Behr Petroleum Synd.	34	5	11	1	Huntington Beach
Fairview Oil Co.	4	6	10	2	Newport
Newport Oil and Refining Co.	28	6	10	2	Newport
SANTA BARBARA COUNTY:					
Wm. F. Tobin	Lookout Park			1	Summerland
SAN BERNARDINO COUNTY:					
San Bernardino and Colton Oil Co.	16	1	4	1	----------
STANISLAUS COUNTY:					
Orestimba Oil Co.	34	7	8	1	----------
TULARE COUNTY:					
Kings-Tulare Oil Synd.	19	21	23	1	----------
VENTURA COUNTY:					
Califraneo Oil Co.	13	4	18	2	Piru
Santa Fe Petroleum Co.	17	4	18	7	Piru
Schell & Jennings	32	4	18	2	Piru
Oak Ridge Oil Co.	18	3	20	13	South Mountain

SPECIAL ARTICLES.

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the Bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff containing much information that will add to the permanent value of the Monthly Chapter are included in each number of 'Mining in California.'

It is anticipated that these special articles will cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations, as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the text of new laws and official regulations and notices affecting the mineral industry.

SILVER LODES OF THE SOUTH FORK MINING DISTRICT, SHASTA COUNTY.

By W. Burling Tucker.

The South Fork Mining District is situated two and a half miles northwest of Igo, and fifteen miles southwest of Redding. The nearest shipping point is Girvan, twelve miles east on the Southern Pacific Railroad.

Topography.

The silver bearing veins occur in a granitic batholith, which lies between the South Fork of Clear Creek, and Andrews Creek, and is about one and three-quarters miles through the base, along the trend of the main fissure systems, northeast and southwest. The elevations, as indicated by the U. S. Geological Survey, range from 1200 feet to approximately 2300 feet. The South Fork drainage empties into Clear Creek a few miles below the Chicago mine.

History.*

Silver ore was first discovered in the South Fork Mining District in 1856. The Chicago Mine, the principal producer of the district, was located in May, 1866, by N. S. and J. B. Batcheler. From 1866 to 1881 over $100,000 worth of ore was taken out of this mine. The first shaft sunk on the Chicago mine yielded a handsome profit. The ore from this mine was mostly silver, although some taken from the original shaft ran as high as $200 per ton in gold. Mr. C. N. Kingsbury, an Igo pioneer who worked in the mine in the early 70's, states that the mine was originally worked to a depth of 180 feet, when excessive water stopped operations.

The ore was hauled by wagon to Red Bluff, a distance of about forty miles, shipped by boat to San Francisco, then transhipped by sailing vessel to Swansea, Wales, for reduction. At a later period Mr. Butterfield operated the Chicago mine for a period of four years, and while

*M. E. Dittmar, E.M.

the metallurgical losses were heavy with the crude practice then available, it is reported that a good profit was made from the mine. During these operations a steam pump was installed and the ore worked in a fifteen-stamp mill, which was located on the South Fork of Clear Creek. Amalgamation was not successful, and concentration was very faulty because of sliming of gray copper sulphides with which the high grade silver was associated.

In the final operations a depth of 210 feet was reached in the Chicago shaft. Leasers worked the Chicago mine until late in the 90's, but increasing costs of operating at greater depth with crude equipment, and the fall in price of silver finally resulted in the discontinuance of operations. Before this time Mr. William Ireland, Jr., former State Mineralogist of California, became interested in the property. The drifting done on the Chicago lode was evidently considerable, but there is no reliable information as to the actual extent. It was evidently stoped to surface from the stated depth of 210 feet, a distance of about 400 feet southwest of the shaft. According to Mr. Alex Lester, who was the pioneer Wells Fargo agent at Igo during the entire period that the Chicago mine was an active producer, the output was approximately $1,000,000. In 1900 the present long drainage tunnel on the Silver Falls and Chicago Consolidated group of mines was driven into the mountain 3000 feet. This tunnel was driven by the Igo Development Company, and cost $120,000. The burning of the plant, death of the managing director, and low price of silver caused the company to suspend operations.

The other properties in the district worked in the early 70's and 80's were the Big Falls Mine, operated by Mr. Ed Ballou, now known as the Ballou Mine. Here the values were mostly gold.

On Andrews Creek, three miles from Igo, is situated the Crystal Mine, formerly owned and operated by H. Rothwell, first located in 1866. It is stated that ore shipped from this property ran from $100 to $300 per ton in silver, with low gold values.

This property is now known as the White Star Group of Mines.

Big Dyke Mine, situated north of the Chicago Consolidated Mines, was discovered in 1866, and next to the Chicago and Crystal Mines was the largest producer in the camp. It is stated that ore shipped from this property ran from $100 to $600 per ton. Acquired by William Dyke and Richter Bros. in 1906. Operated at intervals from 1906 until 1919.

Geology.

O. H. Hershey records the formations, in which the fault fissures occur as batholithic in character. He describes the country rock as light gray, medium textured crystalline, consisting of white feldspar, colorless quartz, dark green hornblende and dark brown biotite, and probably a granodiorite. There is a finer-grained phase, possible gneissic inclusions, dark gray basic segregations and small dikes of pegmatite and aplite. The rock constitutes a fairly large batholith and as the veins all have more or less vertical dips, they may be depended to continue in this granite mass. The veins occupy fissures in the granite. The granite mountain, according to George Bancroft, is a

batholith of quartz-hornblende diorite. J. S. Diller, in Redding Folio, maps the nearby areas of like formation, also as quartz hornblende-diorite and makes note of the batholithic structure.

The granodiorite is traversed by a system of northeast and southwest fissures, roughly parallel. Bancroft recognized two sets of veins, one



striking N. 45° E., the other N. 58° E.; the dip is generally to southeast at high angles. Near the surface some of these veins show a slight dip to the north, but the average dip is from 75 to 80 degrees southeast. Both walls of the veins have heavy gouge showing some fault movement. The silver-bearing mineral is tetrahedrite associated with galena, small amounts of pyrite, sphalerite and some chalcopyrite, with small amounts of gold. These roughly parallel quartz veins intersect at small angles, both in strike and dip.

Enrichment has occurred above intersections on the dip, where the convergence points upward. This is illustrated on the map of the Chicago workings, showing different veins and their intersections. The width of the veins varies from 8 to 4 feet. The zone of oxidation is from 10 to 50 feet in depth. Trend of ore shoots is to the northeast.

Water, Timber and Power.

Water and timber are plentiful for mining operations. The Pacific Gas and Electric Company's power line passes within three miles of the district.

Conclusions.

With intelligent development to determine the ore shoots that occur on the intersections of the different vein systems, both on strike and dip, and their general trend, the South Fork Mining District should develop a prominent silver producing area. The principal lack at present is a small flotation plant for treatment of the ores.

Acknowledgments.

The writer wishes to acknowledge the uniform courtesy extended him by owners and operators of mines in the district, and particularly the personal assistance in the field rendered by Dr. F. M. Archer and Chas. Dozier of Redding, and Arch Wright and Albert Kingsbury of Igo.

Description of Mines.

Silver Falls and Chicago Consolidated Mines has been the most important mine in the district. It is four miles northwest of Igo. The present workings are in Secs. 17, 18, 19, 20, T. 31 N., R. 7 W., on the southwestern slope of the granite mountain, at an elevation of 1400 feet. The property is owned by Dr. F. M. Archer of Redding, California. Holdings consist of the following claims: Pillchuneck, Union, Cold Spring, Richmond, Madison, and Chicago, held under U. S. mineral patents; Fraction No. 1, Fraction No. 2, Fraction No. 4, Metal, Amy and Batholith, by location, totalling 220 acres.

Developments consist of the main Chicago shaft which was sunk to a depth of 210 feet on the Chicago-Madison vein, and stoped to the surface 400 feet southwest of the shaft. Production from these workings was approximately $1,000,000.

On the Richmond claim, 3 shafts, known as the Wright shafts, were sunk on the Richmond lode system. No. 1 shaft is 30 feet deep; 40 feet northeast of this shaft is No. 2 shaft which was sunk to a depth of 80 feet; and 60 feet northeast of the latter is No. 3, having a depth of 20 feet. A drift was driven from No. 1 shaft to No. 2. The vein in these workings is said to be from 10 inches to 2 feet wide. When work was suspended in No. 2 it is reported that there was 12 to 18 inches of good ore in the bottom. Ore mined from these workings was sorted up to 400 ozs. per ton and shipped. Samples taken from ore in place along the strike of the vein between these shafts ran from 10 ozs. to 163 ozs. in silver per ton. The ore shoot is 120 feet long, average width 12 inches. These shafts are approximately 2150 feet north of the portal of the main crosscut tunnel, the surface being 540 feet above the tunnel level.

At the southwest end of the Chicago claim a crosscut tunnel was driven 50 feet, cutting the main Chicago-Madison vein, and a drift run northeast 75 feet and stoped out to the surface. The vein is 12 inches to 2 feet wide, carries high values in gold, and samples taken from the face of the drift ran $26 per ton in gold. These workings are 550 feet above the tunnel level. In 1900 a crosscut tunnel was driven 3000 feet in the mountain, at an elevation of 1400 feet, giving a depth of 600 feet below the outcrop of the Chicago vein. This tunnel cut 36 fissure veins as identified and mapped by George Bancroft. Quite a number of these veins are little more than seams or fractures in the granite. The most prominent may be classified as the Pillchuck, Union, Cold Spring, Richmond and Chicago-Madison lode systems. The Pillchuck, cut in the tunnel at a depth below the surface of 261 feet, was the first vein of any consequence. A drift was driven on this vein about 100 feet northeast, but not driven far enough to cut the ore shoot developed on the surface. The vein shows some quartz with heavy gouge on both walls. Further in the mountain the Union vein system was cut 384 feet below the surface. The next exposure of importance is on veins 26 and 27. The crosscut here obtains a depth of 540 feet vertically below the surface and then extends northeasterly 200 feet as a drift on 27. The tunnel then turns due north and is continued as a crosscut 600 feet farther to what is known as vein No. 36, which was drifted on 100 feet.

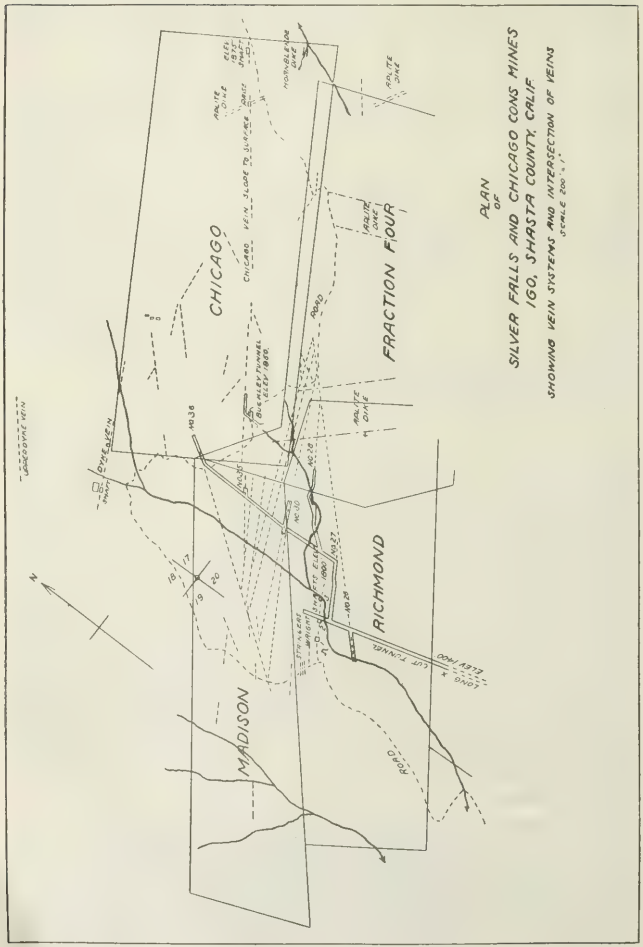
Vein No. 28, which was cut in this crosscut, was drifted on northeast 225 feet. In this drift a shoot of ore was developed having a length of 210 feet, the vein averaging 12 inches in width. Ore stoped about 20 feet above drift. Shipment made from this stope in February, 1910, to the Mammoth Smelter, without sorting, assayed 17.7 ozs. ag. and $0.83 in gold. Shipment included all vein matter between walls in the five-foot fissure. Veins No. 30 and No. 35 were drifted on only a short distance. No. 35 is evidently the main Madison and Chicago lode, although it may be vein No. 30. This system apparently includes veins 28 and 30 intersecting on the northeasterly strike. Vein No. 30 intersects veins 35 and 36 several hundred feet from the tunnel on the southwesterly strike. The intersection of the veins on both strike and dip is important in forming ore shoots. See map, showing intersection of vein systems. Ore shoots form in lenticular lenses of quartz, varying in width from 10 inches to 4 feet. Equipment: Blacksmith shop and compressor building, bunk house; 3000 feet 3-inch pipe for airline in place in main crosscut tunnel; blower and 8-inch ventilation pipe line; 3000 feet of pipe.

Big Dyke Mine.

It is situated 4 miles northwest of Igo, in Secs. 17, 18, 19 and 20, T. 31 N., R. 6 W., adjoining the Chicago Consolidated Mines Company's property on the north. The property is owned by William Dyke, John and Frank Richter of Igo, California. There are six contiguous lode claims totalling 120 acres; known as the Big Dkye Group.

Claims: Edna, Little Dyke, Alta, Helen, Dyke Extension and Big Dyke.

Development has been confined to the Big Dyke vein on the Big Dyke claim.


PLAN
OF
SILVER FALLS AND CHICAGO CONS MINES
160, SHASTA COUNTY, CALIF.
SHOWING VEIN SYSTEMS AND INTERSECTION OF VEINS
SCALE 200 = 1'
CHICAGO
FRACTION FOUR
RICHMOND
MADISON
CHICAGO VEIN, SLOPE 75 W. FROM VERTICAL
ADIT
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A series of roughly parallel veins in the granodiorite, strike N. 60° E., and dip slightly to the southeast from the vertical. The Big Dyke fissure is about 3 feet in width with a filling of quartz and altered granite having heavy gouge on both walls. This filling is heavily mineralized with argentiferous galena, tetrahedrite, some pyrite, sphalerite, some native silver and small amount of gold. The veins are oxidized and leached to a depth of 20 to 50 feet.

Developments: At an elevation of 2000 feet a vertical shaft was sunk to a depth of 153 feet on the vein. On the 100-ft. level the vein was drifted on 165 feet to the northeast, and 20 feet to the southwest. Some stoping was done on the ore shoot on this level, and a shipment made to the Mammoth Smelter at Kennett is said to have averaged 300 ozs. per ton in silver. About 50 feet below this level a drift was run 65 feet northeast on the vein. About 100 feet below the collar of the shaft there is a crosscut tunnel 200 feet long which intersects the vein on the 100-foot level, 100 feet northeast of the shaft. Southwest of the shaft a tunnel, now caved, was driven 200 feet on the vein. It is reported that the ore in the shaft has a width of 12 to 36 inches; assays range from $20 to $400 per ton.

Equipment: 15-horsepower gasoline hoist, 20-horsepower air compressor and pumps. Idle.

White Star Silver Group of Mines (Formerly known as Crystal Mine).

It is situated three miles northwest of Igo, on Andrews Creek, at an elevation of 1250 feet. The property is owned by Thomas Kingsbury, Albert Kingsbury and J. D. Hubbard of Igo, California. Holdings consist of the following claims: J. D., White Star, North Star, Wood, Contact, Contact Fraction, Henry Ford and Henry Ford Extension, totalling 160 acres. These claims are located in Sec. 20, T 31 N., R. 6 W.

Three parallel veins cut the granodiorite, and are about 20 to 40 feet apart. Strike northwest and southeast, dip 80 degrees southeast.

The ore carries native silver, tetrahedrite, sphalerite, small amount of pyrite, chalcopyrite, and some gold associated mostly with the pyrite.

Developments: Outside of a number of prospect shafts and short tunnels, all work has been confined to the middle vein. A crosscut tunnel has been driven N. 50° W., 320 feet, which cut the three veins at a depth of 90 feet below the surface. No. 1 vein was cut 150 feet from the portal of the tunnel, and drift run 50 feet to the northeast and 35 feet to the southwest, and was stoped about 15 feet above the drifts. Vein has a width of 12 inches to 3 feet. Twenty feet farther on it cut No. 2 vein, which was drifted on 100 feet to the southwest, and 60 feet to the northeast. On this level, 20 feet to the southwest, a raise was run to the surface on ore. The ore extracted from this raise is said to have carried high gold values, and it was stoped to the surface. In the northeast drift on this vein, at a distance of 40 feet from the crosscut tunnel, an upraise was made for 40 feet, then the vein was drifted on 40 feet to the southwest and connected with the shaft from the surface. The main crosscut tunnel continues 160 feet, where it cut No. 3 vein, which has a width of 2 feet, but no development has been done on this vein. At 10 feet northeast of the main crosscut tunnel, a winze has been sunk 50 feet and a drift driven on the vein

100 feet northeast. No. 1 and No. 2 veins intersect northeast of the winze on this level forming an ore shoot 60 feet in length. Width of the vein is from 2 to 5 feet.

A shipment of ore made from this shoot to the Selby Smelter on April 27, 1922, ran 150 ozs. in silver, 0.2 oz. gold, 1.8% lead, and 13.3% zinc.

The property has been operated off and on by Mr. Albert Kingsbury, who has shipped about $2,000 worth of ore to smelters. The general run of ore from this mine will average from $10 to $50 per ton.

Equipment: Consists of cars, handpump, blacksmith shop and tools. Development work in progress.

Climax Mine.

It is situated 3 miles northwest of Igo, on the South Fork of Clear Creek, in Secs. 16-21, T. 31 N., R. 6 W., elevation 1400 feet. Holdings consist of three claims known as Climax, South Climax and West Climax, totalling 60 acres. The vein occurs on a contact of granite and meta-andesite. Strike N. 40° E., dip 45° E. Developments consist of a 150-foot shaft, drift 110 feet east on vein and 75 feet west, and 170-foot tunnel. Vein is from 10 to 25 feet wide, carries values in gold, silver, and shows pyrite, sphalerite and galena in quartz. Property idle.

Continental Mine.

It is 6 miles northwest of Igo, on the South Fork of Clear Creek, at an elevation of 2200 feet. Holdings consist of 7 claims, in Secs. 7 and 18, T. 31 N., R. 6 W., and adjoin the Ballou Group of claims, on the west. There are two veins on this property, one which strikes N. 10° E.; the other striking N. 45° E., and dipping 80° S.E. Country rock is granodiorite. On the slope of the ridge north of the South Fork of Clear Creek, a crosscut tunnel has been driven N. 50° W., intersecting the vein, which has a course of N. 45° E. The vein has been drifted on 200 feet northeast. This vein is 8 inches to 3 feet wide and the fissure is filled with quartz and altered granite, with gouge on both walls. The fissure is heavily mineralized with argentiferous galena, pyrite, tetrahedrite, sphalerite, and native silver, and carries a small amount of gold. The vein is oxidized and leached to a depth of 20 to 50 feet. This tunnel gives a depth of 200 feet vertically below the outcrop. Near the top of the ridge, about fifty feet below the outcrop, a tunnel was driven on the vein, extent not known and now caved, but probably 200 feet. At the mouth of the tunnel there is a shaft. On the surface the outcrop of quartz is 8 to 10 feet wide and can be traced for at least 3000 feet. In the 80's the operators had a 6-stamp mill on the South Fork, where ore was milled from these upper workings. Equipment consists of cars, track and blacksmith shop. Property idle. Only assessment work done. Owners: V. V. Apperson and associates of Willows, California.

Manzanita Mine. (Ballou Group of Mines.)

This group of mines is situated 6 miles northwest of Igo, in Secs. 7 and 18, T. 31 N., R. 6 W. The workings are on the north slope of the ridge, northeast of the South Fork of Clear Creek, at an elevation

of 2300 feet. Holdings consist of 5 claims, namely: Hope, Sulphide, Manzanita, Greater Falls Series, Plus Series, all held under U. S. mineral patents, totalling 100 acres. The property is owned by May V. Ballou of Redding, California. These claims were located December 13, 1880. A series of parallel quartz veins, whose general strike is N. 20° E., and dip 80° E., traverse the granodiorite. On the Manzanita claim, at an elevation of 2300 feet, a crosscut tunnel was driven 30 feet west, cutting a vein which strikes N. 20° E. This vein was drifted on to the south 200 feet. The vein has a width of 8 inches to 2 feet, but the pay ore occurs in a seam of oxidized quartz near the footwall that is heavily stained with iron. This seam carried high gold values. The quartz carries gold, and some pyrite. This tunnel is only about 75 feet below the surface and in the oxidized zone and probably with greater depth one may expect to encounter silver-bearing ores, as in the rest of the district.

There are seven tunnels and one shaft on the property. Tunnel on the Hope claim is 700 feet long. On the Sulphide claim there is a tunnel 300 feet in length, besides a number of shorter tunnels, from 50 to 100 feet in length. Property idle.

DRY PLACERS OF SOUTHERN CALIFORNIA.

By Chas. S. Haley.

From the time of the days of the Mexican colonies—when Alta California, as it was then called, was a province of the Spanish crown—gold has been won from the dry placers of the desert. The Indians in the days of the padres used to bring in gold to the missions, which was laboriously recovered from the desert washes by the crudest of methods. Unfortunately, however, there is no reliable record of production until comparatively modern times; but we know that in total it amounted to many millions of dollars. Since the American occupation of California, we have somewhat of a record, however; and we know of districts which have produced from a hundred thousand to two millions of dollars—all won by hand methods and mostly by dry washing.

For this reason, it seemed to the present investigator, in preparing a volume on the placer gold resources of the State, that there might still be a possibility of obtaining an economic return from these placers by the application of large scale working methods; and that it might in some cases justify the bringing of water for some distance to cover the ground.

However, the results of this investigation—which has covered every district of importance in the desert—have, on the whole, been very disappointing; and the writer is forced to the conclusion that these placers have already been exploited by the only practical means—the Mexican with his little hand operated bellows and hopper. The reasons for this conclusion will be given herewith.

From the standpoint of geological history, the district south of the Tehachapi has been distinctly different from the region of the great valley to the north. The ranges of subsidence and elevation have been much less during Tertiary and later times. During the Ione and later transgressions which covered the foothills of the western slope of the

Sierras and the Coast Range, this region was comparatively quiescent. For this reason, it may be assumed that the topography and to some extent the climatic conditions of this region during the time at which changes were taking place to the north, did not vary greatly.

This fact leads to a vital difference in the manner and amount of deposition of the gold in the desert channels—so far as it occurs along the line of channels. Whereas in the north we have a primary concentration from the erosion of the metamorphics and intrusives of the Sierras, to be followed later by a reconcentration of the values in the Tertiary streams by the present, or Quaternary drainage running in many cases normal to the older. In the region of the desert we have an entirely different condition, and one not nearly so favorable to the concentration of gold in large quantity and persistent amount.

In the south, the drainage during Tertiary times evidently did not greatly vary from the present lines. Roughly, practically all of the deposits on which stream action had the slightest bearing may be classed along the drainage lines of ancient streams whose courses follow the general direction of the modern ones, such as they are. In some cases, the ancient ones seem larger than those of the present day—in other cases smaller.

In San Diego County, we have a course which, commencing in the Cuyamaca Mountains, near Julian and the Banner district, runs down through Ballena via Hatfield and Coleman creeks—which have crossed it and caused local concentration—down through Ramona and the San Vicente region, and finally empties into the ocean somewhere round La Jolla. This region is not of economic importance, as the values were very spotty, according to the records of the districts, and facilities for working are limited to a very short season of the year.

East of this, in Imperial County, we have either local erosion deposits, like that in the Borego country—which is said to average about fifteen cents a yard—or the deposits in the Chuckawalla basin, the Chocolate Mountains, the Eagle Range, and the country north and east of Desert Center. These were all more or less tributary to the drainage system of the Colorado, which is probably one of the oldest rivers on the western slope. On the Colorado itself, or near it, we have the Potholes, at Laguna; the Picacho Basin; and other deposits in the Blythe-Parker-Ehrenberg region. These were all investigated by the writer; and his conclusion is that, although a recorded production running into the millions has come out of them, little remains of interest to either large capital or the small miner.

The gravel, or eroded material, was very spotty and seemed to carry the values in the subangular stuff at some distance above bedrock; and any pumping scheme which might be used to get water would be so costly and cumbersome that the ground will never pay it back. The Mexican with his little portable machine and lack of overhead in moving from gulch to gulch where the greatest concentrations were, had the only feasible system. The Picacho and Laguna deposits are disintegrated schists and slates for the most part, containing quartz stringers from which the gold has come. In both cases the erosion caused by the Colorado River at the base of a low range of hills has resulted in the accumulation of this material. The river wash itself

does not carry much value, but the disintegrated matter above carries it; and the erosion of present day gulches has resulted in local concentrations which were worked by the Mexicans.

Coming down from the Owens Lake country, along the eastern base of the Sierras, was an ancient channel which may have come through Red Rock canyon, where it was joined by another, flowing eastward from Tehachapi by way of Jawbone canyon. Turning easterly, its course can be traced by way of Goler and Summit Diggings. From here on, it may have gone by way of Copper Canyon to Long Range and Coolgardie, there to lose itself near Barstow in the present channel of the Mojave. Another portion of this system runs from the Stringer district down through St. Elmo wash, where it is still being worked in a small way by hand dry washers. Another comes down Goler wash, in the Panamints.

This channel or system of channels, is one of the best known in the south, and illustrates, by its physical characteristics, a point which strikes the writer very forcibly in its bearing on the possible economic operation of these gravels.

As a rule, the stream gravel, which consists of well rounded boulders of crystalline rocks from the Sierras, carries no value at all. Wherever it crossed a belt of metamorphics containing quartz stringers, or any body of olivine-bearing, or other basic rocks; by local erosion it produced, in connection with the heavy cloudbursts which swept down the gulches intermittently, local concentrations of gold. As a result, at Goler one can notice that the shingling of the washed material is transverse to the general direction of the course of the deposits. Heavy gold is found near the tops of the ridges and from thirty to sixty feet above bedrock, and on local false bedrocks of clay and disintegrated volcanics. At Summit Diggings, intensively worked on account of its shallow depth during early days, a scheme is now proposed of bringing water twelve miles to cover the deposit. The same thing is proposed at Coolgardie, with a fifteen-mile water system. As the concentrations have long been worked out by hand methods, and the general body of the deposits will only run from fifteen to sixty cents a yard, it is considered a waste of time and money to carry out either of these ideas.

In Lytel Creek, along the line of the Santa Fe, there was a local concentration from stringers in the granite. This has all been worked out. A little water was available here.

The last of these very interesting systems consists of a channel which, coming down from Placerita canyon, near Newhall, with another branch which headed above Bouquet canyon, crossed into San Francisquito and came down somewhere below Piru, to be joined by another course which came from Lockwood by way of Piru canyon.[1] It was impossible to work out the definite course of this system, but the above is a fair approximation. This was much worked in the early history of Los Angeles and Ventura counties; but as even the Chinamen gave it up as no longer affording them a living, it would not be advisable for a white man to try it. The values appeared to be concentrated on the points of the present hills and in the gulches. Quite a little water was available for working this system.

[1]In preparing this article, the San Gabriel and the Bear and Holcomb Valley deposits have been omitted, as they do not come under the head of dry, or semi-dry placers.

It must be remembered, in estimating the gross production of this, as well as other regions in this part of the country, that a large part of the work was done when wages averaged about a dollar a day, in times of industrial depression. Many men, making a bare living at best, preferred to be their own masters while doing it; and the aggregate of all their earning presents an impressive figure. Considering the length of time involved, and the number of men employed, it is no wonder that the aggregate amount, even from very poor diggings, was large.

One final point that has impressed the writer, and with particular force, is the total and absolute failure of air separation processes when applied on anything larger than a hand scale. Two monuments to this failure still stand in mournful state—one at Goler, and the other at Coolgardie. Limited capacity and imperfect separation are the main reasons. A machine which will work on a laboratory scale with material which has been dried on a hot plate, certainly will not be a success when applied to the general run of desert material—especially after a shower has moistened the ground. The material simply balls up on the canvas tables. Further, machines of this character are so cumbrous that they lose the chief advantage of the hand machine—its ability to be transported from one spot, or concentration of gold, to another as soon as the pay has been worked out.

The most successful method of handling this material, in the judgment of the writer, is one which was tried out in the Randsburg district some time ago. It consists in the use of a very little water and the constant saving and return of the same for rewashing. This venture 'broke even' on four dollar ground when water cost a quarter cent a gallon and had to be hauled five miles. The cost of one miner's inch, which in the north country is supposed to move one yard of ground under proper conditions, would be thirty-six dollars a day, at this rate, if the water were not returned.

In the method referred to, a sluice about seven feet long and fourteen inches wide, is given a head motion by an eccentric, and driven by a two-horsepower gas engine. The sluice has a false bottom, with holes immediately behind the hungarian riffles. The material is wheeled and shoveled in, after boulders have been screened out. The water carries out the fines on about a twelve-inch grade into a wheelbarrow which stands over a pit. The wheelbarrow is punched full of holes, and the water is drained into the pit from it. It is then pumped back by a centrifugal pump, which is run by the same gas engine from a countershaft, through the false bottom, where it jets up behind the riffles to perform its service in carrying the material through the sluice again. The only loss of water is through evaporation and absorption; the riffles are always kept open by the uplifting jets of water; and the concentrating motion of the eccentric head makes a very effective jig of the whole affair.

To the writer's mind, where any water at all is available, this process of separation has all the air processes on the market completely distanced; but it can only be applied on a small scale to ground which will run from four dollars up—and in his experience there is so little of the desert placer which will run this amount per yard that it is practically negligible.

SECRETARY'S OFFICE.

W. W. THAYER, Secretary.

The California State Mining Bureau was created April 16, 1880, by legislative act. In March, 1893, the original act was repealed and an amended act approved and passed by the legislative body. Again on June 16, 1913, a new Mining Bureau Act was approved which became effective August 10, 1913, repealing all former acts, and forming the basic law under which the Bureau now functions.

It is doubtless true that both the mining and lay public have not in the past always recognized the part played by the Bureau in the development of the state's mineral resources. Innumerable inquiries regarding them, originating within and without its borders and in foreign countries, have been answered with ultimate results reflected by a consistent growth in the value of the state's mineral output since the records of production were first compiled by the Bureau in 1887.

It is believed that a better understanding of the economic position occupied by the Bureau will be imparted to the public whose funds support it, by embodying in the Monthly Chapter a review of the executive activities.

The responsibility for the coordination of effort of each department, to the end that the utmost efficiency may be maintained with the limited and variable appropriations accorded the Bureau by successive legislatures, rests upon the office of Secretary.

Activities referable to that office, such as reports of new maps and publications issued, amount of mail handled, changes and enlargements in offices, changes in personnel of the staff, property and equipment, financial statements, etc., are therefore included herein.

New Publications.

During the month the following Bureau publications have been made available for distribution:

Oil Field Map No. 5, Whittier-Fullerton, including Whittier, West Coyote and Montebello Fields. Revised to May 20, 1922.
Oil Field Map No. 7, Sunset Oil Field. Revised to May 1, 1922.
Oil Field Map No. 13, Kern River Oil Field. Revised to May 25, 1922.
Oil Field Map No. 14, Coalinga Oil Field. Revised to May 15, 1922.
Oil Field Map. No. 15, Elk Hills Oil Field. Revised to June 1, 1922.
Summary of Operations, California Oil Fields, April, 1922. Vol. 7, No. 10.
Mining in California, June, 1922, (Monthly) Vol. 18, No. 6.

Distribution of Publications.

The Bureau's publications are constantly in demand, requests for copies coming from all over the United States and foreign countries.

Publications were distributed during the month as follows:

Publications	Number distributed
Report XV, State Mineralogist	1
Report XVII, State Mineralogist	18
Mines and Mineral Resources of Colusa, etc.	1
Mines and Mineral Resources of Del Norte, etc.	3
Mines and Mineral Resources of Fresno, etc.	1
Mines and Mineral Resources of Butte, etc.	2
Mines and Mineral Resources of El Dorado, etc.	4

Publications	Number distributed
Mines and Mineral Resources of Los Angeles, etc.	1
Mines and Mineral Resources of Monterey, etc.	2
Mines and Mineral Resources of San Bernardino, etc.	2
Mines and Mineral Resources of Nevada County	5
Mines and Mineral Resources of Plumas County	1
Bulletin No. 6, California Gold Mill Practices	5
Bulletin No. 23, Copper Resources of California	1
Bulletin No. 37, Gems, Jewelers' Materials and Ornamental Stones of California	5
Bulletin No. 46, Index of Mining Bureau Publications	1
Bulletin No. 50, Copper Resources of California (Revised)	2
Bulletin No. 72, Geologic Formations of California	8
Bulletin No. 75, United States and California Mining Laws	30
Bulletin No. 76, Manganese and Chromium in California	2
Bulletin No. 78, Quicksilver Resources of California	5
Bulletin No. 85, Platinum Resources of California	6
Bulletin No. 86, California Mineral Production for 1918	1
Bulletin No. 89, Petroleum Resources of California, with special reference to unproved areas	84
Mining in California (Monthly), Vol. 18, No. 5, May, 1922	2400
Summary of Operations, California Oil Fields (Monthly), April, 1922, Vol. 7, No. 10	2600
County Maps and Registers of Mines	5
El Dorado Forest Map	3
Placer Forest Map	2
Shasta Forest Map	3
Sierra Forest Map	3
Siskiyou Forest Map	3
Tuolumne Forest Map	1
Inyo Geological Map	1
Tuolumne Mineral Map	2
Forest Map, Unmounted	1
Forest Map, Mounted	1
Geological Map of California, Mounted	10
Map Accompanying Bulletin No. 89	28
Plumas Mineral Map	2
Oil Field Maps	475

Mails and Files.

The Bureau maintains in addition to its correspondence file a mine report file which includes reports on some 7500 mines and mineral properties in California. Also there is available to the public a file of the permits granted to mining and oil corporations by the State Commissioner of Corporations.

During the month 716 letters were received and answered. They are practically all requests for information and the inquiries cover all phases of prospecting, mining and developing mineral deposits, reduction of crude minerals and marketing of refined products.

Drafting.

The Bureau maintains an up-to-date drafting department, where topographic and geological maps, tracings, oil well logs, and oil field maps are prepared.

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Statistician and Curator.

STATISTICS.

California produces commercially at least fifty different mineral substances, with a total annual value of nearly $250,000,000. There are several thousand operating properties including mines, quarries, oil and gas wells, mineral springs, salt works, gravel pits, mills and smelters.

Some data relative to the 1921 production has been given in 'Mining in California', beginning with the April issue, and additional substances are covered herein. It is hoped that the completed figures and final summaries may be ready for publication in the August issue of this bulletin. Although over six months have elapsed since the close of 1921, there are still a few operators who are delinquent in their reports. Statistics lose much of their value if late; and the tardiness of only a few prevents early publication of the data. We respectfully urge promptness upon all those interested in the development of California's mineral resources.

ASPHALT.

Bibliography: State Mineralogist Reports VII, X, XII, XIII, XIV, XV, XVII. Bulletins 16, 32, 63, 69.

Asphalt was for a number of years accounted for in reports by the State Mining Bureau, because in the early days of the oil industry, considerable asphalt was produced from outcroppings of oil sand, and was a separate industry from the production of oil itself. However, at the present time most of the asphalt comes from the oil refineries, which produce a better and more uniform grade; hence, its value is not now included in the mineral total, as to do so would be in part a duplication of the crude petroleum figures. Such natural asphalt as is at present mined is in the form of bituminous sandstones, and is recorded under that designation.

The production of refinery asphalt, from 16 plants in California, amounts annually to over 250,000 tons, worth approximately $2,500,000. California leads all other states of the Union in such production, as her crude oils are almost entirely of asphaltic base.

DOLOMITE.

Bibliography: Reports XV, XVII. Bulletin 67.

Previous to the 1915 report dolomite was included under limestone. Limestones are frequently more or less magnesian-bearing, and a chemical analysis is often necessary to definitely decide as to whether they are calcite or dolomite; the latter standing intermediate between magnesite ($MgCO_3$) and calcite ($CaCO_3$). Since dolomite, as such, has been found to have certain distinctive applications, we have given it a separate classification.

An important part of the tonnage being shipped is utilized as a refractory lining in the bottoms of open-hearth steel furnaces, as a substitute for magnesite. A portion is used for its carbonic acid gas (CO_2), and part for its magnesia. We are also informed that some calcined dolomite has been used by the paper mills. As dolomite contains the proper proportions of lime and magnesia, it can replace an artificial mixture of calcined limestone and magnesite in the sulphite process of manufacture of paper from wood pulp. Dolomite is also sometimes used as a flux in metal smelting.

The dolomite production in Inyo County is utilized for its CO_2 by the chemical plants on Owens Lake, in the manufacture of soda ash and bicarbonate from the waters of the lake. The Tuolumne County material is burned for the preparation of a dolomitic lime.

The production of dolomite for the year 1921 amounted to 31,195 tons, valued at $99,155, and came from a total of 7 quarries in 5 counties, distributed as follows:

County	Tons	Value
Inyo	22,112	$49,073
Monterey	2,500	8,750
San Benito, San Bernardino, Tuolumne*	6,583	41,332
Totals	31,195	$99,155

*Combined to conceal output of a single operator in each.

Amount and value of the output of dolomite, annually, have been as follows:

Year	Tons	Value
1915	4,192	$14,504
1916	13,313	46,566
1917	27,911	66,416
1918	24,560	79,441
1919	24,502	67,953
1920	42,388	132,791
1921	31,195	99,155
Totals	168,061	$506,826

FELDSPAR.

Bibliography: Reports XV, XVII. Bulletin 67. U. S. Bureau of Mines, Bulletin 92.

Feldspar was produced by eight operators in three counties during 1921, to the amount of 4349 tons, valued at $28,333.

Feldspar production began in California in 1910. The mineral is a constituent of many rocks, but can only be commercially produced from pegmatites where the crystals are large and quite free from impurities. The open-cut quarry method of mining this material is commonly used.

Manufacturers of enamel wares and pottery buy most of the better grades of feldspar produced. Small quantities are used in the manufacture of glass and scouring soaps, and the more impure material is used as chicken grit, in making various brands of roofing, and in other ways. Various experiments have been made with the potash feldspars in the attempt to extract their potash content for use in fertilizers. The most successful of these has been accomplished through the medium of cement manufacture, and recovery of the potash as a by-product.

The requirements of the pottery trade demand that in general the percentage of free silica associated with the feldspar be less than 20%, and in some cases the potters specify less than 5%. An important factor, also, is the iron-bearing minerals frequently present in pegmatites and granites, such as biotite (black mica), garnet, hornblende, and black tourmaline. Feldspar for pottery uses should be practically free of these. The white, potash-mica, muscovite, is not particularly objectionable except that, being in thin, flexible plates, it does not readily grind to a fineness required for the feldspar.

The most important recent developments in feldspar deposits in California have taken place in San Diego and Riverside counties, where large deposits of massive, high-grade spar are being opened up. These deposits are unusually free from black mica and other deleterious iron-bearing minerals objectionable in pottery work. The important districts are near Lakeside and Campo in San Diego County, and near Lakeview, Murrietta, and Elsinore, in Riverside County. For 1921, some production was also reported from San Bernardino County; but none was reported from Monterey and Tulare counties.

Total amount and value of feldspar production in California since the inception of the industry are given in the following table, by years:

Year	Tons	Value	Year	Tons	Value
1910	760	$5,720	1917	11,792	$46,411
1911	740	4,560	1918	4,132	22,061
1912	1,382	6,180	1919	1,272	12,965
1913	2,129	7,850	1920	4,518	26,189
1914	3,530	16,565	1921	4,349	28,333
1915	1,800	9,000			
1916	2,630	14,350	Totals	39,034	$200,179

FULLER'S EARTH.

Bibliography: Reports XIV, XVII. Bulletin 38. U. S. Bureau of Mines, Bulletin 71.

Fuller's earth includes many kinds of unctuous clays. It is usually soft, friable, earthy, nonplastic, white and gray to dark green in color, and some varieties disintegrate in water. Like all other clays, fuller's earth is a hydrous aluminum silicate, but usually contains a higher percentage of water of composition than most clays. This water is not an essential factor in the bleaching properties of all fuller's earths, as some bleach fully as well after it has been driven off as before, and others lose much of their bleaching power when this water is removed.

All fuller's earths which have been found valuable for bleaching purposes show a distinctly so-called 'acid reaction.' (If a sample is touched to neutral litmus paper the paper will be turned red). Chemical analyses are now well understood to be no criterion in determining the classification of a given clay as 'fuller's earth.' *The final determination is a commercial one as to its capacity for absorbing basic colors and removing these colors from solution in animal, vegetable or mineral oils, also from water.*

[1]"The Shipping Board's Inquiries also brought out the interesting information that only domestic fuller's earth is used for the refining of mineral oils. There appears, on the other hand, to be a difference of opinion as to the suitability of the domestic earth for use in refining edible oils. Some of the larger users of fuller's earth, anticipating a shortage of imported material, began early in the war to experiment with domestic earths in refining edible oils and fats, with results so satisfactory that they became independent of imported earth. Others stated that they had experimented with every known domestic earth, but had not found one that completely met the requirements to supplant the imported earth. The requirements of a good earth for refining edible oils are (1) that it shall bleach well and that the oil shall not revert to its original color; (2) that it shall filter well and not cake badly; (3) that it shall leave no permanent disagreeable taste or odor; (4) that the retention of oil in the spent earth shall be small; and (5) that there shall be no spontaneous ignition either in the press or in the waste piles. Those who use the imported earth claim that it is standard in all of these requirements, and that the domestic earth is deficient in one or more of them. Such a defect as inability to bleach well appears to be inherent in some domestic earth, and can not be remedied by treatment. Other defects, such as the taste or odor left by the earth, which is the most frequent objection urged against the domestic material, may possibly be overcome by treatment. Another serious fault charged against the American earth is that it retains a greater proportion of oil than the English earth, which means a direct loss in production; also that it clogs the filter presses more, so that they require more frequent cleaning, which causes further decrease in production. It is also charged that domestic earth is more subject to spontaneous combustion."

In California, fuller's earth has been used in clarifying both refined mineral and vegetable oils, and for special chemical purposes; although its original use was in fulling wool, as the name indicates.

Production has mainly come from Calaveras and Solano counties. Deposits have also been found in Riverside, Fresno, Inyo, and Kern counties. Experiments are being conducted by some of the large oil refiners, with clays of the montmorillonite and halloysite group ('rock soap') to determine their suitability, or efficacy as a substitute for fuller's earth in the refining of petroleum products. Deposits of this class of material have been exploited during the past three years in Inyo, San Bernardino, and San Diego counties, and occurrences have been noted in several other counties of California.

The production of 1185 tons, valued at $8,295, here credited to 1921, as 'fuller's earth' is in reality a colloidal clay of the montmorillonite class ('bentonite', 'otaylite', 'elkonite', 'shoshonite', are merely local names arbitrarily applied to varieties of this mineral found in a given locality). Because it was used for clarifying and filtering processes, we have placed it, for the purposes of this statistical report, under the 'fuller's earth' heading. As noted above, the final determination as to what constitutes a fuller's earth is a commercial one.

[1]Middleton, Jefferson, Fuller's Earth in 1918: U. S. Geol. Surv., Min. Res. of U. S. 1918. Part II, p. 136. 1919.

Fuller's earth was first produced commercially in this state in 1899, and the total amount and value of the output since that time are as follows:

Year	Tons	Value	Year	Tons	Value
1899	620	$12,400	1912	876	$6,500
1900	500	3,750	1913	460	3,700
1901	1,000	19,500	1914	760	5,928
1902	987	19,246	1915	692	4,002
1903	250	4,750	1916	110	550
1904	500	9,500	1917	220	2,180
1905	1,344	38,000	1918	37	333
1906	440	10,500	1919	385	3,810
1907	100	1,000	1920	600	6,000
1908	50	1,000	1921	1,185	8,295
1909	459	7,385			
1910	340	3,820	Totals	12,381	$177,443
1911	466	5,294			

GEMS.

Bibliography: State Mineralogist Reports II, XIV, XV, XVII. Bulletins 37, 67. U. S. G. S., 'Mineral Resources of the U. S.'; Bull. 603, p. 208. Bull. Dept. Geol. Univ. of Cal., Vol. 5, pp. 149-153, 331-380. Am. Jour. Sci., Vol. 31, p. 31.

The production of gem materials in California has been somewhat irregular and uncertain during the past ten years. The compilation of complete statistics is difficult owing to the widely scattered places at which stones are gathered and marketed in a small way. The higher figure of the year 1920 was due to shipments of quartz crystals from Calaveras County and Iceland spar from Modoc County sold for optical purposes, which use demands material of gem quality and free from flaws. The 1921 yield was in smaller amount.

The following table shows the production, by counties, of rough, uncut gem and jeweler's materials during 1921:

County	Value	Kind
Butte	$331	Diamonds and Californite.
San Diego	1,405	Tourmaline, quartz crystals, beryl, spessartite garnet.
Los Angeles	*9,218	Garnets.
Modoc		Optical Iceland spar.
Riverside		Quartz crystals.
San Bernardino		Blue chalcedony.
Sonoma		Chalcedony.
Total value	$10,954	

*Combined to conceal output of a single operator in each.

Varieties of California Gem Stones.

Diamonds have been found in a number of localities in California; but in every case, they have been obtained in stream gravels while working them for gold. The principal districts have been: Volcano in Amador County; Placerville, Smith's Flat and others in El Dorado

County; French Corral, Nevada County; Cherokee Flat and Yankee Hill, Butte County; Gopher Hill and upper Spanish Creek, Plumas County. The most productive district of recent years has been Cherokee in Butte County. One stone weighing 1.85 carats was found in Morris Ravine, near Cherokee, in 1920.

California *tourmalines* are decidedly distinctive in coloring and 'fire' as compared to foreign stones of this classification. The colors range from deep ruby to pink, and various shades of green; also a blue tourmaline has been found.

One of our California gem stones, *benitoite*, has not been found elsewhere; and in but a single locality here: The Dallas Mine in San Benito County.

Kunzite, a gem variety of spodumene, was first found in the Pala district in San Diego County. It has thus far been found in only one locality (Madagascar) outside of California. It is of a lilac color, and is described in detail in Bulletin 37 of the State Mining Bureau.

Beryls of excellent fire and delicate colors are also obtained in the Pala district, of which the *aquamarine* (blue) and *morganite* (pink) varieties deserve special mention. Morganite, like kunzite, has thus far been found elsewhere only in Madagascar.

Californite, or 'California jade,' is a gem variety of vesuvianite, and is green or white in color. It is found in Butte, Fresno, and Siskiyou counties.

Some *rhodonite* has been mined in Siskiyou County, and used for decorative purpose, its value being included in the marble figures.

Chrysoprase has been produced in Tulare County.

Turquoise has been found in the desert section of San Bernardino County, but none produced commercially in recent years.

Total Production of Gem Materials in California.

The value of the gem output in California annually since the beginning of commercial production is as follows:

Year	Value	Year	Value
1900	$20,500	1912	$23,050
1901	40,000	1913	13,740
1902	162,100	1914	3,970
1903	110,500	1915	3,565
1904	136,000	1916	4,752
1905	148,500	1917	3,049
1906	497,090	1918	650
1907	232,642	1919	5,425
1908	208,950	1920	36,056
1909	193,700	1921	10,954
1910	237,475		
1911	51,824	Total	$2,144,492

GOLD.

Bibliography: State Mineralogist Reports I to XVII (inc.). Bulletins 36, 45, 57. U. S. Geol. Surv., Prof. Paper 73.

Gold was the first and, for many years, the most important single mineral product of California. Although now surpassed for a number of years in annual value by petroleum, and by cement during the past two years, it still heads our metal list, and California continues to outrank all the other gold-producing states of the United States, including Alaska.

The increases in costs of all supplies, labor, and transportation beginning in 1915 made it increasingly difficult in the period following for the gold miner to operate at a profit. Many mines were forced to close down, and the gold output of not only California, but of the other western gold states, decreased greatly. Economic conditions are now slowly improving, and gold production is again on the upward trend. This is evidenced by the increase of nearly a million and a half dollars in value for 1921 over the 1920 yield. This, too, in spite of the continued shut-down of all but one of the large copper properties, which have always been important producers of by-product gold and silver.

Outlook for 1922.

According to the mid-year review of Yale[1], mint and smelter receipts for the first six months of 1922 have totaled $7,721,258 in gold, or $371,140 more than during the first six months of 1921:

"The gold-mining industry is slowly recovering from the effects of the war, but a number of the mines still continue to work under restrictions and few large deep or placer mines are being started. The increase in the output of gold appears to be coming from an added number of small mines, both deep and placer, that are worked by their owners or lessees rather than from the properties of the larger companies, but the increase is mainly in the output of the dredges, more gold coming from the dredges now than from all the deep mines in the State. The ratio of increase in the output of gold from the deep mines is about 4 per cent and that of the increase from the combined placers, including dredges, is 15 per cent. The water supply for the hydraulic and other placer mines has generally been good, but it came a month or more later than usual, owing to cold weather and the packing of snow on the mountains, and this condition naturally reduces somewhat the receipts of gold from the placer mines early in the year."

Production in 1921.

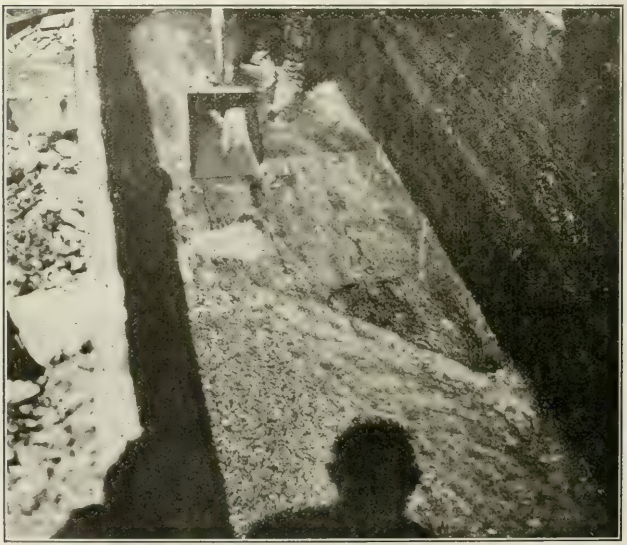
The State Mining Bureau has never independently collected statistics of gold and silver production, as there is no necessity for duplicating the very thoroughly organized work of the U. S. Geological Survey covering those metals. The data here given relative to these two metals have been received through the courtesy and cooperation of Mr. Charles G. Yale, Statistician in Charge of the San Francisco branch office of the Division of Mineral Resources. Anyone wishing fuller details of the production of these metals may obtain the same by applying to the U. S. Geological Survey, Washington, D. C., or to room 303, U. S. Custom House, San Francisco, California, for a copy of the 'separate' on the subject.

[1]Yale, Chas. G., U. S. Geol. Surv., Press Bulletin July 20, 1922.

The gold production of California for 1921 was distributed, by counties, as follows:

County	Value	County	Value
Amador	$2,167,443	Placer	$132,468
Butte	456,760	Plumas	127,148
Calaveras	1,495,758	Sacramento	1,690,662
El Dorado	34,109	San Bernardino	217,568
Fresno	13,085	Shasta	267,681
Humboldt	2,054	Sierra	612,267
Imperial	537	Siskiyou	42,635
Inyo	80,373	Stanislaus	18,439
Kern	84,698	Trinity	437,993
Lassen	39,943	Tuolumne	96,026
Madera	1,053	Yuba	4,738,248
Mariposa	331,295	Del Norte, Los Angeles,	
Mendocino	1,509	Orange, San Diego*	3,991
Merced	3,163		
Mono	37,754		
Nevada	2,570,162	Total value	$15,704,822

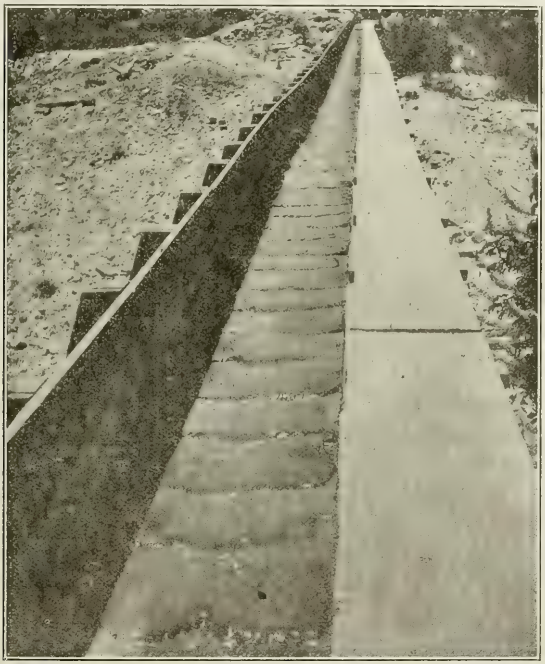
*Combined to conceal output of a single operator in each.



Shoveling gold in sluice-box during clean-up of Elephant Hydraulic Mine, Volcano, Amador County, Cal., June 24, 1922. The bright patch in front of the shovel, and streak diagonally across the flume at upper edge of gravel, is washed gold in small-size nugget form.

The following is quoted from the advance chapter on Gold in 1921, by courtesy of Mr. Charles G. Yale, of the U. S. Geological Survey:

"A somewhat gratifying condition is shown in certain of the metal-mining industries in California, as proven by the material increase in value of total output in 1921, while in others depression still exists. The increase is entirely due to the improvement in gold and silver mining in the State, the copper, lead, and zinc industries all showing greatly decreased output, as compared with 1920. The total value of these metals produced in California in 1921 was $20,952,423, which is an increase of $1,978,763 over 1920. Only one of the larger copper-mining companies continued operations throughout the year and most of the smaller mines remained idle. The large lead-producing companies curtailed operations or shut down entirely, and what shipments



Pine-block riffles in sluice-box of Elephant Hydraulic Mine, at Volcano, Amador County.

were made by any of the mines were comparatively small. Only one producer of zinc reported output and that was in an experimental or test way with the process of recovery adopted. Deep-mine gold output increased 4 per cent, but placer gold increased 15 per cent. The deep-mine silver increased 114 per cent, while the increase from placers was only nominal. Costs of mining all the metals still continued higher than the normal rate, which has naturally resulted in curtailment of operations among the larger mines and kept many, large and small, entirely idle. Under such conditions inauguration of new enterprises has been exceptionally small in number and older companies have not spent much money in new equipment or in prospecting new ground. Development has continued, however, where circumstances have warranted, but smaller crews have been employed than usual, as none of the companies have shown a desire to close down entirely, except where conditions have compelled them to do so. For the first time in many, many years the placer gold output has exceeded that from

the deep mines, for in 1921 the placers led by over half a million dollars. This supremacy was gained by the activities of the gold dredges.

"In the five Mother Lode counties of the State, in one of which the deepest gold mines are in operation, the output of siliceous milling ore increased to some extent in 1921, but the average recovery per ton of ore was less by 97 cents.

"The average value of all metals from ores of the State in 1921 was $10.50, as compared with $10.20 a ton in 1920. From ordinary ore sent to gold and silver mills the recovery was $7.67 in gold and $0.09 in silver, compared with $8.34 a ton in gold and 0.16 in silver in 1920. The recovery from concentrates treated was $29.15 a ton in gold and $5.89 in silver, compared with $24.22 a ton in gold and $6.34 in silver. Crude ore of all kinds sent to smelters averaged $5.02 in gold and $75.61 in silver. Old tailings treated—38,299 tons—averaged $2.84 in gold and $0.56 in silver.

"The details of mining work in the Mother Lode counties of California are given in the section on production by counties. It is to be borne in mind that these figures are by county, not strictly confined to the actual mines in the Mother Lode itself, as generally recognized, but include those on the so-called East belt and others in the respective counties. By far the largest production, however, is from mines in the Mother Lode itself."

* * * * * * *

"The mine production of gold in California in 1921 was $15,704,822, or $1,393,779 more than in 1920. Of the deep-mine gold 99 per cent was derived from siliceous ore. Of the placer gold the dredges yielded $856,421 more than in 1920; the hydraulic mines $96,575 more; the drift mines $64,486 more; and the surface or sluicing mines $76,729 more. From 1898, when gold-dredging began in California, to the end of 1921, the gold output from that source has been $124,992,984. Since 1898 the Oroville or Feather River dredging field, in Butte County, has yielded $31,698,775, not including $2,556,216 derived in the last 12 years from the adjacent fields in the same county; from 1903 to 1921 inclusive, the Marysville, or Yuba River field, in Yuba County, produced $44,234,042; and since 1902 the Folsom, or American River field, in Sacramento County, has produced in gold $28,501,049. Dredges have also been, and are being, operated in several smaller fields in other northern counties of the State.

"The placer mines produced 52 per cent of the total gold yield in 1921 and the deep mines 48 per cent, as compared with 49 per cent and 51 per cent in 1920. This is the first time since the enforced restrictions on hydraulic mining that gravel mines have exceeded the output of the quartz mines in gold in California. The dredges produced 49 per cent of the total gold from all sources in 1921. Of the total placer gold, dredges produced 95 per cent, hydraulic mines 2 per cent, drift mines 2 per cent, and sluicing mines 1 per cent. The larger dredging fields are at Oroville, Butte County; Folsom, Sacramento County; and Hamilton, Yuba County. In these 3 fields 20 dredges were working in 1921, but there were also 1 in an 'outside' field of Butte County, 1 in Amador, 3 in Calaveras, 1 in Placer, 4 in Shasta, 2 in Stanislaus, and 3 in Trinity. Yuba County made by far the largest increase of gold output in 1921, as compared with 1920—$1,266,112—and reached the highest peak of total production ever obtained in any dredging field in the State. Sacramento also increased its dredge-gold yield by $112,902, but Butte County shows a reduction of $21,633 for the year.

"It should be mentioned here that certain difficulties are met with in the arrangement of the 'distribution' of gold in California; that is, placing its exact origin by county, and also that some counties are apt to be credited with a larger output of gold than they are really entitled to. The reason is that in certain mining centers, like Grass Valley and Nevada City, in Nevada County, Jackson, in Amador County, Redding, in Shasta County, Oroville, in Butte County, Yreka, in Siskiyou County, and so on, gold is brought for sale to banks, or buyers, or for express shipments from quite a circle within range of these towns. This is mostly from small mines, leased and individually worked, by foreigners who will not answer inquiries, and very much of it from 'high-graders.' The latter gentry prefer, when possible, to sell or ship their gold at or from points at some distance from where it was mined. The shipments are made by express or private hands. Hundreds of small lots are received by storekeepers in exchange for goods, and by banks and gold-dust buyers, who make no note of the name of the seller or the locality he comes from. But these in the aggregate make large sums in a year and must be credited, for example, to 'small mines at Grass Valley,' but much of the gold may have come from Placer, Yuba, Sierra, Plumas, Butte, or other neighboring counties. There is no way of telling the exact origin, however, as the question is not asked by the buyers. In the centers named, as well as in others, much gold accumulates in the way described and is then sent to be minted.

* * * * * * *

"The gold recovered from ore and tailings in California in 1921 was as follows: By amalgamation, 283,404.29 fine ounces; by cyanidation, 38,100.18 fine ounces, a large part of which was derived from the concentrates; from concentrates and ore sent to smelters, 43,736.68 fine ounces. These figures are only approximate, as many small operators keep no separate accounts, and even the larger companies do not always segregate the quantity of gold obtained by methods of treatment. This is especially the condition where larger mills amalgamate in the batteries and on the plates and pass the tailings and concentrates direct to the cyanide plants. All the placer gold was recovered by amalgamation."

Total Gold Production of California.

The following table was compiled by Chas. G. Yale, of the Division of Mineral Resources, U. S. Geological Survey, but for a number of years statistician of the California State Mining Bureau and the U. S. Mint at San Francisco. The authorities chosen for certain periods

were: J. D. Whitney, state geologist of California; John Arthur Phillips, author of "Mining and Metallurgy of Gold and Silver" (1867); U. S. Mining Commissioner R. W. Raymond; U. S. Mining Commissioner J. Ross Browne; Wm. P. Blake, Commissioner from California to the Paris Exposition, where he made a report on "Precious Metals" (1867); John J. Valentine, author for many years of the annual report on precious metals published by Wells, Fargo & Company's Express; and Louis A. Garnett, in the early days manager of the San Francisco refinery, where records of gold receipts and shipments were kept. Mr. Yale obtained other data from the reports of the director of the U. S. Mint and the director of the U. S. Geological Survey. The authorities referred to, who were alive at the time of the original compilation of this table in 1894, were all consulted in person or by letter by Mr. Yale with reference to the correctness of their published data, and the final table quoted was then made up.

The figures since 1904 are those prepared by the U. S. Geological Survey:

Year	Value	Year	Value
1848	$245,301	1886	$14,716,506
1849	10,151,360	1887	13,588,614
1850	41,273,106	1888	12,750,000
1851	75,938,232	1889	11,212,913
1852	81,294,700	1890	12,309,793
1853	67,613,487	1891	12,728,869
1854	69,433,931	1892	12,571,900
1855	55,485,395	1893	12,422,811
1856	57,509,411	1894	13,923,281
1857	43,628,172	1895	15,334,317
1858	46,591,140	1896	17,181,562
1859	45,846,599	1897	15,871,401
1860	44,095,163	1898	15,906,478
1861	41,884,995	1899	15,336,031
1862	38,854,668	1900	15,863,355
1863	23,501,736	1901	16,989,044
1864	24,071,423	1902	16,910,320
1865	17,930,858	1903	16,471,264
1866	17,123,867	1904	19,109,600
1867	18,265,452	1905	19,197,043
1868	17,555,867	1906	18,732,452
1869	18,229,044	1907	16,727,928
1870	17,458,133	1908	18,761,559
1871	17,477,885	1909	20,237,870
1872	15,482,194	1910	19,715,440
1873	15,019,210	1911	19,738,908
1874	17,264,836	1912	19,713,478
1875	16,876,009	1913	20,406,958
1876	15,610,723	1914	20,653,496
1877	16,501,268	1915	22,442,296
1878	18,839,141	1916	21,410,741
1879	19,626,654	1917	20,087,504
1880	20,030,761	1918	16,529,162
1881	19,223,155	1919	16,695,955
1882	17,146,416	1920	14,311,043
1883	24,316,873	1921	15,704,822
1884	13,600,000		
1885	12,661,044	Totals	$1,735,922,923

GYPSUM.

Bibliography: Reports XIV, XV, XVII, XVIII. Bulletins 38, 67.

Gypsum is widely distributed throughout the state, and is produced to a considerable extent, to supply the fertilizer manufacturers and also those of plaster and cement.

The action of gypsum as a fertilizer was formerly considered to be indirect[1]; that it was not a food for plants, but was supposed to act on the double silicate of magnesia and potash in the soil, freeing the magnesia and potash, so that they become available as plant food. Its use was believed to be beneficial only if these elements are present in the soil. More recently, investigations are stated to prove that gypsum serves as a source of both sulphur and calcium, which are plant foods.

Some authorities hold that land plaster tends to make nonporous clay soils more pervious to water and to make sandy soils less pervious. Ground gypsum has an affinity for water and will draw moisture from the atmosphere, so it keeps moisture in the soil and is of value to the farmer who is starting grain and grass crops, as it holds moisture where the roots of the small plants most need it. The use of ground gypsum or land plaster in a dry, hot season may draw enough moisture from the atmosphere to save a crop from damage by drought. Land plaster is employed to neutralize the black alkali that forms in many of the soils of arid regions, as in parts of California, Nevada and Utah.

Land plaster may be applied to the soil by drilling, or scattered in the hill, or it may be sowed broadcast, in quantities ranging from 200 to 500 pounds to the acre.

In the calcined form as plaster of Paris, gypsum plays a very important part in surgical work. It is also widely used in building operations, as a hard-wall plaster, as plaster board, etc. Approximately 2% of raw gypsum is added in the manufacture of Portland cement just before the final grinding.

During 1921, producers in Kern and San Bernardino counties took out a total of 37,412 tons, valued at $78,875, compared with 20,507 tons, valued at $92,535, in 1920.

Total Production of Gypsum in California.

Production of gypsum annually in California since such records have been compiled by this Bureau is as follows:

Year	Tons	Value	Year	Tons	Value
1887	2,700	$27,000	1906	21,000	$69,000
1888	2,500	25,000	1907	8,900	57,700
1889	3,000	30,000	1908	34,600	155,400
1890	3,000	30,000	1909	30,700	138,176
1891	2,000	20,000	1910	45,294	129,152
1892	2,000	20,000	1911	31,457	101,475
1893	1,620	14,280	1912	37,529	117,388
1894	2,446	24,584	1913	47,100	135,050
1895	5,158	51,014	1914	29,734	78,375
1896	1,310	12,580	1915	20,200	48,953
1897	2,200	19,250	1916	33,384	59,533
1898	3,100	23,600	1917	30,825	56,840
1899	3,663	14,950	1918	19,695	37,176
1900	2,522	10,088	1919	19,813	50,579
1901	3,875	38,750	1920	20,507	92,535
1902	10,200	53,560	1921	37,412	78,875
1903	6,914	46,441			
1904	8,350	56,592	Totals	547,558	$1,978,336
1905	12,859	54,500			

INFUSORIAL AND DIATOMACEOUS EARTHS.

Bibliography: State Mineralogist Reports II, XII, XIII, XIV, XV, XVII, XVIII. Bulletins 38, 67. Am. Inst. Min. Eng., Bull. 104, August, 1915, pp. 1539-1550.

Infusorial and diatomaceous earths—sometimes called tripolite—are very light and extremely porous, chalk-like materials composed of pure silica (chalk, being calcareous) which have been laid down under water and consist of the remains of microscopical infusoria and diatoms. The former are animal remains, and the latter are from plants. The principal commercial use of this material is as an absorbent. It is also employed in the manufacture of scouring soap and polishing powders; for filtration purposes; in making some classes of refractory brick; and as an insulating medium both in heating and refrigeration. It is a first-class nonconductor of heat, where high temperatures are employed, such as around steel and gas plants and power houses. In such cases, it is built in as an insulating layer in furnace walls. In Germany, under the name 'kieselguhr,' it was used as an absorbent for nitroglycerine in the early manufacture of dynamite.

As a nonconductor of heat it has been used alone or with other materials as a covering for boilers, steam pipes, and safes and in fireproof cements. It is used largely by paint manufacturers as a wood filler. Boiled with shellac it is made into records for talking machines. It has been used for absorbing liquid manures so that they could be utilized as fertilizers, and as a source of silica in making water-glass as well as in the manufacture of cement, tile glazing, artificial stone, ultra-marine and other pigments of aniline and alizarine colors, paper filling, sealing wax, fireworks, hard-rubber objects, matches, and papier maché, and for solidifying bromine. For making insulating brick the material is sawed from blocks, and for all other purposes it is ground and screened.

The most important deposits in California thus far known are located in Monterey, Orange, San Luis Obispo, and Santa Barbara counties. The Santa Barbara material is diatomaceous and is of a superior quality. Infusorial earth is also found in Fresno, Kern, Los Angeles, Plumas, San Benito, San Bernardino, San Joaquin, Shasta, Sonoma, and Tehama counties.

The 1921 production showed a decrease both in tonnage and value from the 1920 figures of 60,764 tons, and $1,056,260. As over 95% of the output was from a single, large operator, we have concealed the exact figures under the 'Unapportioned' item in the state and county totals. There were four operators in 1921, in Monterey, San Luis Obispo, and Santa Barbara counties.

Total Production of Diatomaceous Earth in California.

The first recorded production of these materials in California occurred in 1889; total amount and value of output, to date, are as follows:

Year	Tons	Value	Year	Tons	Value
1889	39	$1,335	1907	2,531	$28,948
1890	----------	----------	1908	2,950	32,012
1891	----------	----------	1909	500	3,500
1892	----------	----------	1910	1,843	17,617
1893	50	2,000	1911	2,194	19,670
1894	51	2,040	1912	4,129	17,074
1895	----------	----------	1913	8,645	35,968
1896	----------	----------	1914	12,840	80,350
1897	5	200	1915	12,400	62,000
1898	----------	----------	1916	15,322	80,649
1899	----------	----------	1917	24,801	127,510
1900	----------	----------	1918	35,963	189,459
1901	----------	----------	1919	40,200	217,800
1902	422	2,532	1920	60,764	1,056,260
1903	2,703	16,015	1921	*	*
1904	6,950	112,282			
1905	3,000	15,000	Totals	240,232	$2,134,621
1906	2,430	14,400			

*Under 'unapportioned.'

LIME.

Bibliography: Reports XIV, XV, XVII. Bulletin 38.

Lime to the amount of 463,534 barrels, valued at $610,619, was produced by seven plants in five counties during 1921, as compared with 463,144 barrels, valued at $557,232 in 1920.

So far as we have been able to segregate the data, this figure includes only such lime as is used in building operations. That utilized in sugar making, for smelter flux, as a fertilizer, and other special industrial uses, are classified under 'Industrial Materials.' That consumed in cement manufacture is included in the value of cement.

Distribution by counties is shown in the following table:

County	Barrels	Value
Kern	72,629	$141,491
Santa Cruz	122,907	242,869
San Bernardino, Shasta, Tuolumne*	267,998	226,259
Totals	463,534	$610,619

*Combined to conceal output of a single operator in each.

For table of production, by years, see under 'industrial' limestone, *post*.

LIMESTONE.

Bibliography: State Mineralogist Reports IV, XII, XIII, XIV, XV, XVII. Bulletin 38. Oregon Agr. College, Extension Bulletin 305.

Limestone was produced in eight counties during 1921, to the amount of 75,921 tons, valued at $305,912, being a decrease in tonnage but an increase in value over the 1920 output of 90,120 tons, worth $298,197.

The amount here given does not include the limestone used in the manufacture of cement, nor of lime for building purposes; but accounts for that utilized as a smelter and foundry flux, for glass and sugar making, and other special, chemical and manufacturing processes. It also includes that utilized for fertilizers (agricultural 'lime'), 'roofing gravel', whiting for paint, kalsomine, terrazzo, chicken grit, carbon dioxide gas, 'paving compound', and facing dust for concrete pipe. That indicated in the table below as coming from Santa Clara County is a calcareous marl sold for agricultural purposes.

In agriculture, the chief reason for the use of lime is now recognized to be that of correcting soil acidity. Lime is stated to be especially necessary for the proper development of the bacteria in the nodules on the roots of the legumes such as the clovers and alfalfa. It will also combine with some of the plant food materials already in the soil to make them more readily available, and will supply any lack of calcium as a plant food that may exist in the soil. To some extent, certain forms of lime will make heavy soils more friable, thus aiding aeration, cultivation and drainage. It may be applied, ground, in either the burned or unburned form, or as hydrated lime.

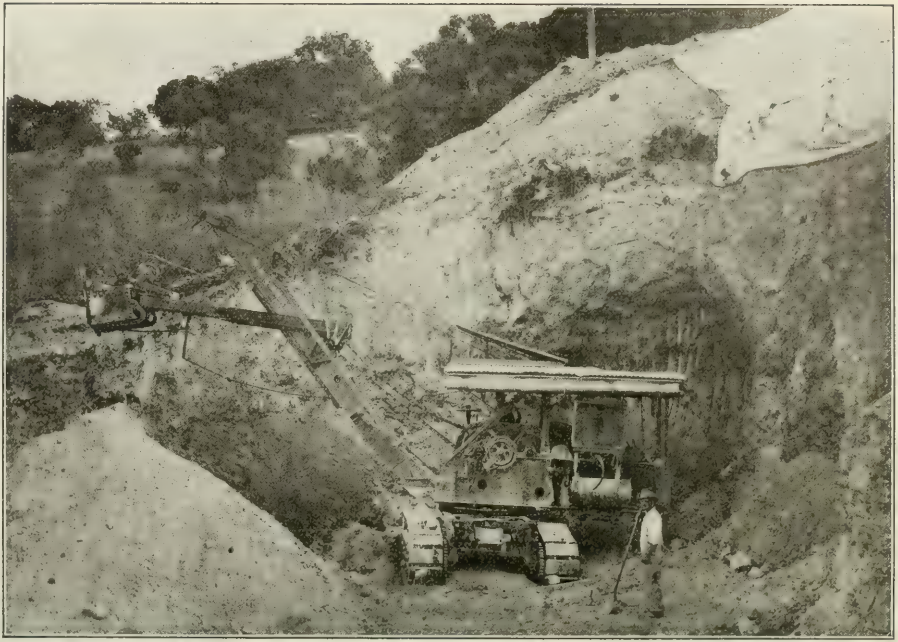
Distribution of the 1921 output was as follows:

County	Tons	Value
El Dorado	15,296	$66,143
San Bernardino	21,862	106,195
Tulare	10,030	40,090
Tuolumne	3,650	9,475
Kern, Los Angeles, Santa Clara[1], Santa Cruz[2]	25,083	84,009
Totals	75,921	$305,912

[1]Calcareous marl, used for fertilizer.
[2]Combined to conceal output of a single operator in each.

In the early reports of this Bureau values for lime and limestone were not segregated. The following tabulation shows the total combined value of such material since records for the state were first compiled, in 1887, to date:

Year	Value	Year	Value
1887	$368,750	1906	$925,887
1888	381,750	1907	1,162,417
1889	416,780	1908	676,507
1890	350,000	1909	997,745
1891	300,000	1910	1,058,891
1892	300,000	1911	843,778
1893	301,276	1912	1,034,688
1894	337,975	1913	803,002
1895	457,784	1914	896,376
1896	332,617	1915	442,592
1897	291,465	1916	608,208
1898	278,558	1917	667,776
1899	343,760	1918	917,573
1900	315,231	1919	800,188
1901	434,133	1920	855,429
1902	460,140	1921	916,531
1903	582,268		
1904	653,956	Total	$21,397,681
1905	878,647		



Bernal calcareous marl deposit, Edenvale, Santa Clara County. Photo by courtesy of Bernal Marl Fertilizer Co., San Jose, Cal.

SILVER.

Bibliography: State Mineralogist Reports IV, VIII, XII, XVIII, inc. Bulletin 67. Min. & Sci. Press, March 1, 1919.

Silver in California is produced largely as a by-product from its association with copper, lead, zinc, and gold ores. As explained under the heading of Gold, the State Mining Bureau does not collect the statistics of silver production independently of the U. S. Geological Survey.

The average price of silver during 1921 was $1.09 per ounce at New York as compared with 54.8¢ in 1914; 50.7¢ in 1915; 65.8¢ in 1916; 82.4¢ in 1917; $1 in 1918; $1.12 in 1919; $1.09 in 1920.

The following paragraph is quoted from the U. S. Geological Survey Advance Chapter on 1921, by courtesy of Mr. Chas. G. Yale, statistician in charge of the San Francisco branch office:

"The production of silver in California in 1921 is shown in the table below. By far the largest output was made by San Bernardino County, followed in order of rank by Plumas and Inyo counties. The large silver output of the State, the greatest in years, was mainly from the mines and leased properties of the California Rand Silver, Inc., in San Bernardino County.

"The silver recovered from the ore and tailings treated in 1921 was as follows: By amalgamation, 67,827 fine ounces; by cyanidation, 12,729 fine ounces; and by ores directly smelted or from concentrates from the flotation process, 3,510,037 fine ounces."

Silver output is sustained and encouraged through the operation of the Pittman Act maintaining the price of domestic silver at $1.00 per ounce minimum. The following statement from the mid-year review by Yale[1] shows the status of the industry for the first six months of the current year, 1922:

"The silver received during the first half of 1922 by the mint and local smelters and refiners amounted to $1,440,842, valued at $1 an ounce, or $157,147 less than in the first half of 1921, when silver was valued at $1.09 an ounce. This decrease is due to the continued idleness of most of the large copper and lead producing mines, from which much of the silver mined in California is derived. The silver mines in San Bernardino County are increasing their output somewhat, but not sufficiently to counteract the loss in the output of copper and lead ores. The mines that now produce the most silver are the California Rand Silver Inc., the Grady lease on the same mine, in San Bernardino County, and the Engels copper mine, in Plumas County."

The distribution of the 1921 silver yield, by counties, was as follows:

County	Value	County	Value
Amador	$35,460	Placer	$1,068
Butte	1,759	Plumas	171,090
Calaveras	10,232	Sacramento	5,254
El Dorado	301	San Bernardino	3,210,706
Fresno	75	Shasta	5,581
Humboldt	37	Sierra	5,236
Imperial	920	Siskiyou	294
Inyo	86,020	Stanislaus	136
Kern	1,897	Trinity	1,390
Lassen	1,234	Tuolumne	2,505
Madera	27	Yuba	26,135
Mariposa	5,251	Del Norte, Los Angeles, Orange, San Diego*	7,449
Mendocino	13		
Merced	87		
Mono	15,160	Total	$3,629,223
Nevada	33,906		

[1]Yale, Chas. G., U. S. Geological Surv., Press Bulletin, July 20, 1922.

*Combined to conceal output of a single operator in each.

Silver Production of California by Years.

The value of the silver produced in California each year since 1880 has been as follows, the data previous to 1887 being taken from the reports of the Director of the Mint. There are no data available for the years previous to 1880:

Year	Value	Year	Value
1880	$1,140,556	1902	$616,412
1881	750,000	1903	517,444
1882	845,000	1904	873,525
1883	1,460,000	1905	678,494
1884	[1]4,185,101	1906	817,830
1885	2,568,036	1907	751,646
1886	1,610,626	1908	873,057
1887	1,632,004	1909	1,091,092
1888	1,700,000	1910	993,646
1889	1,065,281	1911	673,336
1890	1,060,613	1912	799,584
1891	953,157	1913	832,553
1892	463,602	1914	813,938
1893	537,158	1915	851,129
1894	297,332	1916	1,687,345
1895	599,790	1917	1,462,955
1896	422,464	1918	1,427,861
1897	452,789	1919	1,240,051
1898	414,055	1920	1,859,896
1899	504,012	1921	3,629,223
1900	[2]724,500		
1901	[2]571,849	Totals	$46,448,942

[1]Lawver, A. M., in Production of Precious Metals in United States: Report of Director of Mint, 1884, p. 175; 1885.

[2]Recalculated to 'commercial' from 'coining value,' as originally published.

MUSEUM.

The Museum of the State Mining Bureau possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the first five of such collections located in North America; and contains not only one or more samples of most of the known minerals found in California, but many specimens from other states and foreign countries as well.

Aside from its purely educational features, the Museum daily attracts throngs of tourists and travelers, and furnishes visual evidence of the immense mineral resources of California. The State Mining Bureau supplies a collection of forty typical minerals and ores, appropriately labeled, to any public school in the state upon request.

Mineral specimens suitable for exhibit purposes are solicited and their donation will be appreciated by the State Mining Bureau, as well as those who utilize the facilities of the collection.

Among the specimens received recently and catalogued for the Museum are the following:

19664. *Cinnabar* (HgS), mercuric sulphide. High grade, crystalline. From Seitz Mine, near Mina, Nevada, by Henry J. Seitz, Mina, Nevada.

19667. Free *Gold* (Au) in quartz, in part, with sulphides. Four pieces of high grade ore, showing crystallized and leaf gold. From North Star Mine, Nevada County, Cal., by North Star Mines Co.

19668. *Mineral Water*, from well, after cooling. From Calistoga Geyser Well, Napa County., Cal., by G. Musante, Calistoga.
19669. *Chalcedony & Quartz Geodes* and Amygdules. From Berkeley Hills, Alameda County, Cal., by T. H. d'Estrella, Berkeley.

During the month a total of 603 visitors signed their names on the Museum register, and in addition there are many others daily who fail to take note of our request for their signatures.

LABORATORY.

FRANK SANBORN, Petrologist.

There were 304 samples received and determined during the thirty-day period covered by this report. Among this number there were but few of special scientific interest. The public are showing a live and increasing desire to find good deposits of the non-metals and salines, and the outlook in that field is promising.

The samples, as submitted, covered a wide range. About fifty tests were made for the precious metals; in one case platinum was detected, and gold in several instances.

The public is earnestly invited to send such samples of minerals to this laboratory as may seem to have an economic or scientific value. The work is carried on without cost to residents of this state, and it is by means of these finds that the mineral wealth of the state is revealed. The possibilities of discovery of minerals of commercial value within the state are very great, and that the number of prospectors is on the increase is evidenced by the fact that the number of samples turned in to the bureau is steadily growing.

Occasionally a sample is received that is interesting not only in a mineralogical way, but proves the occurrence in the state of a rare metal or mineral in possible commercial quantities. One such sample recently received for the Museum was of allanite—a complex silicate containing the cerium metals. Judging from the sample submitted, the deposit may have a commercial value as a source of these metals.

A list of samples of possible commercial value, judged from the sample submitted only, is appended.

The Bureau will supply the name and address of the party who sent in any sample listed, upon request, if the reference number is given.

05–191 Octahedrite (titantium dioxide).
05–192 Schist; contains lead, zinc, gold, silver, and copper.
05–193 Asbestos (chrysotile); short fibre.
05–194 Lead-silver-copper-gold ore.
05–195 Gold ore; very high-grade.
05–196 Kaolin-like mineral; good grade clay.
05–197 Fibrous anthopyllite.
05–198 Kaolinized rock.
05–199 Copper ore; high-grade—some gold and silver present.
05–200 Deweylite (variety of serpentine); also amphibole asbestos.
05–201 Gold ore; over $20 per ton.
05–202 Lead-silver ore.
05–203 Mica.
05–204 Arsenopyrite.
05–206 Copper ore; some gold present.
05–207 Cobalt.
05–208 Ferruginous shale.

05–209 Gold ore.
05–210 Gold ore; over $20 per ton.
05–211 Gold ore; over $10 per ton.
05–212 Marl.
05–213 Gypsum.
05–214 Copper ore, with some silver.
05–215 Lead, copper, silver ore.
05–216 Arsenopyrite.
05–217 Kaolinized rock; high alumina content.
05–218 Copper-cobalt ore.
05–219 Pure white quartz.
05–220 Massive garnet.
05–221 Barite.
05–222 Copper ore.
05–223 Diatomaceous earth.
05–224 Feldspar.
05–225 Dolomite.
05–226 Gold ore; value over $20 per ton.
05–227 Marl.
05–228 Marl.
05–229 Kaolinized rock; alumina content high.
05–230 Manganese oxide.
05–231 Copper ore.

LIBRARY.

E. Cooney, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received during the month, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the State are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geol. Survey Bulletins:
- No. 736–A—The Structure of the Madill-Denison Area, Oklahoma and Texas. By O. B. Hopkins, Sidney Powers and H. M. Robinson.
- No. 730–B—Erosion and Sedimentation in the Papago Country, Arizona. By Kirk Bryan.

U. S. Geol. Survey Mineral Resources:
- Gold, Silver, Copper, Lead and Zinc in New Mexico and Texas in 1920. By Charles W. Henderson.
- Silica in 1921. By L. M. Beach.
- Magnesium in 1921. By G. F. Loughlin.
- Zinc in 1921. By C. E. Siebenthal and A. Stoll.
- Abrasive Materials in 1921. By L. M. Beach and A. T. Coons.
- Peat in 1921. By R. W. Cottrell.

U. S. Bureau of Mines Bulletins:
- No. 200—Evaporation Loss of Petroleum in the Mid-Continent Field. By J. H. Wiggins.
- No. 207—The Analytical Distillation of Petroleum and Its Products. By E. W. Dean, H. H. Hill, N. A. C. Smith and W. A. Jacobs.

U. S. Bureau of Mines Technical Papers:
- No. 268—Preparation and Uses of Tar and Its Simple Crude Derivatives. By W. W. Odell.
- No. 298—Methods for Testing Petroleum Products. (A Handbook for Inspecting Laboratories.)

U. S. National Museum. Smithsonian Institution. Contributions from the United States National Herbarium. Vol. 22, Part 6—Grasses of British Guiana. By A. S. Hitchcock.

Annual Report of the Smithsonian Institution, 1920.

Illinois State Geological Survey, Extract from Bulletin No. 38—Geology and Mineral Resources of the Avon and Canton Quadrangle. By T. E. Savage.

Illinois State Geological Survey, Extract from Bulletin No. 38—Further Investigations of Illinois Fire Clays. By C. W. Parmlee and C. R. Schroyer.

Illinois State Geological Survey, Extract from Bulletin No. 43—Geology and Mineral Resources of the La Harpe and Good Hope Quadrangles. By T. E. Savage and M. L. Nebel.

Kentucky Geological Survey—Oil Field Stratigraphy of Kentucky. By Willard Rouse Jillson.

Province of Quebec, Canada Department of Colonization and Fisheries, Bureau of Mines. Report of Mining Operations in the Province of Quebec.

Canada Department of Mines, Mines Branch—Barium and Strontium in Canada. By Hugh S. Spence.

Department of Mines, Geological Survey of Victoria—Bulletin No. 45—Brown Coals of Victoria, Melbourne, Australia.

Secretaria De Industria, Commercio Y Trabajo, Boletin Minero, Tomo XIII—Numero 4. Mexico.

Secretaria De Industria, Commercio Y Trabajo, Boletin Del Petroleo, April De 1922. Mexico.

Geology of the An-Shan Iron Mine District, South Manchuria. By Hanzo Murakami.

Republica Argenta. Ministero De Agricultura De La Nacion, Boletin No. 29—Estudios Geologicos En El Valle Superior De Rio Negro. Por El Doctor Anselmo Windhausen.

Boletin No. 30—Observaciones Geologicas En El Gran Bajo De San Julian. Por Dr. Ricardo Wichmann.

Boletin No. 28—Apuntes Geologicos Sobre Los Hallazgos De Carbon Al Sur Del Lago Nahuel Huapi. Por El Dr. Juan Rassmuss.

Societies and Educational Institutions.

Transactions of the American Institute of Mining and Metallurgical Engineers, Vol. LXVI.

Proceedings of the Engineers' Society of Western Pennsylvania, Vol. 37—No. 10.

Quarterly of the Colorado School of Mines. April, 1922.

University of California, Department of Geological Sciences, Vol. 13—No. 6—Geology of the Cuyamaca Region of California.

Vol. 13—No. 10—New Species from the Cretaceous of the Santa Ana Mountains, California.

State of Washington, Department of Conservation and Development, Bulletin No. 26—Underground Water Supply of the Region about White Bluff and Hanford. By Olaf P. Jenkins.

Research Publications of the University of Minnesota. Studies in Engineering. No. 4—An Investigation of Secondary Stresses in The Kenova Bridge.

Economic Geology, June and July, 1922.

The American Mineralogist, June, 1922.

Journal of Geology, May and June, 1922.

Mining and Metallurgy, June and July, 1922.

Records of the Australian Museum—Vol. XIII—No. 5. Sydney, Australia.

Memorias De La Real Academia De Ciencias Y Artes De Barcelona:

Vol. XVII—Num. 9—Las Leyes Graficas En Los Espacios No—Euclideos. Por J. M. Bartrina Y Capella.

Vol. XVII—Num. 10—Las Fenilcumarinas. Por R. F. Dr. Eduardo Vitoria, S. J.

Vol. XVII—Num. 11—Excursiones Geologicas Por La Provincia De Burgos. Por Dr. D. M. San Miguel De La Camara.

Vol. XVII—Num. 12—Monografia De Los Melusinidos De Las Islas Canarias. Por Dr. Elias Santos Abreu.

Maps.

U. S. Geol. Survey Topographic Sheets:
Kentucky Well Quadrangle, Madera County, Cal.
California Oxalis Quadrangle.
Gregg Quadrangle, Madera County, Cal.
Charleston School Quadrangle, Merced County.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

Architect and Engineer, San Francisco.
Arizona Mining Journal, Phoenix, Arizona.
Asbestos, Philadelphia, Pennsylvania.
American Petroleum Institute, New York.
Chemical Engineering and Mining Review, London, England.
Cement, Mill and Quarry, Chicago, Illinois.
Engineering and Mining Journal-Press, New York.
Financial Insurance News, Los Angeles, California.
Journal of Electricity and Western Industry, San Francisco.
Metallurgical and Chemical Engineering, New York.
Mining and Oil Bulletin, Los Angeles.
Mining and Engineering Record, Vancouver, B. C.
Oil Weekly, Houston, Texas.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil, Paint and Drug Reporter, New York.
Oil Trade Journal, New York.
Oil Age, Los Angeles.
Oil News, Galesburg, Illinois.
Petroleum Record, Los Angeles.
Petroleum Refiner, Kansas City, Missouri.
Petroleum Age, New York.
Petroleum World, Los Angeles.
Queensland Government Mining Journal, Brisbane, Australia.
Rock Products, Chicago, Illinois.
Southwest Builder and Contractor, Los Angeles.
Stone, New York.
Salt Lake Mining Review, Salt Lake City, Utah.
Standard Oil Bulletin, San Francisco.
Safety News, Industrial Accident Commission, San Francisco.
The Record, Associated Oil Company, San Francisco.

Newspapers.

The following papers are received and kept on file in the library:

Amador Dispatch, Jackson, Cal.
Arkansas Oil and Mineral News, Hot Springs National Park (Arkansas).
Bakersfield Morning Echo, Bakersfield, Cal.
Blythe Herald, Blythe, Cal.
Bridgeport-Chronicle-Union, Bridgeport, Mono Co., Cal.
California Oil World, Los Angeles, Cal.
Colusa Daily Sun, Colusa, Cal.
Daily Midway Driller, Taft, Cal.
Del Norte Triplicate, Crescent City, Cal.
Exeter Sun, Exeter, Cal.
Georgetown Gazette, Georgetown, Cal.
Gateway Gazette, Beaumont, Cal.
Gilroy Gazette, Gilroy, Cal.
Goldfield News, Goldfield, Nevada.
Guerneville Times, Guerneville, Cal.
Humboldt Standard, Eureka, Cal.
Healdsburg Enterprise, Healdsburg, Cal.

Inyo Independent, Independence, Cal.
Inyo Register, Bishop, Cal.
Lake County Bee, Lakeport, Cal.
Mountain Messenger, Downieville, Cal.
Mariposa Gazette, Mariposa, Cal.
Mining and Financial Record, Denver, Colo.
Mountain Democrat, Placerville, Cal.
Nevada Mining Press, Reno, Nevada.
Oroville Daily Register, Oroville, Cal.
Oatman Mining Press, Oatman, Arizona.
Oregon Observer, Grants Pass, Oregon.
Plumas National Bulletin, Quincy, Cal.
Plumas Independent, Quincy, Cal.
Placer Herald, Auburn, Cal.
Petroleum Reporter, Etna Mills, Cal
San Diego News, San Diego, Cal.
Santa Barbara Daily News,, Santa Barbara, Cal.
Stockton Record, Stockton, Cal.
Shasta Courier, Redding, Cal.
Siskiyou News, Yreka, Cal.
Siskiyou Standard, Fort Jones, Cal.
Sunset Journal, Sunset District, San Francisco, Cal.
Sacramento Union, Sacramento, Cal.
Tuolumne Prospector, Tuolumne, Cal.
Ventura Daily Post, Ventura, Cal.
Weekly Trinity Journal, Weaverville, Cal.
Western Sentinel, Etna Mills, Cal.

PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of consumers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

Sufficient publicity has not heretofore been given to this feature of the Bureau's work, but in 'Mining in California' a suitable medium is provided for current inquiries of this nature, and, therefore, written or verbal inquiries that come to the attention of the Bureau are summarized in each issue.

The name of the product wanted or offered, only, is published; the name of the owner of the deposit, or buyer, and other details being supplied upon request.

In writing, the reference number of the item should be given.

Mineral Products or Deposits for Sale.

02–94 Chalcedony—has an immense deposit.
02–95 Chrysotile asbestos (short fibre—rips to ¾ inch).
02–96 Dolomite deposit.
02–97 Deposit of diatomaceous earth.
02–98 Barytes.
02–99 Coal and oil.
02–100 Gold quartz property; operating, 2 leads, 2-stamp mill; or capital for further development.

Mineral Products or Deposits Wanted.

03–84 Green fluorspar.
03–85 Chrome ore.
03–86 A small copper property.
03–87 Gold mine—somewhat developed.
03–88 Montmorillonite or bentonite.
03–89 Green rock for roof work. (There is a local market for 300 T. per month.)
03–90 Clean sand (above 70% silica) for making sand-lime brick.
03–91 Diatomaceous earth.
03–92 Zirconium.
03–93 Infusorial or diatomaceous earth.
03–94 Montmorillonite; diatomaceous earth; volcanic ash.
03–95 Soapstone, suitable for cutting into slabs.
03–96 Low-grade iron ore (40% to 50% iron).

EMPLOYMENT SERVICE.

Following the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and address of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

The Bureau registers technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

A list of applicants for positions and 'positions open,' received by the Bureau during each 30-day period preceding the date of publication of the Monthly Chapter is carried in each issue.

Each notice is designated by a key number, and communications sent to the Bureau in reply to any notice will be forwarded to the proper party without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau, to avoid possible loss.

Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

01–21 Geologist. One year's experience with large Eastern oil company. Single. Age 29. References.

01–22 Superintendent Gravel Mine. Six years in charge of placer operations in California and over twenty years experience in such work. Married. Age 43. Salary wanted, $200 per month. References.

01–23 Mine Superintendent or Master Mechanic. Five years as miner, shift boss and foreman in Nevada; three years master mechanic in South America; six years general consulting practice. Age 35. Married. Salary wanted, $300 per month. References.

01–24 Mine Superintendent. Six years as engineer, superintendent and general manager in Arizona copper mines. General field experience. Age 39. Married. Salary wanted, $300 per month. References.

01–25 Mine or Mill Superintendent. Many years experience in Shasta and Trinity counties. Age 55. Married. Salary, open.

01–26 Geologist. Five years university training. Two months geologist for cement company. Age 31. Single. Salary wanted, $125 per month.

01–27 Topographic Draftsman. Eleven years experience as surveyor and draftsman. Age 32. Single. Salary wanted, $150 per month. References.

01–28 Engineer, Superintendent or Manager. Twelve years in managerial capacity and consulting work in California, Nevada and Spanish America. Age 37. Married. (Wife will not accompany.) Salary wanted, $200 and expenses, at least. References.

01–29 Any position wanted by university graduate. Age 25. Single. Salary not important. References.

AUGUST, 1922

REPORT XVIII OF THE STATE MINERALOGIST

DISTRICT REPORTS OF MINING ENGINEERS.

In 1919–1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each division working out from a local branch office.

This move brought the Bureau into close personal contact with operators, but did not materially shorten the time between the gathering of data in the field and their publication in the Report of the State Mineralogist at the end of an annual or biennial period.

Mining activities and development noted by district engineers in their respective fields are now embodied in monthly reports published in each issue of 'Mining in California,' thus making these data available within a maximum period of thirty days, and the Monthly Chapter as far as possible a compendium of current mining progress throughout the State.

The counties included in each field division and the location of the local offices are shown on the accompanying outline map of the State. (Frontispiece.)

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the State's oil fields is included under this heading.

REDDING FIELD DIVISION.

W. B. Tucker, Mining Engineer.

Modoc County.

Mathew J. Holt has acquired a controlling interest in the *Big Four Mine*, situated in the High Grade Mining District, eight miles east of New Pine Creek, Oregon.

The *Sunshine Mine*, which is situated on High Grade Hill, about 9 miles east of New Pine Creek, Oregon, has been leased by Thomas J. Highland and A. Thomson, of Alturas.

Shasta County.

The Bully Hill Smelter of the *Shasta Zinc and Copper Company*, after two months experimental work, is practically operating at full capacity, treating 150 tons of crude ore per day, with a production of 25 to 30 tons of zinc oxide, and 10 to 15 tons of copper matte. Two hundred men are employed.

The *Shasta Iron Company* have recently increased shipments of iron ore from the company's mine at Heroult. The iron ore is shipped to Oakland, San Francisco and Los Angeles. Twelve cars per month are being forwarded.

The company is also shipping lime rock to the Shasta Zinc and Copper Company at Bully Hill. Twelve men are employed. F. J. French, superintendent.

The *Quartz Hill Mine*, situated four miles northwest of Redding, in section 10, T. 32 N., R. 5 W., was recently sold for taxes. Regis Halter of Redding purchased the property.

The *Gold Leaf Mine*, situated four miles west of Redding, in section 5, T. 31 N., R. 5 W., in Shasta Mining District, is being reopened by Ira Judson Coe of San Francisco.

The shaft has been retimbered down to the 120-foot level. Four men are employed. G. E. Bateman, superintendent.

The *Double Header Mine*, which is situated near Tower House, is being developed by Charles Garrett and associates of Redding. A new two-stamp mill has ben installed on the property, and the ditch line is being repaired, preparatory to starting milling operations. Charles Garrett is in charge of operations.

The *Chicago and Silver Falls Group of Mines*, situated in the South Fork Mining District, near Igo, has recently been bonded by Dr. F. M. Archer, of Redding, to Santa Barbara interests.

Twelve men are employed on development. Walter Parsons, superintendent.

The *Ruby Pearl Mine*, situated twelve miles west of Castella, in the Shasta Forest Reserve, in section 4, T. 38 N., R. 5 W., is being operated by Wm. Basham, Larsen, and Anderson of Castella, owners. The vein strikes northwest and southeast and dips 40 degrees east. It has a width of 12 inches to 2 feet, and occurs in diorite-porphyry.

Development consists of lower tunnel in 530 feet on the vein, and an upper tunnel 177 feet in length.

The lower and upper tunnels are connected by a raise on the vein.

There was a Straub mill and Deister concentrator on the property. Two men are employed on development work.

S. Grensfield and M. Merrilees of Bully Hill recently located the *Eureka Mine* in the Pittsburg Mining District.

H. B. Conner and Fred Craven of Redding have located eight claims in the Shasta Mining District, five miles northwest of Redding. The claims located are known as: Gold Jack, Gold Wedge, Bald Eagle No. 1, and No. 2; Sunset No. 1, and No. 2; and Golden Queen No. 1, and No. 2.

Albert Grutska has located the *Mountain View Quartz Mine*, in the Old Diggins District, in section 10, T. 32 N., R. 5 W., eight miles north of Redding.

Siskiyou County.

There is renewed activity in placer mining on St. Clair Creek, two miles below Cecilville. Frederich Otto and Charles Mitchell are working the *Pelucca Placer Mine*.

The *Keynote Mine*, situated in the Fool's Paradise District is being operated by W. E. Anderson. The mill is working on ore assaying $40 per ton.

Harry and Joseph Davidson recently struck a rich pocket on Vesa Creek, which empties into the Klamath River, 12 miles from Yreka. The *Davidson Bros.* have taken out seventy ounces of gold quartz, one specimen containing seventeen ounces of practically pure gold.

The specimens so far taken out, represent about $1,700 worth of gold. The Board of Supervisors are contemplating buying them for the Siskiyou County Gold Exhibit.

Tehama County.

The *Tuscan Oil Company* has resumed drilling operations on its property, six miles north of Red Bluff. The well is down 1800 feet, and is drilling through sand and blue shale. Two shifts are employed. L. F. Richardson, superintendent.

Trinity County.

The *Foster Gold Mining Company,* owners of the *Bonanza King Mine,* recently suspended operations.

The *Bolliver Mine,* situated one and a half miles from Five Pines, is being developed by J. W. Gusack of Five Pines.

Five Pines Mine, in sections 20 and 29, T. 35 N., R. 8 W., in the Minersville Mining District, two miles northwest of Minersville, is being operated by lessees. Owner: Five Pines Mining Company of Minersville; N. J. Van Ness, president.

AUBURN FIELD DIVISION.

C. A. Logan, Mining Engineer.

Alpine County.

With an area of 776 square miles and less than 100 registered voters, this county is the least developed in the state. Placed as it is on the summits and east slope of the Sierra Nevadas it is geologically and geographically more closely allied to Nevada than to California, and except for a few acres in Carson Valley is everywhere made up of rugged mountains and deep canyons ranging from 5150 feet on the floor of the valley at the state line to peaks over 11,000 feet high. Grazing in summer is the principal industry at present. Mining began in 1861 with the finding of silver ores, which induced the belief that the county contained a continuation of the Comstock belt. Miners flocked in from Virginia City and other Nevada camps and a boom started that resulted in a number of ill-advised mining ventures. The failure of these gave the county a poor reputation among mining people. This handicap, apparently undeserved, has not been overcome, due to the remoteness of the district and the lack of a resident population interested in the development of the county's mineral resources.

TRANSPORTATION.

The county is reached from the western side by four good dirt roads, entering from Murphys, Jackson, Placerville and Truckee, the first named or Big Trees road, going in over Ebbett's Pass, 8900 feet in elevation and the last two via Luther's pass, elevation 7800 feet and a few miles south of Lake Tahoe. The nearest railroad point is Minden, Nevada, from which a good dirt road runs 18 miles to Woodfords, which is the junction with the roads from the west. Markleeville, the

county seat, is 24 miles from Minden, and is reached either from Woodfords or by the Big Trees road, which follows the East Fork of Carson River. The roads are very well kept up and the principal mines are accessible by automobile

WATER, POWER AND TIMBER.

The two forks of Carson River offer numerous ideal power sites. The East Fork particularly passes near the principal mining districts and has been utilized by two mining companies who have built dams and generated electric power for mining and milling. In the undeveloped sections numerous tributaries could be utilized. Timber is plentiful in the higher mountains.

GEOLOGY AND MINERALOGY.

The granite forming the mountain range is covered over a large area and to undetermined depth by flows of andesite. Only one mine visited showed rock of strictly sedimentary origin. This is near the state line on the border of Carson Valley, where a body of white granular quartzite is claimed to carry gold. The main andesite area covers the east central part of the county from the higher summits to beyond the state line. Lindgren points out that near Silver Mountain the andesite shows a section from 3000 to 4000 feet thick. The principal mining development and production has been in an area about 3 miles square in the andesite, bounded on the west by the East Fork of Carson River and extending only a little south of Monitor Creek. Besides this there has been considerable work and some production at Silver Mountain. Outside these areas, only a little prospecting has been done. Grover's Hot Springs, 4 miles west of Markleeville, and other hot springs further north in Nevada, mark the course of a main north and south fault line. Dislocations in the vicinity of this line have probably given outlet to the heated water from deep seated sources. This water, rising through the andesite as hot springs, has kaolinized the andesite and deposited within it the ore bodies associated with quartz and chalcedony and in some cases with manganese compounds. Great outcrops of hard rock, formed by the silicification of the andesite along these fracture zones have been left standing by subsequent erosion of the softer andesite and are indicators of the general location of the ore bodies which occur below them. In some cases these immense croppings themselves carry gold and silver in narrow veins of sufficient richness to make ore of workable width. The main sulphide ore bodies are, however, irregular and without definite walls, and show branching stringers of high grade. Numerous geologists have considered it probable that zones of secondary enrichment carrying larger and better ore bodies than any yet mined, may be found some distance deeper than yet reached. Just how deep this zone will lie is a matter of conjecture, but estimates have ranged from 150 to 500 feet below the lowest present explorations. If present, such zones may be quite deep because of the permeable nature of the rock and the extent of fracturing. Copper carbonates are notably absent and chalcocite has been found in small amount so far. The unaltered andesite is grey-green and often brecciated. The first serious setback to mining

here was experienced when it was found that the ores were not amenable in most cases to ordinary free milling processes. Most of the early failures were due to this. In the early years of mining only ore of the highest grade could be shipped on account of the expense of transportation, as it had to be hauled across the mountains to Sacramento.

The principal ore mined from the Morning Star Mine was enargite, which occurred in 'solid masses.' It carried silver and gold in addition to copper, also some antimony. The higher grade which was shipped carried up to 34% copper and had a value up to $400 a ton, including much silver and some gold. In the old stopes at present, and on the dump is a great deal of massive pyrite, some of it showing intimately mixed enargite. This pyrite carries gold and silver probably in payable quantity if the enargite did not interfere with cyaniding, but not rich enough to ship. The gangue is jasper, quartz and kaolinized andesite.

In the Colorado No. 2, which was the principal silver producer, the ore was a complex mixture of sulphides of lead, zinc, silver and antimony, with the richer ore carrying $100 a ton or more in gold and silver. Galena, pyrite and complex sulphides of silver and antimony are prominent. Eakle mentions numerous silver minerals from this mine. Rhodochrosite and black oxides of manganese accompany the ore and kaolin and silica are also gangue minerals. Some of the ore was deposited evidently in open fissures of irregular shape with the quartz and ore minerals freely crystallized. Veinlets and 'feeders' of rich ore with rhodochrosite extend through the altered andesite and have at time been followed until they made into good sized ore bodies.

The vein in the Exchequer Mine at Silver Mountain was described by A. Eilers as being of broken up quartz and clay, but of solid quartz in the ore shoots, and as being a true fissure vein 3 to 7 feet wide with well defined gouges. The ore minerals were stated to be pyragyrite (sulphantimonite of silver), proustite (sulpharsenite of silver), argentiferous stibnite and pyrite. Ore taken from the 100-foot level for milling in 1874 assayed from $51 to $66 silver per ton.

In some of the gold mines, notably in the Alpine and Boulder Hill, rich free milling gold ore occurred, but aside from these the ores have been base and have not been amenable to ordinary raw or free milling processes.

Outside of the two districts mentioned above there has been little done and not a single prospect is known to have been developed to a conclusive point, although some work has been done lately on a few to be mentioned.

ORE TREATMENT.

Most of the early day plants built in the county were failures. Even mills designed to handle free milling gold ores had a very low efficiency. It was first thought the bodies of silver ore were on a continuation of the Comstock Lode of Nevada. Raw milling and amalgamation would not work upon the silver ores, and concentrating tables were unknown at the time. The first stamp mill was built in 1863 and is said to have saved about 50% of the value indicated by assays. The charge was $30 a ton for milling. Next came kiln drying and crushing, with roasting and amalgamation by the Freiburg barrel process. Contracts were made in 1867 for ore to be treated by this process, but it proved

unsuccessful when tried upon ore from the Morning Star Mine. The Silver Creek mill treated for the year ending July 1, 1869, 76 tons of ore yielding $110 a ton from the Tarshish, later the Colorado No. 2 Mine. In that year there were four quartz mills doing custom work in the county. The first one built was the Pioneer, with ten 400 lb. stamps and all were small affairs. The mining companies were not able to build their own mills and with custom mills unfitted for handling refractory ores, little progress could be made. Copper ores had to be hauled to Sacramento by wagon, for shipment to Swansea, so only rich ore could be handled. Silver-gold ores that carried less than $10 a ton could not be handled profitably, judging by old reports, because of expensive reverberatory roasting of crude ore, no concentrators being in use. In 1873 the manager of the principal company tried crushing the ore wet and amalgamating with salt and bluestone without roasting. The first run by this process gave a return of about $10 a ton; custom milling cost $15 a ton. In 1874 the same company completed a mill for wet raw treatment. It contained eight 600 lb. stamps, 4 Hepburn pans, 2 Hendy concentrators, and settling tanks for slimes and tailings. This mill had a capacity of 16 tons a day. After treating 100 tons of ore in it, the manager decided that roasting was necessary. The same year, the Monitor mill was described as containing 10 stamps, crushing dry, four amalgamating pans, a Knox pan, settlers and a McGlew furnace, designed for chloridizing roasting to be followed by amalgamation. Ore sent from the Exchequer Mine to this mill returned only 17% of the assay value. From these sidelights it is easy to see that the natural difficulties of pioneering were augmented by the inexperience of the metallurgists with this type of ores, which were different from anything they had handled before. As far as can be learned, the later operations at Silver Mountain were never successful.

Likewise, work at the silver-gold mines near Monitor was not profitable, and the principal mine, called Colorado No. 2, lay idle for several years because ore was not rich enough to pay for the expensive haul to the railroad, and no suitable means of working it locally had been found. Peter Curtz, who had been acquainted with the mine for many years, reopened it in 1878 and 1879, bringing with him the first Frue vanners seen on this coast and also an experienced metallurgist named Ottokar Hoffmann. The mill contained ten stamps, later 15, and 4 Frue vanners. An ore averaging $12 a ton was concentrated and treated by chlorination. Records of the assay value of the concentrate and the amount of bullion made during the summer of 1879 showed excellent recovery, ranging from 90% to 95% of the gold and silver in the concentrate.

Tests in the last few years by oil flotation are reported to have shown this process also well suited for the ores at Monitor.

SOME OF THE MINES.

Advance Mine has been previously described by the writer in this Bureau's report for 1920. Since that time, only assessment work has been done.

In the past few years, a number of experienced engineers have examined and sampled the mine and have tested the ore. Besides the

narrow, rich stringers of mixed sulphides which have been followed as possible indicators of larger chambers, there is a large mineralized zone of low grade ore, with the silver sulphides scattered through the kaolin in grains and in minute opal seams. Ore sampling of all the drifts and crosscuts and raises, without, it is said, due regard to the boundaries of this low grade zone, are reported to have given an average of 3 ounces silver and $2 gold per ton. The ore would be extremely cheap to mine and mill on account of its soft nature, which permits picking, although it stands well.

All the accessible workings are upon or above the level of Advance tunnel, which opens upon the north bank of Monitor Creek just west of the old town of Monitor. A shaft was sunk in early days just outside the portal of this tunnel, to a depth of 300 feet or more. Good ore is reported to have been found in this shaft and some of it was milled but according to Peter Curtz, who was in charge of the mill, work was stopped here because the ore could not be successfully treated locally.

Alpine Mine was found by tracing float ore. It lies northwest of Colorado Hill, upon which the Monitor mines are found. There are here outcrops of jasper rock similar to those at Monitor, due to alteration of the andesite which in its unchanged state on this mine is a recemented andesite breccia or agglomerate, greenish-grey in color. As far as can be judged by an examination of outcrops and of such shallow openings as are accessible, and from information furnished, the gold occurs in narrow seams and stringers of quartz and iron oxides in the jasper and andesite, and at times disseminated through the flinty bluish rock in the finely crystallized sulphide of iron. These veins are said to be rich enough in gold to make ore of workable width.

What Peter Curtz regards as the main ledge of the series, strikes N. 33° W. and is traceable 3000 feet to the top of Colorado Hill. It is a jasper outcrop six feet wide where crosscut and is said to assay $1 to $6 a ton. This is 1000 feet east of the Alpine Mine workings.

The 'six ft. vein' on the Alpine claims shows on the surface as an outcrop of the andesite, carrying a series of veinlets ½ inch to 3 inches wide which strike north and dip vertically. What is termed the 16 ft. ledge also crosses the property. This is a formation of rich narrow stringers. On the Lewis claim of this group a series of adits driven years ago from the west slope in an easterly direction, are said to have crosscut these two 'veins.' The lowest of these was 1000 feet long and is said to have cut both zones which are only 80 feet apart and converging with depth. The No. 1 or six ft. ledge is reported one foot wide here and was stoped for a length of 100 feet and an unknown height. The No. 2 or 16 ft. ledge maintains its width and Curtz claims it assays $6 a ton in the crosscut but was not stoped as ore of that value could not be milled at a profit then. Seams in this vein are said to assay $80 a ton.

On Markleeville claim, and about 800 feet south of Lewis claim, several adits were also run, and a stope 80 ft. long by 80 ft. high was mined. The lowest tunnel is about 600 feet long and the vein there is about 6 feet wide. Ore in sight is reported worth $2.50 to $4.50 a ton. In addition to free gold, some silver ore occurs here. Total production of the group is uncertain; it is reported to have been $378,000, but there is no record at hand.

A tramway built to serve this group of claims has its upper terminal just below and between the two groups of adits. It is ¾ of a mile long and delivered ore by gravity to the company's mill on Carson River, 1000 feet lower. In spite of cheap mining, and milling by water power, it is stated that ore worth less than $7 a ton could not be profitably worked. The mill is still on the river and houses a hydro-electric power plant.

Boulder Hill Mine was the scene of the first gold discovery in the county about 1861. It is on the hill of the same name between the Alpine Mine and the river. The original discovery was of large boulders which when milled yielded at a fabulous rate in free gold, $20,000 being obtained from a few tons of ore. There has been no recent activity.

Colorado No. 2, formerly alluded to as the principal silver producer of the county, has been idle for many years. Since operation by Curtz in 1879–1880, the mine has passed through the hands of stock companies and a large plant for both mine and mill were put in, including dam and electric power plant on Carson River, electric locomotives for mine use, power line to the mine, steam and electric equipment for mill and hoist, etc. Most of this except 10 stamps and some concentrators, has been removed lately.

The ore is the same as in the Advance, and has been previously described herein; the claims adjoin and the Advance connects by a raise with the lower tunnel on Colorado No. 2. The mine was sampled in connection with the Advance when the two were under common ownership, and contains considerable ore of milling grade, according to the statement of a former operator, who says he left such ore in the mine. Ore averaging $12 a ton from this mine was successfully treated by stamping and concentration on Frue vanners by Peter Curtz in 1879, giving concentrate worth from $420 to $900 a ton, of which 38% to 43% was gold and the balance silver. Original records show that 91% to 95% of assay value of concentrate was recovered at the mine in bullion by chlorination. The early production from this mine, reported at half a million dollars, was made by working the ore in rockers and shipping concentrate.

The present company was a heavy loser by speculation in other business several years ago and has done no recent work. Only the patented claims remain in their possession now.

Exchequer Mine is in Silver Mountain District, at the head of Scandinavian Canyon. Up to 1875, the operating company spent $125,000 on the mine, mill and surface plant. An adit over 800 feet long was driven, with an inclined winze in an ore body 60 feet long at the tunnel level and increasing in size downward. Apparently the same ore body was struck in workings from a vertical shaft, and 60 feet below the winze. Another ore body 50 feet long and 20 inches wide was found in a crosscut from 100-ft. level of the vertical shaft. Raymond pointed out that these two small ore bodies appeared to be the tips of a larger body that might be found below. The ore was of good grade, consisting of ruby silver and stibnite assaying from $40 to $75 a ton. Many expensive and fruitless experiments were made in attempting to treat

it, but as far as the records show, no local plant ever succeeded in doing this, although some production was made from ore shipped. The Acacia vein, similar in size to the main or Buckeye vein also gave good assays and was prospected by an adit 200 feet long or more. In later years the company ran a long lower adit to cut the Exchequer and I. X. L. ore bodies at greater depth. This adit was run 4400 feet up to 1888 and was then apparently abandoned. It was designed to be 8500 feet long and would have given a depth of 2000 feet under the outcrops of ore.

I. X. L. Mine was near the Exchequer and on one of the same veins. The discoverers of this mine in 1861 are said to have taken over $50,000 from a space 40 feet long and 22 feet high, within 50 feet of the surface. In 1863, 1000 tons milled are said to have averaged $250 a ton by assay and to have milled $125 a ton.

Development of the I. X. L. from the north drift of the 200-ft. level of the Exchequer vertical shaft was going on in 1875 but was evidently later given up and work devoted to the long adit mentioned above.

Work on the *Wolf Creek Mine*, a prospect of high grade gold ore mentioned in the 1920 report, is being continued. The owners are developing the mine by their own labor, working during the summer months. Some work has also been going on this summer near Woods Lake, not far from the Jackson road. None of the numerous old gold claims elsewhere in the county have shown any recent activity.

COPPER MINES.

As a matter of history, it is interesting to record that the first copper mine worked in the state was the *Uncle Billy Rogers Mine* located in the Hope Valley district in this county, near the Amador County line. Although the metal had been previously reported from other parts of the state by Dr. John B. Trask, the first production was from here in 1855. The ore was described as 'beautiful ore, rich in garnets.'

Alpine Fairview Mine. Wm. Scheele, owner, Gardnerville, Nevada. This group contains 11 claims, unpatented, on Fairview Mountain less than a mile from the California-Nevada state line and two miles from the Woodfords-Gardnerville road. Elevation is 7000 to 7300 feet.

A ledge averaging ten to fifteen feet wide is said to have been traced 1050 feet, striking northwest and dipping west. Samples from the adit carry a porous, rusty gossan with a good showing of malachite, indicating that they have not yet passed below the leached zone.

The claims were bonded in 1920 by the Tri-State Mining and Development Company of Reno. They are said to have sold $23,000 worth of stock. Early in August, 1922, the owner brought suit to recover possession, alleging the agreement had not been fulfilled.

Since 1920 the adit near the mountain top has reached a length of 165 feet entering the ledge from the northeast and following it. Only a few assays have been made, indicating up to 30% copper, according to Scheele. One half ton of ore yielded at the rate of $40 a ton at smelter, including gold at the rate of $4 a ton. The present freight rate to the smelter is about enough to absorb the profits. A so-called gold ledge is a reef of quartzite dipping east and said to carry gold. It is expected to meet the copper ledge in depth.

The property was idle when visited. It is 2000 feet or more above the floor of Carson Valley and could be well opened by adits to that depth. There is a new camp building on the claims.

Morning Star Mine has been described in past reports. In November, 1920, the Griffin Company of San Francisco began work and continued until April, 1921.

After cleaning out the 480 level adit for 1000 feet this company continued the level straight ahead nearly north for over 700 feet, passing under the heavy iron stained outcrop near the face. Peter Curtz, manager for the owning company, reports this adit crossed a vein of gold, silver and copper ore one-foot wide and assaying $16 a ton in gold and silver and 3% copper, at a point 1600 feet from the portal. He considers this a feeder, coursing in the direction of the heavy outcrop to the northwest, and possibly making into a larger ore body thereunder. This vein was not followed. The face of this adit when work ceased is supposed to have nearly reached the north line of a faulted zone, north of which it was hoped to find more enargite ore. A short distance from this feeder, a crosscut was turned eastward, and was carried about 400 feet to the East Ledge, but possibly not through it. No drifting was done on this ledge. There is a showing of ore reported here, as well as at the north face, where Curtz claims there is 3 ft. of good enargite ore.

On the upper or 200-ft. level, the old adit was opened and 225 feet of new work was done, running N. 22° E.; passing just beyond the north line of fault and for a short distance beneath the outcrop. This crosscut is a broken formation 24 feet wide carrying lumps of enargite. Curtz thinks 30 to 40 feet of work on this level would be required to get ore, and 75 feet on the 480 level from the face would put it directly below the upper level and 250 feet deeper. The heavy outcrop continues 300 to 400 feet north of the faces of these adits, offering good inducement for prospecting.

During their tenure the last company erected several new buildings. The surface improvements now consist of boarding house and bunk house for 35 men, two new cottages, garage, office and compressor house. The mine is connected by a pole line with the power plant on East Carson River, furnishing power for nearly nothing. The mill, intended for testing purposes, contains a Huntington mill of 50 tons capacity, 3 slime concentrators, 2 sand concentrators and 2 six-ft. belt vanners. There is enough timber on hand for a year's work or more.

SUMMARY AND CONCLUSION.

The system of prospecting and mining by adits has been used so much in this county that one can not help asking if it has not been overdone. This is an ideal method of mining cheaply. At the same time, when ore bodies are so rich and irregular in distribution as those in Alpine County, and where there is such an abundance of electric power to be had at small cost and where time is such an important factor due to natural conditions, other methods might be better. The maxim of following the ore might be applied with better results than have been had by taking long shots by driving expensive adits.

Except for the fissure veins of quartz in the granite area of the high Sierras, the prospector sees little on the surface to guide him except the immense silicified outcrops which have often marked the approximate location of ore beneath.

Several good geologists have considered it possible that zones of secondary enrichment may occur at depths not heretofore explored. The best method to prospect for such ore would probably be by drilling, guided by known bodies of primary ore already worked, and by structural features.

Production in the past, and the size of ore odies found, compared with the total amount of work done, might induce the belief that the mines have not made a good showing. However, as mentioned above, the fault may lie in the method of prospecting and the lack of experience with such ores, as well as in the need of a local plant equipped for reducing refractory ores. At present there is no mine in the county with sufficient ore proved to justify such a plant. The county's future in mining depends upon the entry of some company with enough money to first prospect for, and if possible, develop some good sized ore bodies. Past history and present developments give ample encouragement for such work.

With a local plant capable of treating the complex ores of the county, a good dead of ore could be worked that is not sufficiently high grade to haul to smelters outside.

Only a few of the mines of the county have been mentioned here, and these principally to illustrate the character of ore deposits. Fuller details on many properties that have been idle for many years, may be had from the works named below:

Bibliography of Geology and Mines of Alpine County.
Raymond, R. W. Statistics of Mines and Mining in the States West of the Rocky Mountains, 1870–1875.
Reports of the State Mineralogist of California:
Eighth Report, 1888.
Fifteenth Report, 1915.
U. S. G. S., P. P. 73, Tertiary Auriferous Gravels of the Sierra Nevada, Waldemar Lindgren.
U. S. G. S. Folio 31, Pyramid Peak.
U. S. G. S. Topographic Sheets, Markleeville and Dardenelles quadrangles.

SAN FRANCISCO FIELD DIVISION.

E. S. Boalich, Chief Mining Engineer.

Mariposa County.

The XVII Report of the State Mineralogist contains a detailed description of the mines in Mariposa County. The field work for that report was carried on in 1919 and 1920. Since then mining has been rather quiet in that section, although occasional instances of new activity have been recorded in various chapters of 'Mining in California' since January, 1922.

In the latter part of July and during the first week in August (1922) the Bureau representative visited most of the mining districts in the county and it is encouraging to note that interest is being revived in

many mining properties here at the southern extremity of the Mother Lode.

There are forty-one mines in the county equipped with mills of some description. Many have been idle for so long that they are probably almost valueless. However, that gives somewhat of an idea as to what the mining industry was here and what its possibilities might be again. Practically no depth has been reached in this section as compared with the mines in Amador and other portions of the Mother Lode. In many instances the mines here closed when the value dropped to figures that are now considered pay ore.

At the present moment there are only two of the forty-one mills, above mentioned, active: the Original, at Clearing House on the Merced River, and the Virginia Belmont, about four miles south of Coulterville on the road to Bagby.

Quite recently the bridge across the river at Bagby was completely destroyed by fire and until that structure is rebuilt certain districts south of the river will be set back, as they depend on the Yosemite Valley Railroad on the opposite side of the river, for freight and supplies.

The loss of this bridge also cuts off travel between Mariposa and Coulterville, the two chief towns in the County. To make the trip now, a circuitous and rough route must be taken via Merced Falls and Pleasant Valley, a distance of sixty odd miles as compared with about twenty-five miles via Bagby.

Among the properties that are being developed, or have been reopened since the county was last visited, are the following:

Bobbie Mining Co., Geo. S. Cowdery, general manager, Cathay, California, Jas. M. Rowland, superintendent. Located in what is known as the Moore Hill District about three miles east of Cathay post office. Planada, a station on the Santa Fe in Merced County is the nearest railroad point, eighteen miles distant. The company holds one claim formerly known as the Rich, adjoining the Francis, which operated successfully for some time and upon which there still stands a 10-stamp mill that has been idle for over twelve years.

Upon the Bobbie property there are three parallel veins with diorite on both the foot and the hanging walls. They have been traced for several hundred feet along the strike, and the principal one, according to the management, contains an ore shoot about nine feet wide and values for the length of a 200-foot drift have averaged over $12. This ore is a heavy sulphide, and a mill is being erected to treat it by a new process worked out by A. E. Vandercook of Sacramento. The principal crushing unit is a 50-ton ball mill and the contractors have put up a bond to guarantee its completion by November 1, 1922.

B. V. D. Mining Co., A. E. Vandercook and P. L. Drew et al., owners, Cathay, California, is located about half a mile southwest of the Bobbie and on a parallel vein.

The country rock and character of the ore are also similar to that of the Bobbie property, and a 50-ton mill, for which the machinery is on the ground, is being erected. They will also use the Vandercook process. The B. V. D. is a recently developed prospect and is not the rehabilitation of an old mine.

Benton Mill, at Bagby, on the Merced River, was completely destroyed by fire in the winter of 1921. This plant formerly treated ore from the famous Pine Tree, Josephine, and other mines on the northern end of the Fremont Grant.

Little Wonder Mining Co., T. E. Clark, manager, situated near Hites Cove. Ten men said to be employed in doing development work. Property not visited.

Mariposa Mine. Owned by Kelso, Holmes et al., who purchased the south half of the old Mariposa Grant late in 1921. This is one of the most important 'Grant' properties, which was formerly a large producer, but which has been idle for years. Situated at the town of Mariposa. It is reported that negotiations are under way whereby this mine is expected to be sold to Thos. Carpenter, representing Utah capital.

Princeton Mine. This is the principal mine included in the southern portion of the 'Mariposa Grant' purchased some time ago by Messrs. T. E. Kelso, W. H. Holmes and associates. Work of blocking out ore in the mine has been underway during recent months and at present the old 40-stamp mill is being moved to a new position where ore from the mine can be handled more efficiently and economically.

Quail Mine, eight miles southeast of Coulterville, described in detail in the XVII Report of the State Mineralogist (p. 134), is being examined by Eastern parties who contemplate purchasing the property. A total depth of seven hundred feet has been reached in these workings and, according to the present owner, there is 30 inches of $14 ore on that level.

Ruth Pierce Quartz Mine. Located four miles east of Hornitos. Jas. A. McMahan, superintendent. This well known old property, which is fully described in XVII Report (p. 136), is reported to be undergoing repairs with a view to resumption of operations. It is fully equipped with a 10-stamp mill in which electric power is utilized.

San Domingo Quartz Mine. Owned by Wm. S. Zeller, Mariposa, California. Located in Colorado District, eight miles northeast of Mariposa. Has been bonded to L. R. Johnson of Ahwahnee, who is planning to erect a small stamp mill to treat the ore which, so far as developed, has all been free milling. This mine, also known as the Buffalo in times past, is further described in the Seventeenth Report, p. 136.

Simpson Mining Co. W. A. Bradley, superintendent. Has bonded the old Honeycomb, St. Gabriel, and Silver Lead Mines in the Quartzburg District near Hornitos. Some development work has already been undertaken and the 5-stamp mill on the Silver Lead property is being overhauled to handle ore from any portion of the combined claims. Details relative to the latter mine are given in the Seventeenth Report, p. 138.

Texas Hill Mining Co. includes the old Carrie Todd and adjoining claims in the Kinsley District, Secs. 7 and 9, T. 3 S., R. 18 E., M. D. M., on the North Fork of the Merced River. Under the management of C. W. Frazier of Coulterville, this property has been active in carrying on development work for the past year. A 10-stamp mill is practically

completed and future prospects look most encouraging. The Seventeenth Report of the State Mineralogist (p. 109) contains details regarding character of the deposit, etc.

White Oak Mine. (Formerly known as Stud Horse Flat Group.) Described in the Seventeenth Report (p. 139), and in 'Mining in California' for April, 1922 (p. 144).

Recent development included the driving of a 200-ft. adit, which at the time the property was visited had just struck the vein. A width of five feet was exposed in the face with no sign, as yet, of the hanging wall. The ore is quartz carrying considerable sulphides. Free gold was noted in several samples taken at random across the vein. John P. Carroll, Bagby, California, owner.

LOS ANGELES FIELD DIVISION.

M. A. NEWMAN, Mining Engineer.

Los Angeles County.

Feather-Stone Insulation Co. This company was incorporated in 1921 to exploit a deposit of diatomaceous earth, located at Covina, and manufacture from same a variety of heat insulating products.

GEOLOGY.

The deposit now being opened by the Feather-Stone Insulation Company at Covina, was discovered in 1918, and is a typical example of the pure siliceous accumulations of the middle Tertiary and belongs to the later Puente formation, a series of Miocene sandstone, shales and diatomaceous earth, which extend from the Puente Hills south to the Santa Ana River, and west and north to the southern base of the San Gabriel, San Rafael, and Santa Monica mountains (U. S. Geol. Survey Bull. No. 309, pp. 103–5).

The Puente series no doubt represents post Vaqueros sedimentation, which took place in the Puente Hills and Los Angeles region throughout the Miocene times. At the end of the Miocene there was a long period of erosion, during which the soft and very light diatomaceous earth deposits were almost entirely removed. On this eroded surface, at the beginning of the Pliocene, the Fernando formation was deposited, serving in some cases as a protection to the soft, underlying beds of diatomaceous earth that had escaped obliteration. The basal conglomerates of the Fernando, which serves as a horizon marker in many places, contain fragments of the opalized diatomaceous earth, similar to the streaks now found in all of the bodies of this material.

After the Fernando series was deposited, there followed a period of uplifting, folding and faulting, which has governed the topography of the whole region. Subsequent erosion has exposed in a few places remains of one great bed of organic sediment of the Miocene. The hills in which the Feather-Stone deposits are located are of such a nature. They are made up almost entirely of diatomaceous earth, and lie in two gentle folds that terminate abruptly against an almost vertical fault, which marks the eastern boundary of the deposit. To the west the beds are thinner and in places covered with a capping of Fernando conglomerate.

The underlying material of the entire deposit is a buff-colored clay, interbedded with streaks of fine sandstone. These clays are diatomaceous in character, 50 per cent of their mass consisting of the same class of siliceous remains, which later furnished the entire bulk of the overlying strata. The line between the buff-colored clays and the pure diatomaceous earth is, however, clearly defined, there being an abrupt change from the clay to the pure white diatomaceous earth that forms the overlying deposit of which more than 300 feet have been exposed by erosion. Of this mass the lower white beds, which are very pure, grade gradually into the upper 'Grey' beds, which contain less silica and more lime and alumina.

The development work, which consists of pits, tunnels, open cuts, and quarry faces, has proven the beds of material to be continuous and homogeneous. At the eastern end of the deposit, tributary to quarry No. 1, there has been proven an area 1500 ft. long and 500 ft. wide, with an average depth of 125 feet. Allowing 80 cubic feet to the ton, this area would yield more than a million tons of high class material, which can be easily and cheaply mined and delivered to a mill erected on the property, or to trucks for hauling to wherever processed.

PLANT.

The company has erected the first unit of a treatment plant, having a capacity of 30 tons a day, and so built that the capacity may be readily increased as business warrants.

The material, after being quarried in open faces passes over a grizzley, and is then trammed in mine cars to a roll crusher. From crusher it goes through a direct heat rotary dryer. From dryer it passes through a Gruendler mill. From the Gruendler mill it is conveyed to cyclones and baghouse. Provision is made to collect material, ranging from 8 pounds to 20 pounds per cubic foot.

GENERAL.

The company proposes to specialize on the manufacture of high temperature insulation material and also on a straight bulding material.

The softer varieties, high in alumina and lime, like the upper beds of the Feather-Stone deposits, are to be used in the making of a high-class heat insulating medium, which, when moulded into brick form and properly burned, yields a porous, two-pound, strong, non-heat conducting brick that retains its shape and size, without shrinking or checking, through all temperatures, to 2000° F.

The hard varieties, crushed to sizes from 1/16- to 3/4-inch mesh, when bound together with cement, will make a substitute for cinder concretes, suitable for use in floors, roofs, or covering for steel columns, wherever lightness and fire-proofing are required. As an aggregate for building one-story houses, its use would ensure cheap fire-, heat- and cold-proof structures.

The company maintains offices at 606 Pacific Finance Building, Los Angeles. Robert Burham, Jr., is president and general manager of the company; J. C. Specht, vice president; R. W. Cole, secretary; D. F. Meiklejohn, superintendent.

The West Coast Asbestos Co., located at Downey, has developed a business of great potential possibilities, in the manufacture of asbestos products. These products include asbestos yarn, cloth, tape, woven brake lining (Emsco), clutch facings, rope, and valve stem and sheet packings, wicking, gaskets and high pressure packing. It uses asbestos obtained from the mines of Canada, Africa, Arizona and California, depending on the particular quality required. It can readily be seen that if the California asbestos mines can furnish a product equal to the Canadian, it will replace the latter.

The increasing uses to which asbestos is being put, as a result of the demand for fireproof material, has opened up a large market for asbestos products, and those deposits in California which possess a commercial grade of asbestos, should begin to find a market for their product.

San Bernardino County.

RANDSBURG DISTRICT.

California Rand Silver, Inc. The following data has been abstracted from the July report of this company:

"Regular dividend No. 31 of 2 cents a share, or a total distribution of $25,600, was made, this making 56 cents a share for the year, or a total of $716,800."

As the shares have a par value of $1, it means the stockholders of this company, who bought at par, have received a return of 56% this year.

MINE DEVELOPMENT.

'Reports from the mine are most encouraging, and augur well for the future. On the north drift, eighth level (806 drift), after development through 300 feet of milling ore, two small ledges of very high-grade material have been encountered, and the belief is that the drift will make shipping ore within a short time.

'The vast body of ore disclosed in the 806 is situated on the Uranium No. 7 claim. This claim, it will be recalled, was jumped by the 'Coyote' Company some months ago. Later, the superintendent of the company notified our general manager to cease work on this property. What steps the Coyote may take in the future on behalf of its pretended right to the ground is problematical. But in that connection stockholders are urged to attend the annual meeting September 14, to the end that directors be chosen who believe and will contend that this ground is the property of the California Rand Silver, which it unquestionably is. The Coyote Company has even now filed protest against the issuance of patent to us.

'The development north on the third, fourth, sixth, seventh, and ninth levels is very promising. Great bodies of milling ore have been exposed. A fair grade of shipping ore has been encountered on the sixth level, and the mine management is hopeful that shipping ore will be found on the other levels named, within the month.

'On the ninth level south (913 drift) the cut has been through fine milling ore for the last 100 feet, with values lately increasing from $50 to $67. The coming month promises some very interesting developments in our property, according to every present indication.

Ore Extraction and Advancement.

'There was extracted in July tonnage as follows:

Shipping ore	1098 tons
Milling ore	4505 tons
Waste	3049 tons

'The total footage was as follows:

Drifts	1000 feet
Crosscuts, raises, shafts, etc.	536 feet
Total	1536 feet

Excellent Progress at Mill.

'The mill is making gratifying progress, 252 tons of concentrates having been shipped during July, the returns from the smelter from concentrates being $74,376.

Total ore milled in July	4380 tons
Average gold heads in July	$1 66 ton
Average silver heads in July	14 60 ton
Total average value	$16 26 ton
Average gold tails, July	$0 41 ton
Average silver tails, July	1 08 ton
Total average value tails	$1 49 ton
Average gold extraction	75.30%
Average silver extraction	92.60%
Recovery per ton	$14 77
Average concentrate value	310 00 ton
Concentrates produced	208.68 tons

For the first six months of 1922, the following figures are significant:

Ore shipped to smelters (net or dry)	6095.67 tons
Concentrates shipped to smelters (net or dry)	457.52 tons
Gross gold value	$33,416 86
Gross silver value	945,847 81
Gross value of gold and silver	$979,264 67
Net value gold	$30,321 70
Net value silver	718,076 42
Net value gold and silver	$748,398 12

Financial.

The receipts from smelter during July were:

From ore	$81,786 54
From concentrates	74,376 55
Total	$156,163 09

The company, after payment of dividend, has cash on hand of $383,036, as follows:

Legal defense fund	$100,000 00
Tax reserve fund	80,000 00
Other interest-bearing accounts	51,680 00
Credit at smelter	42,736 00
Commercial account	108,620 00
Total cash	$383,036 00

The above data, which we have given in rather full detail, should prove of especial interest to all intending investors in the Randsburg District.

To the average man or woman, they should do more to call attention to the richness of Randsburg than the get-rich-quick type of advertising, which is so much in vogue.

Randsburg Silver Mining Company (Coyote). In order to test the ground with a view of determining the depth and thickness of the formations of the Foster Group, the Coyote Company proposes to put down several diamond drill holes.

The first diamond drill hole is to be put down in the bottom of the Foster shaft, located on Kelly No. 1 claim. This shaft is now down 450 feet and with 1000 feet of diamond drilling from the bottom, much valuable information will be obtained regarding the mineralization of this particular section.

OIL FIELD DEVELOPMENT OPERATIONS.

R. E. Collom, State Oil and Gas Supervisor.

From July 8, 1922, to and including August 12, 1922, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well	Field
KERN COUNTY:					
Coalinga-Kern Oil Company	14	20	14	6	Coalinga
Pacific Oil Company	35	30	24	8	Elk Hills
Pan American Petroleum Company	2	31	24	2-G	Elk Hills
Pan American Petroleum Company	2	31	24	9-G	Elk Hills
Pan American Petroleum Company	2	31	24	15-F	Elk Hills
Pan American Petroleum Company	3	31	24	1-K	Elk Hills
Pan American Petroleum Company	2	31	24	3-G	Elk Hills
Standard Oil Company	32	30	25	3	Elk Hills
E. A. Clampitt	36	28	27	5	Kern River
A. W. Hunt	2	29	28	7	Kern River
Atlantic and Pacific Oil Company	20	30	22	1	McKittrick
Potter Oil Company	6	30	23	1	McKittrick
Potter Oil Company	6	30	23	P. N. 1	McKittrick
Conservative Oil Company	32	31	24	1	Midway
Consolidated Mutual Oil Company	28	31	23	17	Midway
Globe Petroleum Corporation	28	32	24	2	Midway
Murvale Oil Company	12	32	23	M-13	Midway
Pacific Oil Company	27	31	23	17	Midway
Pacific Oil Company	7	32	24	33	Midway
B. B. and O. Oil Company	28	12	24	28	Sunset
C. J. Berry	34	12	24	12	Sunset
Garner-Madison Oil Company	34	12	24	9	Sunset
McCutcheon Oil Company	2	11	24	9	Sunset
Tannehill Oil Company	34	12	24	22	Sunset
Western Minerals Company	17	11	23	14	Sunset
Hodgman Lease	28	25	27	1	----------
Shale Hills Development Company	35	26	18	1	----------

Company	Sec.	Twp.	Range	Well	Field
LOS ANGELES COUNTY:					
Apex Petroleum Corporation	29	4	12	2	Long Beach
Bona Fide Oil Syndicate	30	4	12	1	Long Beach
R. R. Bush Company	19	4	12	1	Long Beach
E. B. Campbell	30	4	12	2	Long Beach
Dabney Oil Syndicate	19	4	12	14	Long Beach
Dabney Oil Syndicate	19	4	12	18	Long Beach
Dabney Oil Syndicate	19	4	12	16	Long Beach
Dabney Oil Syndicate	19	4	12	17	Long Beach
de Lendrecie Oil Company	19	4	12	1	Long Beach
Duplex Petroleum Corporation	30	4	12	1	Long Beach
El Paso Pacific Oil Syndicate	29	4	12	1	Long Beach
General Petroleum Corporation	19	4	12	2	Long Beach
General Petroleum Corporation	19	4	12	3	Long Beach
George F. Getty	30	4	12	3	Long Beach
Hall-Weber Syndicate	29	4	12	1	Long Beach
Henderson Petroleum Syndicate	29	4	12	1	Long Beach
Henderson Petroleum Syndicate	19	4	12	1	Long Beach
Henderson Petroleum Syndicate	20	4	12	1	Long Beach
Edward Hericks	24	4	13	7	Long Beach
Hub Oil Company	19	4	12	1	Long Beach
Hub Oil Company	24	4	13	1	Long Beach
Hughes Drilling Company	30	4	12	1	Long Beach
Industrial Oil Syndicate No. 2	19	4	12	1	Long Beach
W. M. Keck	20	4	12	1	Long Beach
W. M. Keck	20	4	12	Klein 1	Long Beach
Liberty Oil Syndicate	19	4	12	1	Long Beach
Carl Maier	19	4	12	1	Long Beach
Marine Oil Corporation	29	4	12	4	Long Beach
Louis Meizer	20	4	12	4	Long Beach
E. J. Miley	19	4	12	1	Long Beach
Pacific Corporation	20	4	12	1	Long Beach
Pacific Corporation	29	4	12	8	Long Beach
Pacific Corporation	20	4	12	9	Long Beach
Petroleum Midway Company, Ltd.	19	4	12	1	Long Beach
Petroleum Midway Company, Ltd.	19	4	12	Davidson 1	Long Beach
Republic Petroleum Company	20	4	12	1	Long Beach
Rice Ranch Oil Company	19	4	12	1	Long Beach
Shell Company	20	4	12	2	Long Beach
Shell Company	29	4	12	Horsch 2	Long Beach
Shell Company	20	4	12	1	Long Beach
Shell Company	19	4	12	2	Long Beach
Shell Company	29	4	12	2	Long Beach
Temescal Oil Company	19	4	12	2	Long Beach
Transport Oil Company	30	4	12	2	Long Beach
United Oil Company	19	4	12	1	Long Beach
Western Star Oil Company	19	4	12	Lewis 1	Long Beach
Western Star Oil Company	29	4	12	1-A	Long Beach
Western Star Oil Company	30	4	12	1-A	Long Beach
Western Star Oil Company	19	4	12	Neece 1	Long Beach
Wigle & McBride	20	4	12	1	Long Beach
Fullerton Oil Company	8	4	14	1	Redondo
Amalgamated Oil Company	5	3	11	4	Santa Fe Springs
Bellview Oil Company	8	3	11	1-A	Santa Fe Springs
Coalinga Mohawk Oil Company	6	3	11	1	Santa Fe Springs
Thos. Donley Land and Oil Co.	6	3	11	1	Santa Fe Springs
Elliott Petroleum Corporation	1	3	12	1	Santa Fe Springs
Farmers and Merchants Trust Co.	19	3	11	1	Santa Fe Springs
General Petroleum Corporation	6	3	11	52-A	Santa Fe Springs
General Petroleum Corporation	6	3	11	78	Santa Fe Springs
General Petroleum Corporation	6	3	11	91-A	Santa Fe Springs
General Petroleum Corporation	6	3	11	77	Santa Fe Springs
General Petroleum Corporation	5	3	11	53	Santa Fe Springs
George F. Getty	6	3	11	4	Santa Fe Springs
George F. Getty	5	3	11	2-A	Santa Fe Springs
George F. Getty	5	3	11	5	Santa Fe Springs
Oscar R. Howard	6	3	11	1	Santa Fe Springs
C. C. Julian Company	6	3	11	2	Santa Fe Springs
E. A. Lamb	6	3	11	1	Santa Fe Springs
Petroleum Producers Syndicate	6	3	11	1	Santa Fe Springs
San Diego-Santa Fe Springs Syn.	6	3	11	1	Santa Fe Springs
Santa Fe Springs Mutual Oil Syn.	6	3	11	1	Santa Fe Springs
Shell Company	31	2	11	1	Santa Fe Springs
Standard Oil Company	6	3	11	1	Santa Fe Springs
Standard Oil Company	6	3	11	3	Santa Fe Springs
Standard Oil Company	6	3	11	2	Santa Fe Springs
Standard Oil Company	6	3	11	Johnson 1	Santa Fe Springs
Standard Oil Company	31	2	11	2	Santa Fe Springs

Company	Sec.	Twp.	Range	Well	Field
LOS ANGELES COUNTY—Cont'd.:					
Twin Bell Oil Syndicate	6	3	11	3	Santa Fe Springs
Union Oil Company	6	3	11	3	Santa Fe Springs
Union Oil Company	6	3	11	11	Santa Fe Springs
Union Oil Company	6	3	11	15	Santa Fe Springs
Universal Consolidated Oil Co.	5	3	11	1	Santa Fe Springs
C. Bell	25	1	13	1	
California Pacific Oil Company	24	1	13	2	
Jos. L. Herron	1	1	13	1	
Potter Oil Company	18	3	13	1	
Union Oil Company	35	2	14	1	
Burt T. Wells	18	1	18	1	
MENDOCINO COUNTY:					
Mendocino-Midway Oil Syndicate	30	19	13	1	
NAPA COUNTY:					
Sugar Loaf Oil Association		8	3	1	
C. V. Wreden		8	3	1	
ORANGE COUNTY:					
Union Oil Company	12	3	10	54	Brea Olinda
Amalgamated Oil Company	34	5	11	2	Huntington Beach
Amalgamated Oil Company	34	5	11	6	Huntington Beach
Amalgamated Oil Company	34	5	11	4	Huntington Beach
Argonaut Oil Company	11	6	11	1	Huntington Beach
General Petroleum Corporation	2	6	11	1	Huntington Beach
Holly Oil Company	35	5	11	1	Huntington Beach
Lindsay Equitable	11	6	11	1	Huntington Beach
Miley Keek Oil Company	34	5	11	19	Huntington Beach
Miley Keek Oil Company	2	6	11	16	Huntington Beach
Miley Keek Oil Company	2	6	11	11	Huntington Beach
Miley Keek Oil Company	2	6	11	21	Huntington Beach
Petroleum Midway Company, Ltd.	35	5	11	3	Huntington Beach
Petroleum Midway Company, Ltd.	35	5	11	4	Huntington Beach
Rhoads Oil Producing Company	11	6	11	7	Huntington Beach
Standard Oil Company	2	6	11	2	Huntington Beach
Standard Oil Company	2	6	11	7	Huntington Beach
Standard Oil Company	2	6	11	15	Huntington Beach
Standard Oil Company	3	6	11	1-A	Huntington Beach
Union Oil Company	34	5	11	3	Huntington Beach
Union Oil Company	30	3	9	21	Richfield
RIVERSIDE COUNTY:					
Cabazon Oil Company	9	3	3	1	
SAN BERNARDINO COUNTY:					
Arrowhead Development Company:	24	3	6	1	
SANTA BARBARA COUNTY:					
Cuyama Petroleum Company	6	10	27	1	
SAN MATEO COUNTY:					
Berger & Caglieri	Purisima Rancho			1	
VENTURA COUNTY:					
I. W. Keerl	32	2	20	1	Conejo
R. C. Worsdell	8	4	21	1	Ojai
R. B. K. Petroleum Company	18	4	18	1	Firu
Shell Company	28	3	23	5	Ventura

SPECIAL ARTICLES.

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the Bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff containing much information that will add to the permanent value of the Monthly Chapter are included in each number of 'Mining in California.'

It is anticipated that these special articles will cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations, as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the text of new laws and official regulations and notices affecting the mineral industry.

PROGRESS REPORT ON PLACER GOLD INVESTIGATION.

By Chas. S. Haley.

The work during the month of July has been largely confined to the channels of the ancient tertiary rivers, which lie on the headwaters of the Yuba and American rivers of the present day.

Commencing above the Mohawk Valley, on the ridge dividing Jameson Creek and the east fork of Nelson Creek, both tributary to the Feather River, there is a channel, which is still very largely virgin, and in many places is heavily lava-capped. There are excellent opportunities for drifting on this channel. Coming down from the McCray Ridge, it passes underneath Rattlesnake Peak, and down through Monte Cristo, above Downieville. Here it crosses to the City of Six and proceeds southerly to Forest and Alleghany, by way of Chips Flat to Moores Flat, and joins the main channel at the Derbeck Mine, above North Bloomfield; in the region of Alleghany and Chips Flat, this channel has been well drifted. At Moores Flat, there are several hundred feet of good, hydraulic gravel, which will be of great value, in case hydraulic mining is resumed, under the proper limitations.

Another channel, commencing above Table Rock, in the Blue Nose and Bunker Hill country, comes down by way of Eureka to White Bear, and also passes southwest of the Forest and Alleghany channel, along Kanaka Creek and through the Grizzly Ridge, probably joining the main channel somewhere near the region of Backbone House. This channel, also, has much virgin ground, and, judging by what work has already been done on it, there should still be an opportunity for profitable drifting.

Another channel, starting near Gold Lake, back of the Sierra Buttes, comes down across the North Fork of the Yuba, by way of Milton, and passes through American Hill and Snow Point, joining the main channel of the Tertiary Yuba, somewhere above Relief Hill. This channel has been drifted more than the other two, but still has some ground which appears promising. A tributary to this channel from the Graniteville

region is very uncertain in its course, but where it has been worked has proved profitable.

In the region north and east of Forest Hill, there is a territory, which, as yet, has been very little investigated. The heavy rhyolite flows at the close of the Eocene period were responsible for the removal of these channels, but in the upper regions there is still a considerable quantity of the old Cretaceous white gravel, deposited before the turning of this channel from its northward course, down through Todds Valley. On many of these branch channels, particularly above the Ralston Divide, there has been a great deal of money taken out, as a rich pocket country was cut down and concentrated by these channels.

A detailed investigation of this section will be undertaken during the months of September and October of this year, and it is hoped that some interesting and possibly profitable ground will be within the scope of this report during the months of October and November.

VALUATION OF MINING AND OIL PROPERTY.*

By Fletcher Hamilton.

When requested by Mr. Ralph Smith of your body to address you upon the subject of valuation of mining and oil property, the invitation was accepted through a desire to be of some service to your membership but, I promise you, with slight realization of the task confronting anyone who might attempt to present a solultion of those problems in which you are so vitally interested and which you, no doubt, have before you continuously.

Valuation of any property, in so far as the State's interest is concerned, is made with the sole purpose of taxing that property for state, county or municipal revenue.

In order that taxation may be just and equitable, it is mandatory, in the interest of justice, that a uniform basis of valuation be adopted for the guidance of those who are charged with the duty of appraising property. If this could be done, the question of tax rates would be simple.

The measure of value of property is governed by the degree to which it is able to produce revenue. The very nature of mining and oil properties places them in a class different from the ordinary real estate, agricultural and other properties, in that every ton of ore or barrel of oil produced reduces the value of that property to that extent. In other words, these industries are known as wasting industries.

It can, therefore, be seen that every individual mining and oil property is a problem unto itself and its value is dependent upon a thorough investigation of its ore or oil reserves, as the case may be.

In the case of the mine, the ore reserves are accurately measurable in so far as they can be considered developed, and at any particular date the value of the mine may well be taken as the net value of the ores developed, measurable and salable on that date.

In the case of oil, we have a much more difficult problem to face and one which introduces a wealth of variable factors. This will be discussed later on.

The mine valuation is made up of practically two factors, Surface Improvements and Net Value from Ore Reserves.

First: Surface Improvements.

As a matter of fact, surface improvements on a mine have little value aside from their usefulness in allowing the owner of the mine to derive the net value from its ores which forms the basis of the mine valuation. It is well known, to those familiar with mining operations, that an idle plant is worth but a small percentage of its original cost when offered for sale. However, when a mine is operating and producing, the same basis of valuation as is placed upon similar property in other industries would probably be just and equitable.

Second: Net Value from Ore Reserves.

Where it is necessary to expend capital and labor in order to produce value, that value is measurable by deducting the cost of production from the gross value of the product. This applies decidedly to the mine.

*Paper read before the State Tax Appraisers Convention, Los Angeles, California, 1922.

The measurement of ore bodies, the sampling and determination of marketable values therein are decidedly technical processes and must be employed to determine the gross value of a mine.

The operating costs, chargeable against and deductible from the gross value, should include all items of expense entering into the production of the final marketable commodity, namely: cost of mining and development, cost of milling, freight and other treatment costs, all general and office expense such as taxes, insurance, salaries of active officers and managers at plant and headquarters; also proper deductions for depletion and depreciation should be made according to the life of the property.

Various methods of valuation have been evolved and proposed, but one method of valuation for all purposes seems to be impossible. The value of a mine for state purposes, the value of a mine for federal purposes, and the value of a mine for the buyer's or seller's purposes are different things. Even the value of a mine for various purposes of the state or county are different.

In the valuation of a mine for taxation purposes, it is desired to place such valuation on a basis comparable with or equitable as to other property. In the valuation of a mine for inheritance tax purposes, it is necessary to arrive at a valuation as of a particular date and which would be a valuation equal to a sale value of a given property, provided there was a demand or market for that property. In all these cases, however, an equitable basis should be provided, and that, undoubtedly, is the net value of ore reserve basis for inheritance tax purposes and net value of ore production basis over a given period for ordinary taxation purposes.

In June, 1920, I served on a committee on valuation in a case of a large copper property wherein the company petitioned the Board of Supervisors for a reduction in the valuation of the property as made by the Assessor.

The committee had available a mine model; maps of mine workings, as well as access to all records of tonnages and values, ore reserves, also mining and smelting costs. All of the ore bodies were checked with stope maps by underground inspection. The grade of the ore was established and checked by the smelter operation records and the value of the ore reserves established, allowing for a smelter loss as shown by the operation records.

The value of copper in the ore was established by taking the average market quotations for a period of ten years previous to the date of valuation.

To illustrate the variable factors: the mining and transportation costs had increased from $2.93 per ton in 1914 to $4.66 in 1918 and the smelting and refining costs had increased from $4.25 per ton in 1914 to $7.91 per ton in 1919.

From the records, it was established that the operating costs, not taking into consideration depreciation and depletion, were $12.21 per ton and the ore reserves were established at $16.04 per ton, thus leaving a net value per ton of $3.83, upon which basis the ore reserves were calculated in giving the mine its valuation.

It was reported also by the committee that the ore reserves would operate the smelter for a period of only six to eight months and that, inasmuch as the mine equipment and camp buildings were of value only as long as the property was operated, this should be taken into consideration.

The committee further reported that, as a matter of assessment policy, possessory rights in unpatented and undeveloped mining claims would be fairly assessed to prospector or location holder at $2.50 per acre and where ground is held, under mineral patent, $5 per acre. In case of successful development, additional assessment proportionate to ore values created, could be placed.

In the matter of valuation of equipment on this property, an interesting point is worth mention. This had to do with a large and costly experimental plant which could not produce a profitable product and was idle. The committee was of the opinion that until the plant was a proven commercial success, its actual cash value for assessment purposes should be based on conditions as they existed, which would be what the machinery and material could be sold for after dismantling; in other words, that experimental work should not be excessively assessed by high valuation of plant.

In review then, the mine valuation consists of, first, its surface equipment and improvements. Its main and essential value, however, lies in its proven ore reserves. In the calculation of the value of these reserves we have variable factors, namely, varying cost of production due to adverse or more favorable operating conditions; also a varying market price for the commodity product, except in the case of gold mines.

I have not dwelled upon the possible or probable ores in the mine for the reason that this constitutes the speculative value of a mining property and involves the judgment of the engineer or geologist upon whose judgment capital is willing to invest in order that real values may be produced.

The subject of mine valuation and taxation is one which is being given considerable attention and I am taking the liberty of including herewith a few paragraphs of a letter from Albert Burch, a well known mining engineer, to the Secretary of the California Metal and Minerals Producers Association, as follows:

DEAR SIR: I recommend that the Committee on Taxation ask the Executive Committee and members of the Association to support the following uniform plan of mine taxation for California:

FIRST. *Assessment.*

Valuation for assessment for purposes of local taxation as follows:

A. Surface improvements on the same basis as other property in the county in which they are located.

B. The value of mining claims and real estate, the surface of which is not used for other than mining purposes, at one quarter of the gross value at the mine of all ores, minerals or metals produced during the preceding year provided, however, that should the net value of such production exceed one-fourth the gross value, then the net value should be taken as the value of the mining claims and real estate. The net value should be determined by deducting from the gross value:

1st. The actual cost of mining and development work performed during the year.

2nd. The actual cost of freight and treatment on the ore.

3rd. General expenses, including taxes, insurance, welfare work, cost of workmen's compensation, office expenses at both mine headquarters, and salary of all officers engaged in the actual operation or management of the business of the mine.

4th. Depreciation to the amount of the actual decrease in value of the surface plant, where its value is not fully maintained by repairs and betterments and where so maintained, the cost of such repairs and betterments.

5th. Allowance for depletion in accordance with the provisions of the U. S. revenue laws.

SECOND. *Tax Levy.*

A. For local (county and municipal) taxes, the levy should be the same as for other classes of property in the same county, district and municipality.

B. For state taxation the levy should be one-half of one per cent on the value of the net proceeds for the preceding year and this should be in lieu of any franchise tax whatever.

My reasons for advocating the above described plan are partly those of justice and partly of expediency.

The present haphazard method is objectionable, because of lack of uniformity throughout the state and because too much latitude is given to the discretion of county assessors who are usually much more familiar with the value of other property than they are with that of mines. Most California mines are located in counties where interests other than mining have the preponderance of influence, and without some controlling law, the natural tendency of the county officer, no matter how honest and capable, is to favor those having the most political influence. On the other hand, in the rare instances where mining is the leading industry, county officers are liable to show it undue favoritism.

It is therefore in the interest of justice that the valuation of mines for assessment purposes be put upon a uniform basis throughout the state, and this highly technical matter be taken, once for all, from the hands of the inexperienced.

That many others have arrived at the same conclusion is evidenced by the fact that the following named states, in which mining is one of their important industries, have passed special laws for the assessment and taxation of mines:

Arkansas	Nevada (constitutional)
Arizona	New Mexico
Colorado	New York
Idaho	Oklahoma
Michigan	South Carolina
Minnesota	Utah
Montana	Wyoming

The laws of the above named states, covering the subject of mine taxation, are by no means uniform but nearly all of them provide some method by which the assessment of mining property is taken out of the hands of local assessors.

The plan which I have outlined above is very similar to that adopted by the State of Colorado at the last session of its legislature which supplants a law previously in force in that state that provided for a much higher valuation on mining property. The history of the industrial development of and the present condition of Colorado are very similar to those of California. Starting originally as a mining state, there has been a gradual growth of: first, stock raising, then agriculture, then general commerce and finally manufacturing; and today, each of the last three named industries far outweighs mining in importance within the state. And it is since the relegation of mining to a position of secondary importance in the state's industries, that special laws for mine taxation have been adopted by Colorado.

Taking up the valuation of oil properties:

In referring to my previous statement that each oil and mining property is a problem unto itself—in the case of the mine, the ore is accurately measurable; in the case of the oil reserve, however, an estimate only can be made and the degree of worth of that estimate is proportional to the completeness to which the particular property has been drilled.

The net value of an oil property is dependent upon amount of oil available, cost of extraction and price; none of these factors is fixed, and property valuation must fluctuate. The actual amount of oil under a property may change due to its migratory nature. The amount of oil recoverable varies with the degree of efficiency in operating methods. Extraction costs vary with changes in cost of labor and supplies. Changes in the market price of oil are frequent. It might be well to note here that within the last thirty days there have been two cuts of 25 cents each in the price of oil at the wells in California which now places 14° gravity to 19.9° gravity oil at a price of 60 cents per barrel, with higher gravity oils at a graduated increase.

The valuation of oil land is made upon the knowledge of past performance of the wells in the tract of land to be considered. The more complete the record, the greater the degree of comparative accuracy in the estimate of value to be made.

The determination of extractable oil content in land depends upon the thickness of oil sands, porosity, viscosity of oil, and gas pressure. These factors have not been fully recorded but cognizance must be taken of them.

The gross production records by individual wells in a given tract are most important and from such records curves showing the variation in rate production have been developed, which, over a period of years, give a fair idea of what may be anticipated in a particular property. It has been found generally that after its flush production, a well gradually declines in production. It is also noted that each additional well drilled into the oil measure lowers the production of adjacent wells. As a tract becomes more completely drilled, the initial or flush production becomes smaller.

So-called 'settled production' has been well established as the basis for valuation of oil land.

As in the case of the mine, an oil property can only be valued by the net value from oil reserves basis.

Chief cost of oil production consists of five factors: (1) Cost of land or drilling right; (2) Surface plant equipment; (3) Drilling of wells; (4) Maintenance of property; (5) General expense.

The time element in draining a given oil measure is important in the valuation of a property. Operating obstacles also make a great difference in items of cost. It is undoubtedly good business to write off, as operating costs, a large depreciation and depletion charge annually.

With a condition wherein so many variables enter, it seems that valuation of oil properties for state purposes should be based entirely upon known factors of production with as little of the variable elements entering as possible.

SECRETARY'S OFFICE.

W. W. Thayer, Secretary.

The California State Mining Bureau was created April 16, 1880, by legislative act. In March, 1893, the original act was repealed and an amended act approved and passed by the legislative body. Again on June 16, 1913, a new Mining Bureau Act was approved which became effective August 10, 1913, repealing all former acts, and forming the basic law under which the Bureau now functions.

It is doubtless true that both the mining and lay public have not in the past always recognized the part played by the Bureau in the development of the state's mineral resources. Innumerable inquiries regarding them, originating within and without its borders and in foreign countries, have been answered with ultimate results reflected by a consistent growth in the value of the state's mineral output since the records of production were first compiled by the Bureau in 1887.

It is believed that a better understanding of the economic position occupied by the Bureau will be imparted to the public, whose funds support it, by embodying in the Monthly Chapter a review of the executive activities.

The responsibility for the coordination of effort of each department, to the end that the utmost efficiency may be maintained with the limited and variable appropriations accorded the Bureau by successive legislatures, rests upon the office of secretary.

Activities referable to that office, such as reports of new maps and publications issued, amount of mail handled, changes and enlargements in offices, changes in personnel of the staff, property and equipment, financial statements, etc., are therefore included herein.

New Publications.

During the month the following Bureau publications have been made available for distribution:

Summary of Operations, California Oil Fields, April, 1922, Vol. 7, No. 10.
Mining in California, June, 1922, (Monthly), Vol. 18, No. 6.

Distribution of Publications.

The Bureau's publications are constantly in demand, requests for copies coming from all over the United States and foreign countries.

Publications were distributed during the month as follows:

Publications	Number distributed
XIV Report State Mineralogist	9
XV Report State Mineralogist	9
XVII Report State Mineralogist	13
Mines and Mineral Resources of Colusa, etc.	7
Mines and Mineral Resources of Del Norte, etc.	7
Mines and Mineral Resources of Fresno, etc.	9
Mines and Mineral Resources of Imperial, etc.	8
Mines and Mineral Resources of Alpine, etc.	8
Mines and Mineral Resources of Butte, etc.	7
Mines and Mineral Resources of El Dorado, etc.	10
Mines and Mineral Resources of Inyo, etc.	1
Mines and Mineral Resources of Los Angeles, etc.	7
Mines and Mineral Resources of Mono, etc.	1

Publications	Number distributed
Mines and Mineral Resources of Monterey, etc.	10
Mines and Mineral Resources of San Bernardino, etc.	13
Mines and Mineral Resources of Nevada County	13
Mines and Mineral Resources of Plumas County	12
Mines and Mineral Resources of Sierra County	13
Bulletin No. 6, California Gold Mill Practices	11
Bulletin No. 23, Copper Resources of California	6
Bulletin No. 37, Gems, Jewelers' Materials, Ornamental Stones of California	12
Bulletin No. 46, Index to Mining Bureau Publications	6
Bulletin No. 50, Copper Resources of California (Revised Edition)	6
Bulletin No. 67, Minerals of California	2
Bulletin No. 72, Geologic Formations of California	17
Bulletin No. 76, Mining Laws, United States and California	9
Bulletin No. 78, Quicksilver Resources of California	10
Bulletin No. 85, Platinum and Allied Metals in California	13
Bulletin No. 89, Petroleum Resources of California, with special reference to unproved areas	112
Mining in California, (Monthly) Vol. 18, No. 5, May	2300
County Maps and Registers of Mines	35
El Dorado Forest Map	8
Madera Forest Map	7
Placer Forest Map	9
Shasta Forest Map	7
Sierra Forest Map	8
Siskiyou Forest Map	8
Tuolumne Forest Map	8
Inyo Geological Map	10
Forest Map, unmounted	6
Forest Map, mounted	7
Geological Map of California, mounted	16
Geological Map of California, unmounted	5
Colored Map accompanying Bulletin No. 89	21
Oil Field Maps	448

Mails and Files.

The Bureau maintains in addition to its correspondence file a mine report file which includes reports on some 7500 mines and mineral properties in California. Also there is available to the public a file of the permits granted to mining and oil corporations by the State Commissioner of Corporations.

During the month 691 letters were received and answered. They are practically all requests for information and the inquiries cover all phases of prospecting, mining and developing mineral deposits, reduction of crude minerals and marketing of refined products.

Drafting.

The Bureau maintains an up-to-date drafting department, where topographic and geological maps, tracings, oil well logs, and oil field maps are prepared.

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Statistician and Curator.

STATISTICS.

California produces commercially at least fifty different mineral substances, with a total annual value in recent years of nearly $250,000,000. There are several thousand operating properties, including mines, quarries, oil and gas wells, mineral springs, salt works, gravel pits, mills and smelters.

Some data relative to the 1921 production has been given in 'Mining in California,' beginning with the April issue, and additional substances are covered herein. The completed figures for the remaining items and the final summaries by groups and counties will be published in the September issue.

LITHIA.

Bibliography: State Mineralogist Reports II, IV, XIV. Bulletins 38, 67.

Lithia mica, lepidolite (a silicate of lithium et al.) utilized in the manufacture of artificial mineral water, fireworks, glass, etc., has been mined in San Diego County since 1899, except between 1905 and 1915. Some amblygonite, a lithium phosphate, has also been obtained from pockets associated with the gem tourmalines. In 1920 there was a marked drop in the yield of lepidolite, the output being utilized in glass manufacture. As there was only a single producer, the figures are concealed under the 'unapportioned' item. The average value reported was $15.24 per ton, f.o.b. rail-shipping point.

Lithia mica total production in the state has been as follows:

Year	Tons	Value	Year	Tons	Value
1899	124	$4,600	1916	71	$1,065
1900	440	11,000	1917	880	8,800
1901	1,100	27,500	1918	4,111	73,998
1902	822	31,880	1919	800	14,400
1903	700	27,300	1920	10,046	153,502
1904	641	25,000	1921	*	*
1905	25	276			
1906					
1915	91	1,365	Totals	15,851	$380,686

*Concealed under 'Unapportioned.'

According to the U. S. Geological Survey, the only other production of lithium minerals in the United States outside of California in recent years has been spodumene from South Dakota.

MAGNESIUM SALTS.

Bibliography: 'Dictionary of Applied Chemistry,' by Thorpe. U. S. Geol. Surv., Mineral Res. of U. S.

Magnesium chloride is an important item in certain chemical uses, and in the preparation of Sorel cement in laying magnesite floors. Previous to 1915, Germany was the principal source of this chloride. Some of the salt companies in California began its commercial preparation in 1916, from the residual bitterns obtained during the evaporation of sea water for its sodium chloride.

In addition to the chloride, some magnesium sulphate, or 'technical epsom salts,' has also been made at four of the plants: Oliver Chemical Company in Alameda County, Whitney Chemical Company in San Mateo County, the Marine Chemical Company at Long Beach, Los Angeles County, and the California Chemical Company at San Diego; though but two of them reported sales of the sulphate in 1921. In 1919, the Merle Magnesia Company at Redwood City, San Mateo County, produced magnesium carbonate for use in magnesia-asbestos pipe covering.

In 1921, the prices reported for the chloride ranged from $22 to $36 per ton, and the prices for the sulphate at $23–30.

The 1921 output of chloride and sulphate totaled 4153 tons, valued at $106,140, an increase in tonnage, but a slight decrease in the value from the 1920 figures of 3150 tons and $107,787.

With the use of magnesite cement and stucco coming more into vogue in building construction, the demand for magnesium chloride will increase in proportion.

Metallic magnesium is prepared generally by electrolysis of fused magnesium chloride in a bath of an alkaline chloride. In the United States, one plant uses a bath of salt and ammonium chloride. A plant at Niagara Falls uses calcined magnesite, the metal being reduced by electrolysis of the fused oxide in an electrolyte or bath of fused fluorides. The commonest known use of the metal is in the powdered form for flash lights in photography. During the war, magnesium was put in shrapnel shells, that observers and gunners might know exactly where the shells were bursting. By day the burning magnesium gives a dense pure-white cloud of magnesium oxide, and at night a dazzling white light. Larger quantities were used in aerial bombs and rockets for lighting up the country at night. Magnesium has, as yet, found but a limited direct use as a metal. Magnalium an alloy of aluminum containing about 2% of magnesium and small percentages of other metals, is stated to be used in automobiles and aeroplanes. The possibilities for further important developments in this direction are promising.

Total Production of Magnesium Salts in California.

The total production of magnesium salts in California since the beginning of the industry here, is shown in the following tabulation:

Year	Tons	Value
1916	851	$6,407
1917	1,064	34,973
1918	1,008	29,955
1919	1,616	82,457
1920	3,150	107,787
1921	4,153	106,140
Totals	11,842	$367,719

MANGANESE.

Bibliography: State Mineralogist Reports XII, XIII, XIV, XV, XVII, Bulletins 38, 67, 76. U. S. G. S., Bull. 427.

By far the greater tonnage of manganese ore is utilized in the preparation of ferro-manganese and employed in the steel industry both for its metal content and to slag off certain impurities during the open-hearth treatment. Though its other uses may be classed as 'chemical,' the tonnage thus consumed is relatively smaller. Its chemical uses are as a decolorizer or oxidizer in glass manufacture, and as a constituent in electric dry batteries. The chemical uses require a much higher grade of ore than the steel industry. For steel purposes an iron content is acceptable, but manganese should exceed 40%. Silica should be under 8%, though higher was taken during the war period. Phosphorus should be under 0.20%. For electric dry cells, the iron content should be under 1.5% Fe_2O_3, and SiO_2, under 6%. For glassmaking the manganese should be practically free of iron. On account of the high prices prevailing for manganese during 1915–1918, selenium replaced manganese dioxide in glass factories; and it is stated to have been so successful that its use continues.

Though the imports of manganese ore from the Caucasus District in Russia were reduced by the war to practically nothing, the United States received important shipments from Brazil, India and Cuba; so that the total imports for 1916 were practically double those of either 1914 or 1915. The 1916 figures were 576,321 long tons, valued at $8,666,179; for 1917, a total of 629,972 long tons, valued at $10,262,929, of which 512,517 tons were from Brazil; in 1918 a total of 491,303 long tons, value $15,095,867, of which 345,877 tons were from Brazil; in 1919, a total of 333,344 long tons, value $11,229,184, of which 246,592 tons came from Brazil; in 1920 total 601,437 long tons, value $11,955,922, with 421,523 tons, Brazil; in 1921, total 401,354 long tons, $5,365,732, with 262,468 tons, Brazil. Consular reports of January, 1922, indicate that some ore is again being shipped from Trans-Caucasia.

Batteries, chemicals, and kindred industries in the United States consume approximately 25,000 tons of high-grade manganese ore, annually, or about one-thirtieth of that used in steel manufacture.

A considerable portion of the state's 1917-1918 product was utilized in California in making ferro-manganese by electric furnace; besides shipments which were sent East. Some 'chemical' ore was also

shipped. For many years the principal producing section has been the Livermore-Tesla District, in Alameda and San Joaquin counties, but exceeded in 1915 by Mendocino and regaining the lead in 1916. In 1918–1920 the largest producing county was Stanislaus, which adjoins San Joaquin on the south, and whose manganese district is a part of the same geological province that includes the Livermore-Tesla District.

Manganese is reported to exist in many localities in the state; but for a number of years, particularly since the discontinuance of the chlorination process in the metallurgy of gold, production was relatively unimportant until the activity of the war period.

The production of manganese ore in California for 1921 amounted to 1005 tons of all grades, having a total value of $12,210 f. o. b. rail-shipping point. This was less than one-half of the quantity, and one-fifth of the value in 1920. The prices paid in 1921 ranged from $6 to $15 per short ton, the average being approximately $12 per ton.

The ores produced in California in 1921 were shipped mainly to plants at Berkeley and Redwood City, where they were concentrated by elimination of the silica. The Consolidated Manganese Company in Berkeley utilizes an electro-magnetic separation. Their product is sold, in part, to iron foundries for use, instead of ferro-manganese, in cupola blast furnaces making gray-iron castings; and, in part, sold for use in the manufacture of pressed, building brick to deepen the color. The American Manganese Products Company at Redwood City refines siliceous manganese ores by a patented chemical process, producing a high-grade, dioxide especially suited for dry-cell electric batteries.

Manganese Production in California, by Years.

Production of manganese ore in California began at the Ladd Mine, San Joaquin County, in the Tesla District in 1867. When shipments of this ore to England ceased late in 1874, upwards of 5000 tons had been produced by that property. For some years following that, the output was small. The tabulation herewith shows the California output of manganese ore, annually, since 1887, when the compilation of such figures was begun by the State Mining Bureau:

Year	Tons	Value	Year	Tons	Value
1887	1,000	$9,000	1906	1	$30
1888	1,500	13,500	1907	1	25
1889	53	901	1908	321	5,785
1890	386	3,176	1909	3	75
1891	705	3,830	1910	265	4,235
1892	300	3,000	1911	2	40
1893	270	4,050	1912	22	400
1894	523	5,512	1913		
1895	880	8,200	1914	150	1,500
1896	518	3,415	1915	4,013	49,098
1897	504	4,080	1916	13,404	274,601
1898	440	2,102	1917	15,515	396,659
1899	295	3,165	1918	26,075	979,235
1900	131	1,310	1919	11,569	451,422
1901	425	4,405	1920	2,892	62,323
1902	870	7,140	1921	1,005	12,210
1903	1	25			
1904	60	900	Totals	84,099	$2,315,349
1905					

MICA.

Bibliography: State Mineralogist Reports II, IV. Bulletins 38, 67.

No commercial production of mica has recently been reported in California. Production in previous years has been as follows:

Year	Tons	Value
1902	50	$2,500
1903	50	3,800
1904	50	3,000
Totals	150	$9,300

[1]"The different uses to which mica is put depend on its form—whether in sheets or in powder. Sheet mica is used in the electrical industry, for glazing, and to some extent for other purposes. Ground mica is used chiefly in the decorative trades and in insulation.

"Sheet mica finds its greatest use in the electrical industry, where an insulating, noninflammable material is necessary. It is used in sheets and as washers and disks in dynamo-electric machinery, electric-light sockets, spark plugs, insulators, guards in rheostats, fuse boxes, and telephones. Flexible cloth and tape, covered with mica, find varied uses in electrical apparatus. Sheet mica is used for glazing the fronts of stoves and for making lamp chimneys and lamp shades. It is also used in spectacles, automobile shields, phonograph diaphragms, in windows where glass would be broken and in lantern transparencies.

"Ground mica is used for decoration in wall paper, to which it gives luster and brightness; in fancy paints, ornamental tiles, concrete, rubber goods, pipe and boiler coverings, insulating compounds, fireproof paints and coverings, patent roofing material, molded mica (ground mica mixed with shellac), and calico printing; as absorbent for nitroglycerin in the manufacture of 'mica powder,' in tempering steel; to a large extent as a lubricant for wooden bearings, or, mixed with oil, as a lubricant for metal bearings; and as a filler for various products. Tar and other roofing papers are coated with coarsely ground mica to prevent sticking when they are rolled for shipment. A possible value of ground mica as a chemical source of potash salts is indicated in a recent Geological Survey report.[2]

"It is understood that sheet mica has come to be of importance as a war mineral through its use abroad as windows in masks worn for defense against asphyxiating gases, and for other uses where a transparent, noninflammable, nonshattering material is necessary, as in automobile goggles and in windows for armored cars."

MINERAL PAINT.

Bibliography: State Mineralogist Reports XII–XVIII, Inc. Bulletin 38.

Mineral paint materials were produced in California in 1921 from a single property in each of the following five counties: Alameda, Placer, Santa Cruz, Stanislaus, and Ventura. The total amounted to 446 tons, valued at $4,748, being slightly more than one-half the 779 tons and $8,477 of 1920. The decrease was due mainly to smaller shipments of yellow ochre from the Knights Ferry District in Stanislaus County. As in 1920, there were no shipments from Colusa County. The material there is a siliceous hematite. The Santa Cruz product is magnetite concentrated from beach sands. That shipped from Alameda County is a red, ferruginous shale; that from Placer, hematite; and that from Ventura, red ochre.

Besides the above-named counties, deposits of mineral paint have been noted, and in the past most of them have yielded some commercially, in the following: Amador, Calaveras, Imperial, Kern, Kings, Lake, Los Angeles, Nevada, Riverside, Sonoma.

[1]Schaller, W. T. Mica in 1916; U. S. Geol. Surv., Min. Res. of U. S., 1916, p. 304, 1917.
[2]Butler, B. S., Potash in certain copper and gold ores, with a note on muscovite by George Steiger: U. S. Geol. Survey Bull. 620, pp. 227-235, 1916.

Mineral Paint Production of California, by Years.

The first recorded production of mineral paint materials in the state was in the year 1890. The output, showing annual amount and value, since that time, is given herewith:

Year	Tons	Value	Year	Tons	Value
1890	40	$480	1907	250	$1,720
1891	22	880	1908	335	2,250
1892	25	750	1909	305	2,325
1893	590	26,795	1910	200	2,040
1894	610	14,140	1911	186	1,184
1895	750	8,425	1912	300	1,800
1896	395	5,540	1913	303	1,780
1897	578	8,165	1914	132	847
1898	653	9,698	1915	311	1,756
1899	1,704	20,294	1916	643	3,960
1900	529	3,993	1917	520	2,700
1901	325	875	1918	728	4,738
1902	589	1,533	1919	1,780	17,055
1903	2,370	3,720	1920	779	8,477
1904	270	1,985	1921	446	4,748
1905	754	4,025			
1906	250	1,720	Totals	17,672	$163,398

MINERAL WATER.

Bibliography: State Mineralogist Reports VI, XII-XVIII, Inc. U. S. G. S., Water Supply Paper 338. 'Mineral Springs and Health Resorts of California,' by Dr. Winslow Anderson, 1890.

A widespread production of mineral water is shown annually in California. These figures refer to mineral water actually bottled for sale, or for local consumption. Water from some of the springs having a special medicinal value brings a price many times higher than the average shown, while in some cases the water is used merely for drinking purposes and sells for a nominal figure. Health and pleasure resorts are located at many of the springs. The waters of some of the hot springs are not suitable for drinking, but are very efficacious for bathing. From a therapeutic standpoint, California is particularly rich in mineral springs. The counterparts of practically any of the world-famed spas of Europe or the eastern United States can be found here.

An interesting development in recent years is the obtaining of 'geyser' wells at Calistoga, in Napa County, by drilling into the thermal-water strata underlying that part of the Napa Valley. There are at present several wells so erupting. They spout in true geyser fashion, and their periods vary from 10 minutes to 2 hours, each following its own schedule rather closely.

It is hoped that the State Mining Bureau will be able in the near future to make some systematic tests as to the radio-activity of the thermal waters of the springs of California. Some preliminary qualitative tests have been made by the writer at The Geysers in Sonoma County, and positive reactions obtained; also, radio-activity has been proven at Arrowhead Hot Springs in San Bernardino County, by Prof. Gilbert E. Bailey of the University of Southern California.

Commercial production of mineral water by counties, in 1921, was as follows:

County	Gallons	Value
Butte	2,900	$4,100
Calaveras	2,809	791
Contra Costa	600,300	6,099
Lake	54,715	26,751
Los Angeles	264,468	13,314
Napa	72,364	55,760
Riverside	56,400	2,945
San Diego	70 924	9,161
Santa Barbara	97,847	133,590
Santa Clara	2,500	275
Siskiyou	250,150	5,015
Sonoma	37,641	9,891
Colusa, Humboldt, Marin, Monterey, San Benito, San Bernardino, San Luis Obispo, and Solano*	1,933,260	99,784
Totals	3,446,278	$367,476

*Combined to conceal output of a single operator in each.

The production above tabulated was in part bottled with artificial carbonation, in part natural, and a large part was used in the preparation of soft drinks with flavors.

Mineral Water Production of California by Years.

Amount and value of mineral water produced in California since 1887 are given herewith:

Year	Gallons	Value	Year	Gallons	Value
1887	618,162	$144,368	1906	1,585,690	$478,186
1888	1,112,202	252,990	1907	2,924,269	544,016
1889	808,625	252,241	1908	2,789,715	560,507
1890	258,722	89,786	1909	2,449,834	465,488
1891	334,553	139,959	1910	2,335,259	522,009
1892	331,875	162,019	1911	2,637,669	590,654
1893	383,179	90,667	1912	2,497,794	529,384
1894	402,275	184,481	1913	2,350,792	599,748
1895	701,397	291,500	1914	2,443,572	476,169
1896	808,843	337,434	1915	2,274,267	467,738
1897	1,508,192	345,863	1916	2,273,817	410,112
1898	1,429,809	213,817	1917	1,942,020	340,566
1899	1,338,537	406,691	1918	1,808,791	375,650
1900	2,456,115	268,607	1919	2,233,842	340,117
1901	1,555,328	559,057	1920	2,391,791	421,643
1902	1,701,142	612,477	1921	3,446,278	367,476
1903	2,056,340	558,201			
1904	2,430,320	496,946	Totals	60,815,166	$13,435,267
1905	2,194,150	538,700			

NITRATES.

Bibliography: Report XV. Bulletin 24. U. S. G. S., Press Bulletin No. 373, July, 1918.

Nitrates of sodium, potassium and calcium have been found in various places in the desert regions of the state, but no deposit of commercial

value has been developed as yet. It is hoped that a closer search may some day be rewarded by workable discoveries. At present the principal commercial source of nitrates is the Chilean saltpeter (sodium nitrate) deposits in South America.

The fixation of atmospheric nitrogen electrically has been accomplished successfully in Germany and Scandinavia. The possibilities of cheap hydro-electric power in California make the subject one of intense interest to us, as we have also the natural raw materials and chemicals to go with the power. Sodium and potassium cyanides can be made by fixation of atmospheric nitrogen electrically.

PHOSPHATES.

Bibliography: Bulletin 67.

No commercial production of phosphates has been recorded from California, though occasional pockets of the lithia phosphate, amblygonite, Li (AlF) PO_4, have been found associated with the gem tourmaline deposits in San Diego County. Such production has been classified under lithia.

A deposit of phosphate rock is reported to have been located near Big Pine in Inyo County.

PLATINUM.

Bibliography: State Mineralogist Reports IV, VIII, IX, XII–XVIII. Bulletins 38, 45, 67, 85. U. S. Geol. Surv. Bulletins 193, 285. Trans. Am. Inst. Min. Eng., Vol. 47, pp. 217–218.

In California, platinum is obtained mainly as a by-product from placer operations for gold. The major portion of it comes from the dredges working in Butte, Calaveras, Sacramento, Shasta and Yuba counties, with smaller amounts from dredges in Amador, Stanislaus and Trinity, and from the hydraulic and surface sluicing mines of Del Norte, Humboldt, Siskiyou and Trinity.

During the last two years, quite a number of prospectors and small operators, working with rockers and panning have recovered amounts of platinum which, though individually small, have in the aggregate added materially to the state's total yield. This is particularly true of the Beegum Creek District in southwestern Shasta County; also the New River and Hayfork districts in Trinity County.

The production of platinum-group metals in California for 1921 totals 869 ounces, crude, containing 613 fine ounces, valued at $58,754. Of this amount, a total of 824 ounces, crude, or 95%, came from the gold dredges. This is an increase of 136 fine ounces in quantity, but a decrease of $10,223 in value compared with the 1920 figures, due to the lower prices prevailing in 1921. An average of approximately $75 per fine ounce was paid for platinum, and around $150 per fine ounce for the iridium content in 1921.

The above-noted total of 613 fine ounces, includes 257 fine ounces of osmiridium and iridium. Most of the platinum refiners pay for the osmiridium on the basis of its iridium content. Crude 'platinum' is

really a mixture of the metals of that group, and carries varying percentages of platinum, iridium and osmiridium or iridosmine, with occasionally some palladium. Some platinum and palladium are also recovered in the electrolytic refining of blister copper. Iron in greater or less amount is always alloyed naturally with native platinum, and usually some iridium and osmium.

For further detailed information on California's platinum resources, analyses, tests, et al., the reader is referred to Bulletin 85, issued by the State Mining Bureau, and to the April issue of 'Mining in California', pages 158-172 *ante*.

In addition, there is usually some platinum recovered as a by-product in the gold refinery of the Mint, but which can not be assigned to the territory of its origin for lack of knowing to which lots of gold it belongs. The San Francisco Mint is stated to have recovered as high as 100 ounces of platinum in a single year from this source, some of which unquestionably came from California mines.

For 1921, the distribution of California's platinum yield was as follows:

County	Fine ounces	Value
Butte	31	$2,432
Calaveras	12	876
Plumas	18	1,615
Shasta	219	26,817
Trinity	27	3,260
Yuba	179	14,396
Amador, Del Norte, Humboldt, Mendocino, Sacramento, Siskiyou, Stanislaus*	127	9,358
Totals	613	$58,754

*Combined to conceal output of a single operator in each.

Russia, previous to 1916, was producing from 90% to 95% of the world's platinum, but for several years following was reduced to practically nothing; and has not yet recovered her former position. Colombia ranks in second place. California is the leading producer in the United States.

Besides its well-known uses in jewelry, dentistry and for chemicalware, an important industrial development of recent years employs platinum as a catalyzer in the 'contact process' of manufacturing concentrated sulphuric acid. It is also necessary for certain delicate parts of the ignition systems in automobiles, motor boats, and aeroplanes. Experiments have been made to find alloys which can replace platinum for dishes and crucibles in analytical work, but so far with only slight success.

Platinum Production of California by Years.

The annual production and value since 1887, have been as follows:

Year	Ounces	Value	Year	Ounces	Value
1887	100	$400	1906	91	$1,647
1888	500	2,000	1907	300	6,255
1889	500	2,000	1908	706	13,414
1890	600	2,500	1909	416	10,400
1891	100	500	1910	337	8,386
1892	80	440	1911	511	14,873
1893	75	517	1912	603	19,731
1894	100	600	1913	368	17,738
1895	150	900	1914	463	14,816
1896	162	944	1915	667	21,149
1897	150	900	1916	886	42,642
1898	300	1,800	1917	619	43,719
1899	300	1,800	1918	571	42,788
1900	400	2,500	1919	*418	30,611
1901	250	3,266	1920	477	68,977
1902	39	468	1921	613	58,754
1903	70	1,052			
1904	123	1,849	Totals	12,230	$473,590
1905	200	3,320			

*Fine ounces, beginning with 1919.

POTASH.

Bibliography: Report XV. Bulletin 24. U. S. G. S., Min. Res. 1913, 1914, 1915. Senate Doc. No. 190, 62d Congress, 2d Session. Mining & Sci. Press, Vol. 112, p. 155; Vol. 114, p. 789.

Potash production began commercially in California in 1914, with a small yield from kelp. Considerable time and money has been spent on research work incident to developing deposits of potash-bearing residues and brines in the old lake beds of the desert regions, and production there has been accomplished on a commercial basis at three plants on Searles Lake.

The imports of potash salts and fertilizers from Germany previous to the European war had an annual value of several millions of dollars, and their cessation made a domestic production imperative. The normal pre-war price of $35 to $40 per ton for high-grade agricultural salts was succeeded by figures of several times those amounts during the period of 1915–1920. Resumption of German imports in 1920 forced the prices down, so that the reports of the 1921 Californian production show sales ranging from $25 to $60 per ton for salts carrying from 35% to 60% equivalent K_2O.

During 1921, a total of 14,806 tons of potash-bearing materials of all grades was produced in California, valued at $390,210, compared with 26,298 tons, and $1,465,463 in 1920. This included refined potassium chloride from salt works bitterns, chloride and sulphate from Searles Lake brines, cement dust and sulphate from cement dust, and molasses distillery slops char. The only yield from kelp in 1921 was from the government plant at Summerland, Santa Barbara County, which also recovered some iodine as a by-product. Some potash char was produced at one plant operating on Hawaiian molasses, but which is not included herein, not being of Californian origin.

The bulk of the 1921 output was utilized in fertilizer preparations, and some was sold for chemical purposes.

Other uses for potash salts, besides those noted above, are in the manufacture of the best liquid soap and some higher-grade cake soaps, of some finer grades of glass, and in matches. The chemical requirements included tanning, dyeing, metallurgy, electroplating, photography, and medicine.

The following tabulation shows the distribution of the 1921 potash output of California:

County	Product	Equivalent per cent K_2O	Tons	Value
San Bernardino	Chloride and sulphate	38-60	7,202	$211,067
Santa Barbara	Chloride	50	143	5,720
Alameda, Riverside, San Mateo, Santa Clara, Santa Cruz*	Chloride, cement dust, molasses distillery slops char, sulphate	4-59	7,461	173,423
	Totals		14,806	$390,210

*Combined to conceal output of a single operator in each.

Total Production of Potash in California.

The annual amounts and values of these potash materials since their beginning in California in 1914, are shown by the following table:

Year	Tons	Value
1914	10	$460
1915	1,076	19,391
1916	17,908	663,605
1917	129,022	4,202,889
1918	49,381	6,808,976
1919	28,118	2,415,963
1920	26,298	1,465,463
1921	14,806	390,210
Totals	266,619	$15,966,957

PUMICE and VOLCANIC ASH.

Bibliography: State Mineralogist Reports XII, XIV, XV, XVII. Bulletin 38 (see 'Tufa').

The production of pumice and volcanic ash for the year 1921 amounted to 406 tons valued at $6,310, and came from a single property, each in Humboldt, Imperial, Inyo and San Bernardino counties. This is a decrease both in tonnage and total value from the 1920 yield.

The pumice deposits in Imperial and Siskiyou counties are of the vesicular, block variety, and are practically the only localities in the United States from which commercial production of this grade has been made. There are other known deposits of this variety in Inyo, Madera, and Mono counties. This form is used largely for abrasive purposes; and is also being utilized in fire-brick, and as an insulating filler in the walls of refrigerators and cold-storage plants. It has also been tried in concrete construction. The volcanic ash, or tuff, variety is employed in making scouring soaps and polishing powders. Foreign importations of block pumice come mainly from the Lipari Islands, Italy.

Commercial production of pumice in California was first reported to the State Mining Bureau in 1909, then not again until 1912, since which year there has been a small annual output, as indicated by the following table:

Year	Tons	Value	Year	Tons	Value
1909	50	$500	1917	525	$5,295
1910	----------	----------	1918	2,114	28,669
1911	----------	----------	1919	2,388	43,657
1912	100	2,500	1920	1,537	25,890
1913	2,590	4,500	1921	406	6,310
1914	50	1,000			
1915	380	6,400	Totals	12,386	$142,813
1916	1,246	18,092			

QUICKSILVER.

Bibliography: State Mineralogist Reports IV, V, XII–XV, XVII. Bulletins 27, 78. U. S. Geol. Surv., Monograph XIII. U. S. Bur. of Mines, Tech. Papers 96, 227.

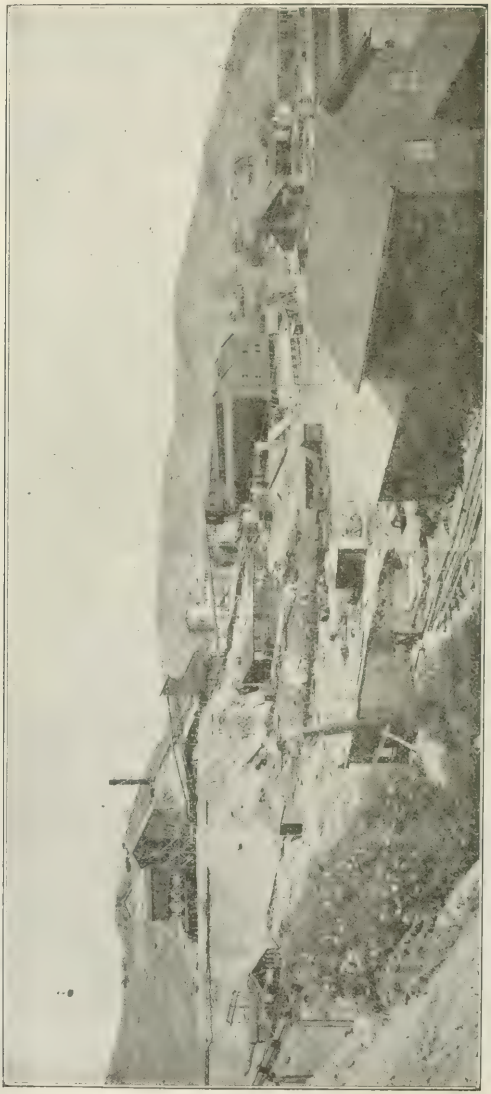
Quicksilver was produced in California in eight counties during 1921, to the amount of 3,157 flasks, valued at $140,666, being a decrease both in amount and value from the 1920 output. This is the smallest number of flasks produced in a year in California since the quicksilver industry began in 1849. The average price received during 1921, according to the producers' reports to the State Mining Bureau, was $44.56 per flask, as against $75.45 in 1920, and the record average of $114.03 for the year 1918.

The average of San Francisco quotations for 1921 was $47.42 per flask. Quotations ranged from $50 in January and May, and $49.50 in December, down to $40.40 for the month of November.

Because of high operating costs, and foreign importations, practically all of California's important quicksilver producers have been shut down since November, 1920, with the exception of the Senator mine of the New Almaden company in Santa Clara County which has been working steadily, and the Cloverdale Mine in Sonoma, operated intermittently.

As passed by the House, the tariff bill now before Congress placed the import duty on quicksilver at 35¢ per pound, equivalent to $26.25 per flask. The Senate has changed this figure to 25¢ per pound, or $18.75 per flask. This and other differences are now to be taken up by the conference committee of the two houses, and it is hoped, for the benefit of the domestic quicksilver idustry, that the higher figure will prevail.

Quicksilver, though not used in such quantities as is copper or some of the other metals, is not less vital in peace than in war. No completely successful substitute has yet been found for quicksilver in some of its uses. Except during the stimulated production resulting from the high prices of the war period, our domestic output of quicksilver for a number of years has not kept pace with domestic consumption. This is not due to a lack of local sources, but mainly to the competition of low-cost foreign metal dumped onto our market through an almost negligible import duty. Other financial and economic conditions obtaining during the past two years have also had their effect on the situation, but they could have been weathered had it not been that the



Reduction plant of New Idria Quicksilver Mining Co., San Benito County, Cal. Tramway terminals and ore bins at left; furnaces in center; burned ore tailings stacker at right.

lack of tariff protection permitted the too-free entry of foreign metal. There is plenty of ground, even in California, in addition to what may be in Nevada and Texas, that will warrant development if only a fair price can be assured that will justify exploitation. Our domestic quicksilver industry is in danger of complete extinction, if not soon given adequate protection against foreign importation. Manufactured mercurials should also be included in the dutiable tariff list, as a protection to our detonator and drug manufacturers, which would in turn further assist the domestic mines. The manufacturers of mercurial products in the United States should join with the miners in the demand for an adequate protective tariff. We should not short-sightedly 'conserve' our domestic quicksilver resources by forcing them to remain in the ground on account of foreign competition, only to wake up some day, when faced with an emergency, to find that quicksilver mining and metallurgy is a 'lost art' in the United States and can not be revived at a moment's notice. Several months' time is required to properly equip and put in operation a reduction plant, and the knowledge of the art is even at present confined to a limited few.

Uses.

The most important uses of quicksilver are the recovery of gold and silver by amalgamation, and in the manufacture of fulminate for explosive caps, of drugs, of electric appliances, and of scientific apparatus. By far the greatest consumption is in the manufacture of fulminate and drugs.

One new use for quicksilver is in the introduction of a small amount into the cylinders of steam turbines to improve the vapor pressure and thus increase efficiency. This mercury is recoverable and can be re-used, so that there is only a small proportional loss.

Quicksilver is an absolutely essential element from a military standpoint, as there has not yet been produced an entirely satisfactory commercial substitute for it in the manufacture of fulminating caps for explosives. However, in order to reduce consumption of the fulminate, some potassium chlorate, picric acid, trinitro-toluol, or tetranitromethylamine is sometimes mixed with it. The Ordnance Department of the U. S. Army, during the war, at least, would accept no substitutes, as they have thus far proven unreliable.

New Equipment.

The most notable development in recent years in the metallurgy of quicksilver is the adaptation of the rotary cement-kiln to the reduction of quicksilver ore at the New Idria Mine, San Benito County. They there installed five such furnaces, with a combined daily capacity of 500 tons. The lead of the New Idria Company in the matter of rotary furnaces was followed at the Sulphur Bank Mine, Lake County; Bella Union or Rutherford Mine, Napa County; Cloverdale Mine, Sonoma County, and at the January Mine, Yolo County.

Total Quicksilver Production of California.

Total amount and value of the quicksilver production of California, as given in available records, is shown in the following tabulation. Though the New Almaden Mine in Santa Clara County was first worked

in 1824, and has been in practically continuous operation since 1846 (though the yield was small the first two years), there are no available data on the output earlier than 1850. Previous to June, 1904, a 'flask' of quicksilver contained 76½ pounds, but since that date 75 pounds. In compiling this table the following sources of information were used: for 1850–1883, table by J. B. Randol, in Report of State Mineralogist, IV, p. 336; 1883–1893, U. S. Geological Survey reports; 1894 to date, statistical bulletins of the State Mining Bureau; also State Mining Bureau, Bulletin 27, "Quicksilver Resources of California," 1908, p. 10:

Year	Flasks	Value	Average price per flask	Year	Flasks	Value	Average price per flask
1850	7,723	$768,052	$99 45	1887	33,760	1,430,749	$42 38
1851	27,779	1,859,248	66 93	1888	33,250	1,413,125	42 50
1852	20,000	1,166,600	58 33	1889	26,464	1,190,880	45 00
1853	22,284	1,235,648	55 45	1890	22,926	1,203,615	52 50
1854	30,004	1,663,722	55 45	1891	22,904	1,036,406	45 25
1855	33,000	1,767,150	53 55	1892	27,993	1,139,595	40 71
1856	30,000	1,549,500	51 65	1893	30,164	1,108,527	36 75
1857	28,204	1,374,381	48 73	1894	30,416	934,000	30 70
1858	31,000	1,482,730	47 83	1895	36,104	1,337,131	37 04
1859	13,000	820,690	63 13	1896	30,765	1,075,449	34 96
1860	10,000	535,500	53 55	1897	26,691	993,445	37 28
1861	35,000	1,471,750	42 05	1898	31,092	1,188,626	38 23
1862	42,000	1,526,700	36 35	1899	29,454	1,405,045	47 70
1863	40,531	1,705,544	42 08	1900	26,317	1,182,786	44 94
1864	47,489	2,179,745	45 90	1901	26,720	1,285,014	48 46
1865	53,000	2,432,700	45 90	1902	29,552	1,276,524	43 20
1866	46,550	2,473,202	53 13	1903	32,094	1,335,954	42 25
1867	47,000	2,157,300	45 90	1904	*28,876	1,086,323	37 62
1868	47,728	2,190,715	45 90	1905	24,655	886,081	35 94
1869	33,811	1,551,925	45 90	1906	19,516	712,334	36 50
1870	30,077	1,725,818	57 38	1907	17,379	663,178	38 16
1871	31,686	1,999,387	63 10	1908	18,039	763,520	42 33
1872	31,621	2,084,773	65 93	1909	16,217	773,788	47 71
1873	27,642	2,220,482	80 33	1910	17,665	799,002	45 23
1874	27,756	2,918,376	105 18	1911	19,109	879,205	46 01
1875	50,250	4,228,538	84 15	1912	20,600	866,024	42 04
1876	75,074	3,303,256	44 00	1913	15,561	630,042	40 23
1877	79,396	2,961,471	37 30	1914	11,373	557,846	49 05
1878	63,380	2,101,552	32 90	1915	14,199	1,157,449	81 52
1879	73,684	2,194,674	29 85	1916	21,427	2,003,425	93 50
1880	59,926	1,857,706	31 00	1917	24,382	2,396,466	98 29
1881	60,851	1,815,185	29 83	1918	22,621	2,579,472	114 03
1882	52,732	1,488,624	28 23	1919	15,200	1,353,381	89 04
1883	46,725	1,343,344	28 75	1920	10,278	775,527	75 45
1884	31,913	973,347	30 50	1921	3,157	140,666	44 56
1885	32,073	986,245	30 75				
1886	29,981	1,064,326	35 50	Totals	2,188,984	$106,841,606	

*Flasks of 75 lbs. since June, 1904; of 76½ lbs. previously.

MUSEUM.

The Museum of the State Mining Bureau possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the first five of such collections located in North America; and contains not only one or more samples of most of the known minerals found in California, but many specimens from other states and foreign countries as well.

Aside from its purely educational features, the Museum daily attracts throngs of tourists and travelers, and furnishes visual evidence of the immense mineral resources of California. The State Mining Bureau supplies a collection of forty typical minerals and ores, appropriately labeled, to any public school in the state upon request.

Mineral specimens suitable for exhibit purposes are solicited and their donation will be appreciated by the State Mining Bureau, as well as those who utilize the facilities of the collection.

During the month a total of 656 visitors signed their names to the Museum register, and in addition there are many others daily who fail to take note of our request for their signatures.

LABORATORY.

FRANK SANBORN, Petrologist.

There were 278 samples received and determined during the thirty-day period covered by this report. Among this number there were but few of special scientific interest. The public are showing a live and increasing desire to find good deposits of the non-metals and salines, and the outlook in that field is promising.

A list of samples of possible commercial value, judged from the sample submitted only, is appended.

The Bureau will supply the name and address of the party who sent in any sample listed, upon request, if the reference number is given.

05–232 Hydrous aluminum silicate, apparently halloysite; also talc-schist.
05–233 Copper-cobalt ore, with a very little nickel.
05–234 Pumice; block and small size lump.
05–235 Kaolinized material; probably a pottery clay.
05–236 Clay; does not burn white.
05–237 Clay; probably a fire clay.
05–238 Diatomaceous earth; also gypsum and calcite.
05–239 Diatomaceous earth.
05–240 Talc; also soapstone.
05–241 High grade copper ore; also lead-silver ore.
05–242 'Soap rock,' montmorillinite group; also volcanic ash (silica)
05–243 Diatomaceous earth, impure; also limonite.
05–244 Barite; impure.
05–245 Copper ore; commercial.
05–246 Scheelite.
05–247 Diatomaceous earth, with some volcanic ash.
05–248 Clay; fairly high grade.
05–249 Asbolite; cobalt-bearing manganese oxide.
05–250 Clay (Fuller's earth).
05–251 Quartz.
05–252 Graphite with clay.
05–253 Copper ore; also chalcedony.
05–254 Chrysotile asbestos.
05–255 Lignite coal; fair quality.
05–256 Arsenopyrite.
05–257 Limonite (ochre).

LIBRARY.

E. Cooney, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received during the month, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the State are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geol. Survey:

Bulletin No. 736–C—Geology of the Wiles Area Ranger District, Texas. By Carroll E. Dobbin.

Bulletin No. 735–D—Silver Enrichment in the San Juan Mountains, Colorado. By Edson S. Bastin.

Carbon Black Produced from Natural Gas in 1921. By E. G. Sievers.

Lead in 1921. By C. E. Siebenthal and A. Stoll.

Fluorspar and Cryolite in 1921. By Hubert W. Davis.

Manganese and Manganiferous Ores in 1921. By H. C. Jenison.

Potash in 1921. By M. R. Nourse.

Gold, Silver, Copper, Lead and Zinc in Colorado, 1920. By Charles W. Henderson.

Asbestos in 1920. By Edward Sampson.

Lead and Zinc Pigments and Salts in 1921. By C. E. Siebenthal and A. Stoll.

Slate in 1921. By G. F. Loughlin and A. T. Coons.

Gold and Silver in 1920. By J. P. Dunlop.

Phosphate Rock in 1921. By K. W. Cottrell.

Water Supply Paper No. 500—Contributions to the Hydrology of the United States, 1921. By Nathan C. Grover, Chief Hydraulic Engineer.

U. S. Bureau of Mines Reports of Investigations:

Serial No. 2361—The Spring Canyon Mine Rescue Association. By A. L. Murray (Car Surgeon, U. S. B. M., P. A. Surgeon (R), U. S. Public Health Service).

Serial No. 2362—Additions, Removals and Changes in Permissible List of Explosives from March 15 to May 31, Inc., 1922. By S. P. Howell (Explosive Engineer, B. M.).
Serial No. 2363—Helium. By R. B. Moore (Chief Chemist, B. M.).
Serial No. 2364—Properties of Typical Crude Oils from the Producing Fields of Oklahoma. By E. W. Dean, A. D. Bauer, M. B. Cooke and C. R. Bopp.
Serial No. 2365—Ignition of Coal Dust by Electric Arcs. By L. C. Ilsley (Electrical Engineer, B. M.) and E. J. Gleim (Associate Electrical Engineer, B. M.).
Serial No. 2366—Oklahoma Promotes Safety in Coal Mines. By D. J. Parker (Chief of Mine Safety Service, B. M.).
Serial No. 2367—Official Approval of Burrell Methane Indicator. By L. C. Ilsley (Electrical Engineer, U. S. B. M.).
Serial No. 2368—Temperature-Pressure Curves of Petroleum Products. By H. B. Cooke (Assistant Refinery Engineer, B. M.).
Serial No. 2369—Explosives Used in April, 1922. By W. W. Adams (Statistician, U. S. B. M.).
Serial No. 2370—Fatalities at Coal Mines in May, 1922. By W. W. Adams (Statistician, U. S. B. M.).
Bulletin No. 182—Carbon Black; Its Manufacture, Properties and Uses. By R. O. Neal and G. St. J. Perrott.
Technical Paper 263—Design and Operation of a Low-Pressure Absorption Plant. By W. P. Dykema and A. A. Chenoweth.
Technical Paper 285—Compressed Air Illness and Its Engineering Importance. By Edward Levy.
Technical Paper 302—Coal Mine Fatalities in the United States, 1921. By William W. Adams.
Technical Paper 313—Production of Explosives in the United States During the Calendar Year 1921. By William W. Adams.
Bureau of Standards Circular No. 120—Construction and Operation of a Simple Homemade Radio Receiving Outfit.
Scientific Paper No. 433—Thermal Expansion of a Few Steels. By Wilmer Souder (Physicist) and Peter Hidnert (Associate Physicist, B. of S.).
Annual Report of the Territorial Mine Inspector to the Governor of Alaska. By B. D. Stewart, Territorial Mine Inspector, and B. W. Dyer, Federal Mine Inspector.
Geological Survey of Georgia, Bulletin No. 39—Historical Sketch of the Geological Survey of Georgia. By H. S. Cave, Asst. State Geologist.
State of Idaho Bureau of Mines and Geology, Bulletin No. 4—Petroleum Possibilities of Certain Anticlines in Southeastern Idaho. By Virgil R. D. Kirkham.
State of Idaho Bureau of Mines and Geology, Bulletin No. 5—Geology and Ore Deposits of Alturas Quadrangle. By S. M. Ballard.
Report of Appraisal of Mining Properties of New Mexico. By J. R. Finlay.

Societies and Educational Institutions.

Smithsonian Institution, United States National Museum:
Bulletin No. 104—The Foraminifera of the Atlantic Ocean. By Joseph Augustine Cushman.
Bulletin No. 31—Contributions from the United States National Herbarium Vol. XXIII, Part II. Trees and Shrubs of Mexico. By Paul C. Standley.
Bulletin of the Institution of Mining and Metallurgy, July, 1922.
The Mining Congress Journal, August, 1922.
Canadian Institute of Mining and Metallurgy, August, 1922.
The Philippine Journal of Science, March, 1922.
The American Mineralogist, July, 1922.
Journal of the American Peat Society.

Books.

Coal. By Elwood S. Moore, M. A.
The Mines Handbook, 1922.

Maps.

U. S. Geol. Survey Topographic Sheets:
Carbon, Cal.
Charleston School, Cal.
Custer, Idaho.
Elk Garden, W. Va.-Md.
Gregg, Cal.
Kentucky Well, Cal.
Kotsina-Kuskulana, Alaska.
Lanes Bridge, Cal.
La Sal Vieja, Texas.
Moorefield, W. Va.
Ortigalita, Cal.
Oxalis, Cal.
Petersburg, W. Va.
Quien Sabe, Cal.
Stockbridge, Mich.
Waldport, Ore.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

Architect and Engineer, San Francisco.
Arizona Mining Journal, Phoenix, Arizona.
Asbestos, Philadelphia, Pennsylvania.
American Petroleum Institute, New York.
Brick and Clay Record, Chicago.
Chemical Engineering and Mining Review, London, England.
Cement, Mill and Quarry, Chicago, Illinois.
Engineering and Mining Journal-Press, New York.
Financial Insurance News, Los Angeles, California.
Hercules Mixer, Wilmington, Delaware.
Journal of Electricity and Western Industry, San Francisco.
Metallurgical and Chemical Engineering, New York.
Mining and Oil Bulletin, Los Angeles.
Mining and Engineering Record, Vancouver, B. C.
Oil Weekly, Houston, Texas.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil Paint and Drug Reporter, New York.
Oil Trade Journal, New York.
Oil Age, Los Angeles.
Oil News, Galesburg, Illinois.
Petroleum Record, Los Angeles.
Petroleum Refiner, Kansas City, Missouri.
Petroleum Age, New York.
Petroleum World, Los Angeles.
Queensland Government Mining Journal, Brisbane, Australia.
Rock Products, Chicago, Illinois.
Southwest Builder and Contractor, Los Angeles.
Stone, New York.
Salt Lake Mining Review, Salt Lake City, Utah.
Standard Oil Bulletin, San Francisco.
Safety News, Industrial Accident Commission, San Francisco.
The Record, Associated Oil Company, San Francisco.

Newspapers.

The following papers are received and kept on file in the library:

Amador Dispatch, Jackson, Cal.
Arkansas Oil and Mineral News, Hot Springs National Park (Arkansas).
Bakersfield Morning Echo, Bakersfield, Cal.
Blythe Herald, Blythe, Cal.
Bridgeport Chronicle-Union, Bridgeport, Mono Co., Cal.
California Oil World, Los Angeles, Cal.
Colusa Daily Sun, Colusa, Cal.
Daily Midway Driller, Taft, Cal.
Del Norte Triplicate, Crescent City, Cal.
Exeter Sun, Exeter, Cal.
Georgetown Gazette, Georgetown, Cal.
Gateway Gazette, Beaumont, Cal.
Gilroy Gazette, Gilroy, Cal.
Goldfield News, Goldfield, Nevada.
Guerneville Times, Guerneville, Cal.
Humboldt Standard, Eureka, Cal.
Healdsburg Enterprise, Healdsburg, Cal.
Inyo Independent, Independence, Cal.
Inyo Register, Bishop, Cal.
Lake County Bee, Lakeport, Cal.
Mariposa Gazette, Mariposa, Cal.
Mining and Financial Record, Denver, Colo.
Mountain Democrat, Placerville, Cal.
Mountain Messenger, Downieville, Cal.
Nevada Mining Press, Reno, Nevada.
Oroville Daily Register, Oroville, Cal.
Oatman Mining Press, Oatman, Arizona.
Oregon Observer, Grants Pass, Oregon.
Plumas National Bulletin, Quincy, Cal.
Plumas Independent, Quincy, Cal.
Placer Herald, Auburn, Cal.
Petroleum Reporter, Etna Mills, Cal.
Sacramento Union, Sacramento, Cal.
San Diego News, San Diego, Cal.
Santa Barbara Daily News, Santa Barbara, Cal.
Stockton Record, Stockton, Cal.
Shasta Courier, Redding, Cal.
Siskiyou News, Yreka, Cal.
Siskiyou Standard, Fort Jones, Cal.
Sunset Journal, Sunset District, San Francisco, Cal.
Tuolumne Prospector, Tuolumne, Cal.
Ventura Daily Post, Ventura, Cal.
Weekly Trinity Journal, Weaverville, Cal.
Western Sentinel, Etna Mills, Cal.

PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of consumers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

Sufficient publicity has not heretofore been given to this feature of the Bureau's work, but in 'Mining in California' a suitable medium is provided for current inquiries of this nature, and, therefore, written or verbal inquiries that come to the attention of the Bureau are summarized in each issue.

The name of the product wanted or offered, only, is published; the name of the owner of the deposit, or buyer, and other details being supplied upon request.

In writing, the reference number of the item should be given.

Mineral Products or Deposits for Sale.

02-101 Gypsum deposit.
02-102 Manganese deposit.
02-103 Hydraulic gravel deposit in Siskiyou County; equipped.
02-104 Asbestos (chrysotile).
02-105 Gold mine; 450 acres patented, free water power and some equipment; Nevada County.
02-106 Silica sand and soda ash.
02-107 Operating brick and tile property; has large reserves of clay shale.
02-108 Asbestos (chrysotile).
02-109 Barite deposit; high grade and white.
02-110 Gold quartz claims in Shasta County; free and base ore; has produced.
02-111 Coal mine; will sell or bond.
02-112 Dolomite marble deposit in San Diego County; close to transportation.
02-113 Drift gravel mine; 8 claims; open for inspection; will sell on easy terms.
02-114 Pyrite ore carrying enargite (arsenical copper ore) and some gold; 32-mile haul to railroad.

Mineral Products or Deposits Wanted.

03-97 Gypsum deposit of large extent and good quality.
03-98 Gypsum, chalk, halloysite, barite and ochre; deposits or tonnages.
03-99 Arsenopyrite or arsenical ore; tonnage.
03-100 Limestone deposit in one of southern coast counties.
03-101 Colemanite; tonnage.
03-102 Amphibole asbestos deposits.
03-103 Sulphur deposit; prefer one that can be quarried.
03-104 Arsenical ore; tonnage.
03-105 Copper-zinc ore deposit; 'complex' ore.
03-106 Limestone deposit on or very close to salt water.

EMPLOYMENT SERVICE.

Following the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

The Bureau registers technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

A list of applicants for positions and 'positions open,' received by the Bureau during each 30-day period preceding the date of publication of the Monthly Chapter is carried in each issue.

Each notice is designated by a key number, and communications sent to the Bureau in reply to any notice will be forwarded to the proper party without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau, to avoid possible loss.

Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

01–30 Mill Superintendent. General milling experience; amalgamation, cyanidation, flotation; gold and silver particularly. Competent assayer. Age 34; married. Salary wanted, $250 and quarters.

01–31 Geologist-Engineer. Technical graduate, petroleum engineering. Five summer vacations spent in oil-field work. Age 23; single. References. Salary wanted, $150–$200.

01–32 Mine Superintendent. Technical education. Twenty years experience covering lode, placer, drift, and hydraulic mining; operation, construction, field work, drilling. Age 46; married. References. Salary open.

SEPTEMBER, 1922

REPORT XVIII OF THE STATE MINERALOGIST

20—17105

DISTRICT REPORTS OF MINING ENGINEERS

REDDING FIELD DIVISION.

W. B. Tucker, Mining Engineer.

Shasta County.

GOLD MINES (operating).

Double Header Mine. It is situated two miles west of Tower House, in section 33, T. 33 N., R. 7 W., in the French Gulch Mining District.

Holdings consist of Sawpit Placer claims No. 1 and No. 2, South Star Quartz mine and 80 acres of patented land in S. ½ of N.W. ¼ of section 33, totaling 140 acres. Owners: Chas. Garrett, J. A. Pepper of Tower House, W. P. Donnelly and W. W. Treat of Anderson.

The property was reopened in February, 1922, by Chas. Garrett and associates. The development work has been confined to a quartz vein which occurs along a fault fissure in the meta-andesite. The vein strikes N. 15° W., and dips 55° east; width 4 to 6 feet. There are two other veins on the property, which have a general east and west strike, and dip to the north about 45°. One of these east and west veins occurs on the contact between the black slate and meta-andesite, and lies 150 feet north of the present workings, on the Double Header vein. This vein has a width of 2 to 4 feet, and dips with the contact. The other east and west vein is south of the portal of the lower tunnel and shows prominent croppings of quartz, in the meta-andesite. On this latter vein outside of few shallow open cuts, and short tunnels, there is no development to speak of. At an elevation of 1500 feet, a tunnel has been driven north 400 feet on the Double Header vein.

The vein developed in this tunnel shows from 4 to 6 feet of quartz, which carries some free gold and iron pyrite. At 175 feet from the portal of the tunnel, a crosscut has been driven 100 feet, on a small quartz stringer which strikes S. 60° E. and dips 70° south. A number of short upraises have been made in this tunnel on the vein. The owners propose to drive the present tunnel ahead to cut the vein which occurs on the contact between the meta-andesite and slate. Some ore is being stoped near the portal of the tunnel, which is reported to have a value of $10 to $20 per ton. At a higher elevation, there are a number of short tunnels on the vein, which have been stoped out to the surface. Equipment: Blacksmith shop, cars, and tools. There is a two-stamp mill on the property. Two men employed.

El Dorado Mine. The property is situated one-fourth of a mile southwest of Tower House, in section 3, T. 32 N., R. 7 W. in the French Gulch Mining District. Holdings consist of 40 acres of patented land. The mine is owned by James G. Conner of Redding; under lease to Messrs. Statton and Van Slyke of French Gulch. Discovered in 1885. Worked for past seven years, 1912 to 1919. The workings are on the steep slope of a ridge north of Mill Creek at an elevation of 1500 feet. The lode lies along a fault contact of meta-andesite and black slate, striking N. 20° W. and dipping 35° east. Along the slate hanging wall, quartz occurs in lenses up to 2 feet in width. Occasionally the quartz is found in the meta-andesite close to the contact and usually mixed

with fragments of andesite. Manganese stains are quite common in the quartz, which is oxidized.

Ore is mostly free milling, but some pyrite is associated with it. Numerous fine specimens showing free gold through the quartz have been taken out. Development work consists of a main adit tunnel, 450 feet long, driven northwest on the lode. At 250 feet from the portal of the tunnel, a winze has been sunk, on the vein 50 feet, with a drift north on the vein 26 feet. Here the vein varies from 2 to 3 feet in width. At the face of the drift the vein is cut off by a fault.

At 340 feet from the mouth of the tunnel there is an upraise 30 feet in ore. It is stoped out here for a length of 50 feet to top of raise, then the vein flattens and values disappear. It is reported that $4,000 was taken out of this raise. The gold occurs entirely in pockets in the quartz. Equipment: Blacksmith shop, tools, and bunkhouse and a two-stamp mill (850-lb. stamps) with triple discharge mortar and amalgamation plates, operated by 8-h.p. Fairbanks Morse Gas Engine. Two men employed.

Reference: State Mineralogist Report XII, page 247; XIII, page 355.

Gold Leaf Mine. This property is situated four miles west of Redding, in section 5, T. 31 N., R. 5 W., in Lower Springs Mining District. Elevation 900 feet.

Holdings consist of four claims: Gold Leaf, Gold Bronze, Summit, and North End; 80 acres. The property is owned by the Gold Leaf Mining Company, Ira Judson Coe, president, Mills Building, San Francisco.

A series of parallel northeast and southwest veins, and also north and south veins which intersect the northeast and southwest veins, east and west of shaft, occur in meta-andesite and slate. The width of veins varies from 2 to 6 feet. Veins dip 65° to the east. The quartz carries free gold with iron pyrite, but most of the values occur with the pyrite.

Development: Vertical shaft 400 feet deep, with levels driven north and south on the vein at intervals of 100 feet. A drain tunnel 224 feet long intersects the shaft on the 120-foot level. Drifting on each level amounts to 150 feet. Stoped from 300-foot level to surface near the shaft.

The ore shipped is reported to have carried $8 to $15 per ton. Equipment: Consists of 25-h.p. direct connected electric hoist. Electric power is furnished by the Pacific Gas and Electric Company.

The shaft is being retimbered, and the mine unwatered. Four men are employed. E. L. Anderson, superintendent.

Reference: State Mineralogist Report XIII, page 358.

Milkmaid and Franklin Mines. They are situated on the north side of French Gulch, in section 17, T. 33 N., R. 7 W., 3 miles northwest of the town of French Gulch.

Holdings consist of eight claims known as: Franklin, Milkmaid, Summit, Ibex, Buckeye, Virginia, Peggy and May-Day; totaling 150 acres. The Franklin mine is reported to have been located in 1852, and the Milkmaid shortly afterwards. Total production of the two mines is

reported to be $2,500,000 and from 1910 to 1922, the production was $496,000. Most of the development work is confined to the Franklin and Milkmaid claims.

Franklin workings: Two veins have been followed to some extent in the Franklin workings; one with a strike of N. 5°–30° W., and a steep dip to the east, the other with a strike of approximately E. and W. and a dip of about 70° N.

The wall rocks are slate and soda-granite porphyry. The veins are near the contact and cut both rocks, but tend to be best developed in the porphyry, fingering out in the slates.

The Franklin is developed by two adit levels, at elevations of 1950 and 2055 feet.

The Franklin or upper tunnel, driven N. 60° E., in porphyry, at 200 feet from the portal cuts the north and south vein, which dips 60° east. This vein above the tunnel level flattens to 45° and when within 30 feet of the surface, straightens up to 70°. Width of vein varies from 12 inches to 4 feet. The elevation of the Geiser tunnel is 1950 feet. It is a crosscut tunnel driven N. 60° E., following a fault fracture, and cuts the north and south vein at 450 feet from the portal. On this level the vein has been followed for a distance of 700 feet.

The Milkmaid workings: The Milkmaid joins the Franklin on the east. The rocks in the vicinity consist of soda-granite porphyry, diorite porphyry and slate. Both porphyries are intrusions in the slate. At an elevation of 1900 feet, the lower Milkmaid tunnel is a crosscut 220 feet to the vein, and is driven 50 feet beyond the vein, a total distance of 270 feet.

The vein strikes N. 10° W., and dips 80° east. On No. 1 level, the vein is drifted on, 150 feet north and 55 feet south.

The upper Milkmaid tunnel is a crosscut tunnel, 100 feet to the vein, with drifts 150 feet north on the vein and 25 feet south. On No. 2 level, the shaft level, drifts extend 300 feet south on the vein from the shaft and 100 feet north. About 200 feet north of the crosscut tunnel an incline shaft has been sunk to a depth of 200 feet. On No. 3 level there is a drift 150 feet south on the vein from shaft. No. 1 level is 50 feet below the upper tunnel level; No. 1 to No. 2 level is 100 feet, and No. 2 to No. 3 level is 70 feet. In these workings, the vein varies from few inches up to 4 feet of quartz; above the upper workings on the Milkmaid and Franklin veins, extremely rich oxidized ore was taken out. The gangue minerals of the vein are quartz and calcite. Much of the quartz presents a faintly mottled grayish appearance due to enclosed wall rock. The sulphides in the ore are arsenopyrite, pyrite, galena and sphalerite. The sulphides amount to about 0.75 per cent of the weight of the ore, and carry $150 to the ton in gold. The ore in the main vein runs from $20 to $45 per ton and is in irregular pay shoots that probably pitch steeply to the south. The best ore is found where the vein is in the prophyry close to the slate contact.

Mine equipment: Consists of compressor plant, blacksmith shop, and bunk houses.

Reduction equipment: Consists of 10-stamp mill (1100-lb. stamps), 4 Frue vanners; driven by electricity. Owner: Western Exploration

Company (H. F. Musser), of Redding. Under lease and bond to Capt. H. E. Smith of Shasta, California. Roy Leach, superintendent. Eight to ten men are employed on the property.

Bibliography: U. S. Geol. Survey Bull. No. 40, pp. 35, 61, 63, 64. State Mineralogist Report XIV, p. 793.

Reid Mine. It is situated eight miles north of Redding, in section 3, T. 32 N., R. 5 W., in Old Diggins Mining District; elevation, 1700 feet. Holdings consist of 160 acres; a patented quarter-section.

There are a series of parallel auriferous quartz veins, striking almost due north and south, with steep dips, slightly to the east, in meta-andesite. The veins are large, varying from 6 to 30 feet in width, and very persistent. Gold values vary from $4 to $30 per ton. Development in recent years has been confined to the main vein. This has been opened on five levels, greatest length of pay chute was 400 feet; and maximum width 30 feet. Workings consist of 1100-foot vertical shaft, and main adit about 1000 feet long. This cut the shaft at the 300 foot level. Levels at 100 feet intervals below main adit. Ore shoot cut on 6th, 7th, 8th, and 9th levels. Stoped above the 8th level, but virgin ground below. On the 7th level, the vein was 16 feet wide, and on the 8th level, 30 feet wide, and said to have averaged $12 per ton in gold. Quartz is very pure, containing some tellurides, and sulphides of copper.

The property was operated continuously from 1904 to October, 1919, shipping all ore to the Mammoth Copper Company at Kennett, who used it for flux in smelting copper ores.

Equipment: Electric hoist, double drum for two compartment shaft; three 50-h.p. motors driving 3 pair Ingersoll-Rand compressors, total capacity 1200 cu. ft. of air per minute; complete machine and blacksmith shop, cars and tools; and aerial tramway, 4400 feet long to bunkers at railroad on west side of Sacramento River.

Six men are employed, repairing bunkers at the mine, and getting equipment in shape to resume operations. Have contract to furnish Shasta Zinc and Copper Company's smelter at Bully Hill with flux.

Owner: Reid Mining Company. Harvey Sallee, president and manager.

Sybel Mine. (*Accident.*) It is situated five miles northwest of French Gulch, in section 7, T. 33 N., R. 7 W., in the French Gulch Mining District, on ridge between the North and South Forks of French Gulch.

Holdings consist of four patented claims which includes millsite; totaling 80 acres. The property is owned by the Shasta Hills Mining Company, of San Francisco. Under lease and bond to Harry Thompson and associates of San Francisco, who also control the Niagara group of mines, having under control 56 claims, and 520 acres of timber.

Operations were started on the Sybel mine in September, 1921, and the property has been under continuous operation to date. It lies at the north edge of the complex of dikes which marks the position of the group of mines near the head of French Gulch. Soda-granite porphyry similar to that of the Franklin, and diorite porphyry cut the

slate. The ore for the most part lies in the diorite porphyry near contact of the slate, but in places the workings follow the contact itself, which here strikes about N. 80° W., and dips about 50° north. The ore consists of blue-gray quartz with patches and streaks of white calcite. The quartz has a mottled gray color, but the calcite is milky white and cut by veinlets of quartz and arsenopyrite. The metallic minerals are pyrite, galena, sphalerite, and arsenopyrite. Gold, wherever in plates large enough to be visible, is as a rule close to the small patches of galena. The galena and sphalerite in the quartz indicates the occurrence of rich ore. The ore being stoped carries values from $10 to $200 per ton, and the average mill feed runs about $40 per ton.

Development: At an elevation of 3700 feet, a tunnel has been driven S. 75° E., 700 feet, and a winze has been sunk on the vein from this level to a depth of 150 feet; at 80 feet below adit tunnel, a drift has been run from the winze on the vein 175 feet east, and 175 feet west, developing a shoot of ore 350 feet in length. The vein varies from 12 inches to 4 feet in width. The adit tunnel is 400 feet below the outcrop of the vein. The adit tunnel cut a fault which strikes N. 50° W., and dips north 50°. The present workings on the tunnel level and in the winze are confined to the vein east of this fault, while old workings above this tunnel level were to the west of the fault. The vein strikes N. 80° W., and dips 50° north.

Mine equipment: Laidlaw - Dunn - Gordon 12″ x 12″ compressor, driven by 50-h.p. motor; air drills, blacksmith shop, and cars. There is a new 5-stamp mill on the property, 1000-pound stamps, and one vanner, driven by electric power. Electric power is furnished by Pacific Gas and Electric Company.

The monthly production is about $6,000 to $8,000.

Fifteen men are employed. Harry Thompson, general manager.

Bibliography: U. S. Geol. Survey Bull. 540, pages 68, 69. State Mineralogist Report XIV, p. 777.

West End Mine. It is situated one mile southeast of Whiskeytown, in section 16, T. 32 N., R. 6 W., in the Stella Mining District.

Property consists of West End Quartz mine and one-quarter section of patented land; totaling 180 acres. Owners: Dr. E. P. Mitchell of Winters, John Kesler of Anderson, and Western Star Lodge of Masons of Shasta. Under option to C. D. Jones & Company of Santa Barbara, California.

Two quartz veins occur in the alaskite-porphyry; the West End vein strikes N. 50° W., dips 70° east, the Spanish vein strikes N. 27° E., and dips 80° west. These two veins evidently intersect about 90 feet south of the shaft. The veins vary in width from a few inches up to 2 feet. The ore is white quartz, showing free gold and some iron pyrite. On the 100-foot level, especially near the veins, the rock is much sheared. The alaskite-porphyry adjacent to the veins is in places partly silicified; and elsewhere near the veins is chloritized; in both situations a small amount of pyrite has been introduced. The zone of intense alteration of the porphyry is confined to the close proximity of the veins, and the silicified and chloritized porphyry carries no gold. In the siliceous phase, the alteration consists in the introduction of quartz along narrow and closely spaced fissures.

The development work has been confined to the West End and Spanish veins on the 50 and 100-foot levels, north of the shaft. Developments: Vertical shaft 100 feet deep. At 31 feet below the collar of the shaft, a drift was driven N. 19° E., and cut the West End vein, 110 feet from the portal, then continued 35 feet N. 16° E., and drifted on the vein N. 15° W., 180 feet, where the vein was cut off by a fault, which strikes N. 70° W., and dips 50° north. About 40 feet from where the vein was cut on this level, a crosscut was driven 100 feet N. 45° E., where it cut the Spanish vein, and this vein was drifted on 50 feet north and 55 feet south. On the 100-foot level, the West End vein was drifted on 200 feet north, to where the vein was cut off by the fault striking N. 70° W. A pump was installed by the present company and the mine unwatered. At 130 feet north of the shaft, a crosscut has been driven 80 feet N. 80° E., where the Spanish vein was cut, and a raise is being run on this vein in hopes of picking up the ore shoot developed in the Spanish stope, which has been stoped out for a distance of 60 feet along the vein from the drain tunnel level to the surface.

Equipment: 9-h.p. Hercules gasoline engine driving 6″ Mast-Foss rod pump; 30-h.p. boiler and steam hoist.

Four men employed. R. S. Williams, superintendent.

Reference: State Mineralogist Report XII, page 260; XIII, page 368.

ZINC AND COPPER.

Bully Hill Mines. These properties are situated 1½ miles north of Copper City, in sections 15, 16, 21, 28, T. 34 N., R. 3 W., in the Pittsburg Mining District. Owned by Shasta Zinc and Copper Company, 1800 Hobart Building, San Francisco. D. C. Jackling, president; M. W. Enrich, secretary; G. T. Jackson, general manager.

At Bully Hill, which is on the East copper belt of Shasta County, there are two lodes that have been worked; the Eastern or Delamar lode in the Bully Hill mine, and the Western or Anchor lode in the Rising Star mine. The general course of the Delamar lode is about N. 10° E., and dip approximately vertical. This lode can be traced for one-half mile, the width being from a few feet to 20 feet. The shear zone is more or less distinct throughout and contains irregularly lenticular and overlapping ore bodies. They vary in extent and size from lenticular or sheet-like nodules, a few inches wide, up to bodies 100 feet in length, and 12 to 30 feet thick. The greatest extent of the ore bodies appears to be in a nearly vertical direction, pitching steeply to the north.

The ore is composed of pyrite, chalcopyrite, chalcocite, bornite, sphalerite, and galena in varying proportions. The Anchor lode is approximately paralled with the Delamar lode, and lies over 200 yards to the west.

It has been developed by tunnel and shaft on the Rising Star mine. Here the ore bodies are irregularly distributed in a shear zone in the rhyolite and form a series of lenticular and overlapping ore bodies. The ore is principally sphalerite with some pyrite, and chalcopyrite.

The quartz is scarce in the gangue, and barite is more common, particularly in ore that is rich in copper. The average content of the ore in these workings is about 22% zinc, 2% copper, 2 ounces silver and 60 cents in gold.

Since 1917, all development work has been confined to the Rising Star mine. A series of lenticular ore bodies have been opened up on the 5th, 6th, 7th, 8th, and 9th, levels of this mine.

Developments: The Bully Hill mine has been opened by a number of tunnels with extensive drifts, crosscuts, and raises, comprising several thousand feet. There are nine levels, 100 feet apart, eight raises from 50 to 560 feet in height, and an 1100-foot crosscut tunnel on the Bully Hill claim, about 600 feet below the gossan outcrop (No. 3 level). At 1100 feet from the portal of the tunnel where the vein



Zinc Oxide Plant, Shasta Zinc and Copper Company, Winthrop, Shasta County.

was cut, a shaft (3-compartment) was sunk to a depth of 950 feet. No. 3 level is connected by chutes and raises with the upper workings, of which some of the drifts run along the vein 800 to 1000 feet.

Rising Star Mine. There is a three-compartment shaft, 800 feet deep. The main adit tunnel (No. 5 level) intersects the shaft 218 feet below the collar with six levels below No. 5 level, 100 feet apart, with drifts on the 6th, 7th, 8th, and 9th levels. Ore is trammed through No. 5 level to storage bins, then hauled in cars by horses one-half mile to bins at the smelter at Winthrop.

Mine equipment: Two-reel electric hoist, 10-drill Rand compressor, driven by 60-h.p. motor, blacksmith shop, and timber-framing shop. Mine water is handled by two 5″ x 9″ Aldrich quinplex pumps, each driven by 100-h.p motor; one pump on the 9th level, the other on the 11th level.

Smelter: During the past two years, there has been constructed on the property a zinc oxide plant, having a capacity of 150 tons per day.

This plant was put in operation during the early part of June, 1922. The method of treating the ore from the Rising Star mine, which runs 22 per cent zinc, 2 per cent copper, 2 ounces silver, and about 60 cents in gold, consists in charging a mixture of fine roasted ore and coal dust into a copper reverberatory smelter. The heating of the mixture to the temperature of the reverberatory furnace will reduce the zinc oxide to zinc and volatilize it. The volatilized zinc will oxidize in the furnace gases and pass with them to be recovered in the flues.

The residual ore mixture is smelted in the usual way for recovery of copper matte with gold and silver values.

Description of plant: From the crude ore bins, a belt conveyor carries the ore to a 10″ x 20″ Blake crusher, where it is reduced to 2″ size. A 20″ belt feeder draws the ore from small surge hoppers and discharges into a 37½″ x 15″ set of rolls, where it is reduced to $\frac{5}{8}$″ size. The discharge from the rolls is conveyed by a 16″ bucket elevator to a Mitchell electric vibrating screen, the oversize going to a second set of rolls, and being returned to the elevator. The screen undersize is automatically sampled and delivered to a conveyor which is equipped with a weightometer. The undersized ore is finally conveyed to any one of the eight storage bins, of a set of 16 bins, set back to back, each having a capacity of 2200 cubic feet. The remaining 8 bins are used for the furnace charge, consisting of calcines, flux, and coal. Under each fine ore bin is a belt feeder, which permits a predetermined flow to conveyors, leading to the McDougall roasters. The roasted ore is discharged to steel-flight conveyors, and conveyed back to the opposite side of storage bins, cooling en route. The calcines are stored in 5 bins, the remaining three being used for coal and flux. The furnace charge is made up by belt feeders, which deliver to a conveyor. A bucket elevator elevates and assists in mixing the charge before it goes to the hoppers of the reverberatory furnace. The reverberatory furnace is fired by fuel oil. The slag is handled in 5-ton hand operated pots and hauled to the dump by electric locomotives. The matte is handled in matte cars, and hauled to bins, after cooling, where it is loaded in railroad cars for shipment.

The waste gases are drawn into cooling flues. Exhaust fans are used to draw the gases through the flue system. All gases are filtered through bags. Bag house No. 1 is a steel structure containing four fireproof compartments, each compartment having four transverse hoppers, which connect with 88 bags. The bags are 18″ diameter and 25 feet long. A mechanical shaking apparatus is used. From No. 1 bag house, the zinc oxide, which contains 3% soluble sulphates, and is not the grade required, is loaded in cars from the hoppers and trammed to the refining plant. These cars are hauled up an incline and dumped into hoppers over refining furnace, which has a capacity of 30 tons per day. Here the crude zinc oxide is reheated, at a temperature of 1200°. The gases from this furnace are drawn through flue (trail) to No. 2 bag house, containing 500 bags, 18″ diameter by 25 feet long. The zinc oxide is here collected in canvas sacks, 4 feet long by 20 inches in diameter, which are attached to hoppers below the bags. These bags are then transported to the storage building,

which is of steel construction throughout, 92 feet by 141 feet. This storage building contains a number of bins in which the zinc oxide can be distributed according to analysis. The capacity of the bins is one month's run. A bolting machine, mixer, and two packing machines complete the equipment in the storage house. Here the zinc oxide is packed in barrels, which are paper lined and ready for shipment to the market.

The plant has been under steady operation since June 15, 1922, production being 30 tons of zinc oxide per day, with 15 to 20 tons of copper matte.

Sixty men are employed at the mine, and approximately 140 men around the smelter.

Bibliography: State Mining Bureau Bulletin No. 50, State Mineralogist Reports, XIII and XIV, U. S. Geol. Survey Redding Folio.

SILVER.

Chicago Consolidated and Silver Falls Mines. Owner, Dr. F. M. Archer, of Redding. Situated in South Fork Mining District, 2½ miles northwest of Igo. It is under option to the California Bi-Metallic Company of Santa Barbara, California. L. G. Vinson, president; Paul Drinkwitz, secretary; L. M. Barker, general manager. Eight men are employed.

Bibliography: State Mineralogist Report XVIII, pp. 316, 317.

AUBURN FIELD DIVISION.

C. A. Logan, Mining Engineer.

The report of activities in the Auburn field division has been omitted from the current chapter on account of the disruption of field and office routine due to the presence of Mr. Logan at the Argonaut Mine while rescue work was in progress. All other available time was devoted to actual field work which will be reported later.

SAN FRANCISCO FIELD DIVISION.

E. S. Boalich, Chief Mining Engineer.

Mono County.

In August of this year Mono County was visited for the purpose of ascertaining the condition of the mining industry in that region and obtaining up-to-date information regarding development and mine operations which have taken place since the last report on that county by the State Mineralogist, in 1920.

This portion of the state is exceedingly interesting from a geological standpoint. However, it has been described in detail so often that it is not considered advisable to repeat those descriptions here. References have been added at the close of each paragraph of the principal publications that contain data of both scientific and economic interest concerning the county. These bulletins and reports will be found available

for reference in the offices of the State Mining Bureau and also in many libraries throughout the United States.

The greater part of Mono County consists of a table land having an elevation of from 5000 to 7000 feet above sea level, which is traversed by a series of north and south mountain ranges rising several thousand feet above the plateau. Its western border includes portions of the Sierra Nevada Mountains, which are often as high as 13,000 feet above the sea.

Surrounded by lofty peaks lies Mono Lake, a body of water with no outlet, which has an approximate area of 1100 square miles, and whose surface has an elevation of 6426 feet. The waters of this lake are heavily charged with various salts of sodium and potassium.

Mining and stock raising are the principal industries. The county suffers on account of poor transportation facilities. The only railroad is the Nevada-California narrow gauge line, which cuts the southeast corner, but which is of little benefit to any of the mining districts except Benton and vicinity.

Stage lines from Nevada points serve most of this territory.

Mining in this portion of the state is largely confined to the production of gold ore, and the industry is showing distinct signs of emerging from the lethargy that has been evidenced during recent years. Prospecting and development of properties on a small scale was noted throughout the county, and in addition several of the larger mine owners are perfecting plans for the resumption of activities which point toward more prosperous days for the entire community.

Mono is a large county, and as previously intimated, comparatively difficult to traverse, even with the modern automobile. Sand and volcanic ash in some sections make the roads extremely heavy, and differences of 3000 or 4000 feet in elevation within short distances are of common occurrence. The mining districts are quite isolated from each other, even when separated by only a few miles as the crow flies. Instead of discussing the various properties in alphabetical order, it is therefore deemed more appropriate to take up one district after another, geographically, in the following paragraphs.

ANTELOPE VALLEY, OR WEST WALKER RIVER, DISTRICT.

Gold, silver, copper, lead, zinc, cadmium, and iron ores, and barite, marble, and building stone occur in this district, which lies principally in Ts. 8 and 9 N., R. 23 E., and is the most northerly part of the county in which any mining has been done.

The only mine which has been active during recent months is the *Golden Gate*, situated near Coleville, and operated by Messrs. Brown and Donovan. The ten-stamp mill has been run intermittently since last winter and possibilities of steady production are said to be particularly bright at the present time.

See State Mineralogist Report XV, pp. 138-141, 165.

PATTERSON DISTRICT.

This district includes approximately eighteen square miles lying five miles west of the town of Sweetwater, Nevada, on the eastern slope of Mount Patterson. Mining has been quite dormant here, but the famous

Silverado property has recently been acquired by the *Mono Mines Co.* of Nevada and ambitious plans are being outlined for work which is to be inaugurated without delay. The mine lies in Sec. 19, T. 7 N., R. 25 E. Values are principally in the form of silver chloride, with small amounts of gold, in a vein varying in width from 2 feet to 5 feet, which has been opened by adits on three levels.

Nels Buck, 3123 N. Clark Street, Chicago, Ill., is president of the present company, and A. G. Anderson, Sweetwater, Nevada, is vice president and manager.

The corporation is said to have purchased the old Bodie power plant on Green Creek, south of Bridgeport, and will construct a power line, a distance of about twenty-five miles, to the mine.

A snow slide in February, 1922, wiped out the camp that was used as mine headquarters. The old mill was not destroyed, but the present program calls for the construction of a new and enlarged mill, as well as a permanent camp, at a point lower down the canyon where a similar disaster could not occur.

In addition to the eight claims previously held in the Silverado group, title has been acquired to the *Kentuck* property adjoining.

State Mineralogist Report VIII, p. 361; XV, p. 165.

MASONIC DISTRICT.

Masonic lies about two miles from the California-Nevada line and twelve miles northeast of Bridgeport, in T. 6 N., R. 26 E., at an elevation of 8000 feet. The surrounding country rock is practically all basic lava, although the principal ore deposits so far discovered are associated with silicified zones in an area of intrusive granite.

The camp of Masonic, proper, is quiet. The principal work being done there is that of Messrs. Bray & Frazier, of Reno, who leased the *Pittsburg-Liberty Mine* in the Spring of 1922. F. W. and Geo. C. Stall, owners of the *Serita* property, are reported to be preparing to resume operations in the near future.

In contrast to the older portion of this district, the neighborhood of the *Chemung Mine* (*Masonic Mines Association*) about 2½ miles southeast of the town of Masonic, presents a scene of real activity.

The Chemung, which is only one claim of a large group owned by the Masonic Mines Association, has produced some phenomenally rich gold ore. It has had a checkered career, however, due to litigation and conflicts between the various interests identified with its development. The Mining Bureau is in no way interested in the history of the troubles which have involved the owners, leasers, and subleasers of this property, but it is encouraging to record the reported fact that a readjustment has been effected and that a new and united regime, headed by Mr. J. Sub Johnson* of Visalia, California, will soon take charge, and that plans for systematic development of the mine and the construction of a mill have already passed the preliminary stages.

*The Bureau has been advised by Mr. Johnson under date of September 18th, as follows: The new company will be known as the *Visalia Masonic Mining Company*, president, George C. Cobb; vice president, Frank Carson; secretary, Bertha H. Haas; treasurer, L. C. Hyde, and manager, Wm. Dexheimer. We expect to have the quartz mill in operation within the next fifteen days and will be nicely equipped for the winter's run.

The greatest depth reached in the mine to date is 185′, vertical. Large quantities of medium grade ore have been developed and several shipments of high grade running into values of several hundred dollars per ton have been made, but transportation costs are well nigh prohibitive.

It is planned to construct a five-stamp mill, and to regrind in a Denver quartz mill. Some of the machinery for the plant is already on the ground.

On claims adjoining the Chemung, the Masonic Mines Association has recently let the following leases. Early in August prospecting work on each lease was just getting under way.

Burgess and Cummings Lease, on the Golconda No. 1 Claim. A 4 x 7 shaft was down about 25′ and a 5′ vein was exposed that has shown values averaging $12.50 per ton in gold.

P. J. Hotze Lease, on north end of the Pennsylvania Claim.

A. B. Smith Leasing Co., on south end of the Pennsylvania Claim. A 4 x 8½ double compartment shaft had reached a depth of about 25′.

In addition to the above, considerable work is being done by other parties in the same portion of the Masonic district.

Among them may be mentioned:

Success Mine, one mile south of the Chemung, C. C. Hayes and J. H. Hayes, Bridgeport, owners. This property consists of two claims which have been developed by a 50′ shaft. Unfortunately water was struck in sufficient quantities to stop work with a windlass and it now stands at the 25′ level. At that point a 3′ vein was noted which is said to carry average values of $11 in gold. Grab samples have shown exceptionally high values in both gold and silver.

This vein strikes northeast and southwest and dips to the east. Outcroppings, heavily iron stained, cover a large area in the vicinity of the shaft and from what can be seen, it is difficult to decide whether the main ore body has been discovered or not. The country rock is andesite.

Faudre and Welsh Group, C. L. Faudre and Frank Welsh, Masonic P. O., owners. This group of ten claims is located at what is locally known as Camp Eleanor, one-half mile south of the Success property, on the new road from Bridgeport to Masonic, via the Chemung Mine.

The country is highly mineralized, but only small stringers have been discovered as yet. An 80-foot crosscut adit has been driven which cuts four small veins, all of which panned well.

Brownie Group, W. L. E. Brown, Masonic, owner. Three claims, which comprise this group, have been located along the strike of a N.E.-S.W. vein, which has been traced for about 1500′ on the surface at Camp Eleanor. Several samples taken along the outcrop averaged $8 in gold. One sample was taken across 6 feet of good looking vein material.

The ore makes on a contact between schist and granite. Mr. Brown also owns a water right on a good spring adjoining his mining claims. He has recently located two claims which constitute the South Extension of the Masonic Mines Association property and has prospected them in a small way by open cuts.

See State Mineralogist Report XV, pp 143, 160; XVII, p. 153.

BRIDGEPORT DISTRICT.

For want of a better description, this name is used to cover the area including the travertine deposit one mile southeast of Bridgeport, and the mines in the vicinity of Green Creek, in T. 3 N., R. 25 E., eight or ten miles south of that town.

The travertine has not been worked for years, until 1921, when a small shipment was made by the Dinneen Marble Company of Oakland. Some beautiful stone has been produced here. The gold mines near Green Creek, notably Dunderberg & Ward, have been idle for many years, although valuable ore is said to have been mined at both places and both were once equipped with mills.

BODIE DISTRICT.

Bodie, one of the most famous old mining camps of the west (situated 16 miles southeast of Masonic), remains quiescent, as it has been for the past several years.

Leasers are working in a small way in the *Standard Mine*, owned by J. S. Cain, and occasional mill runs are made in the mill of that property, which is in excellent condition.

A surface discovery on the site of the old *Goodshaw Mine* was made about August 1st, which aroused considerable interest among the few remaining inhabitants of the town. A small amount of work at a point where no outcroppings were in evidence, at all, revealed quartz which panned very rich in gold. Additional work might easily open up something that would help revive interest in this district which has a production record of $25,000,000 to $30,000,000 since its discovery in 1860.

Immense mine dumps, said to average as high as $5 in gold per ton, will some day undoubtedly be cyanided or otherwise treated at Bodie, even if no new ore bodies of any extent are brought to light.

See State Mineralogist Report XV, pp. 143–149, and numberless other official and technical publications issued during the past fifty years.

LUNDY AND MONO LAKE DISTRICT.

This region is extremely interesting. Within a radius of a few miles are found granite, basic lavas, recent volcanics, rocks of the metamorphic series, glacial drift, and lake deposits.

The granite, which contains a number of gold-bearing quartz veins, varies from coarse-grained, light-colored to fine-grained, dark-colored granodiorite. It is frequently intruded by dikes.

The metamorphic series, including hard bedded limestone, and quartzite has in places been found to be gold bearing.

The recent volcanics contain all varieties from fine pumice sand to glassy and porous rocks which may sometime be used for structural purposes.

The waters of Mono Lake contain about 5 per cent of solids, principally sodium chlorides, carbonate and sulphate. These salts have been intermittently produced in a small way at various times in the past by crude evaporating methods.

It is said that traces of gold are also present, in solution, in the lake waters. When this locality was visited three plants were found on the lake where efforts are to be made to extract gold from the water on a commercial scale.

While the above objective is more or less widely advertised, the exact processes to be used are kept veiled from public view. It is understood that the recovery of the gold is to be attempted by electrolytic methods.

The plants, which are all on the northwest shore of the lake (near the post office of Mono Lake) are said to be under the following management:

Mono Recovery Company, W. M. McDowell, Tacoma, Wash., president; P. F. Gleason, secretary and treasurer.

Professor Parker's Plant, D. G. Kidder, manager.

Whittaker Plant, W. Harrison Whittaker, manager.

As far as could be discovered, no attempts at actual operation have yet been undertaken in any of the above, although installation of electrical equipment was in progress by the Mono Recovery Company.

It has been a rather widely accepted opinion among technical men that endeavors of this kind are foredoomed to failure so it will be interesting to follow the activities of the above, and mark the degree of success they may attain.

Mining in the Mono Lake region is inactive. The *Crystal Lake* property at Lundy remains idle, although it is reported that the owner, Mr. Thos. R. Hanna, of Martinez, California, contemplates reopening the mine at an early date.

See State Mineralogist Report XV, p. 167.

BENTON DISTRICT.

Benton, the oldest mining town in Mono County, is situated in the southeast portion, 24 miles north of the Inyo County line and 7 miles west of the Nevada State line. Blind Spring Hill rising immediately east of the town is the center of most of the mining activity which has taken place in the district.

Report XVII of the State Mineralogist (p. 151) contains mention of the activities that were observed in this region in 1920.

In August, 1922, a period of depression was being passed through and practically nothing was being accomplished. Some development at the *Comanche Mine* and a similar small amount by the *Diana Development Company* was all that prevented the hill from being entirely deserted.

See State Mineralogist Report VIII, p. 376.

CASA DIABLO DISTRICT.

The *Casa Diablo Mine*, the principal property in this section of Mono County, is twenty-two miles north and a little west of Bishop, Inyo County. This mine, which was discovered in 1895 and which has been idle for some time, was recently taken over by the *Bishop Community Gold Producers Mining Co.*, H. T. Bonfield, superintendent. Among

other well known men who were backing the property is Jas. J. Jeffries of Los Angeles.

In this mine are three veins between granite walls—their width varying from 8 inches to 2½ feet. Average values are said to be $12 per ton. Several thousand feet of development work has been done. Equipment includes an electric generating plant and a ten-stamp mill, together with a saw mill, air compressor, four-mile transmission line, and eight-mile water pipe line.

Seventy-five men were employed in the mine and on the surface.

Napa County.

Napa Asbestos Quarries. Jas. S. Brogan, 28 Hill Street, San Francisco, and R. R. Norton, 2545 Benvenue Avenue, Berkeley, owners.

It is believed that this is the first recorded occurrence of asbestos in Napa County. The deposit, which lies in Sec. 4, T. 7 N., R. 3 W., is said to have been discovered in 1907 or 1908, but it has only recently been brought to the attention of the Mining Bureau.

Messrs. Brogan and Norton have located nineteen claims in the above township, which lie about one mile west of the Napa-Berryessa road, and one-half mile north of the old Perch Ranch, eighteen miles northeast of the town of Napa.

Short fibre chrysotile asbestos is disseminated throughout a body of serpentine which outcrops prominently for a length of at least fifteen hundred feet and a width of three hundred feet. Erosion has exposed the ore on the west side for a vertical distance of approximately two hundred feet. The general strike of the lens of serpentine, which is surrounded by Cretaceous shales, is N.W.-S.E.

Aside from the surface evidence to be noted, the deposit has been prospected by an adit driven from the east side of the hill at a point about two hundred feet lower than the apex of the outcrop. This adit is sixty feet long and at the face has penetrated ore quite similar in character to the surface croppings.

The elevation of the property does not exceed thirteen hundred feet above sea level, and the haul to the railroad (at Napa) is an easy one, over well-kept dirt and gravel roads.

Timber for fuel or other purposes is scarce.

Power would have to be developed by internal combustion engines, as no electric power line is available within a radius of several miles.

Spring water and an excellent camp site are located within one-half mile of the deposit.

A picked sample of the ore taken from the surface was tested in the Bureau's laboratory and found to contain 49 per cent fibre.

LOS ANGELES FIELD DIVISION.

M. A. Newman, Mining Engineer.

Inyo County.

Bishop Creek Milling Co. Property located 22 miles southeast of Laws. Milling operations were suspended February, 1922. At present the company is putting down a number of diamond drill holes and claims to have opened up several large bodies of low grade ore. Fifteen men are employed.

Between July, 1921, and February, 1922, running at reduced capacity, the company shipped approximately 500 tons flotation concentrates, which gave net smelter returns of $73,860. This represented a tonnage of about 12,500 tons of crude ore.

The officers of the company are as follows: Gaylord Wilshire, president; H. R. Kearns, secretary; L. M. Allen, superintendent. An office is maintained at Bishop, California.

California Alkali Co. Located on the west shore of Owens Lake at Cartago, a station on the Owenyo branch of the Southern Pacific Railroad. The company operated its plant from 1917 till May, 1921, when it closed down due to the low price of soda ash, as compared to that received during the war period. The plant has a rated capacity of 100 tons dense soda ash per day. At present plant is idle, though operations may be resumed the early part of the coming year.

Main office of the company at 639 Holbrook Building, San Francisco. T. W. Decker, president; J. F. Shuman, vice president; E. B. Bonestell, secretary-treasurer; W. H. Lowery, superintendent.

Cerro Gordo Mines Co. Mines are located about 5½ miles northeast of Keeler. Company has a 50-ton mineral separation flotation plant at Keeler. This was built in 1921. Ore is brought from mines to mill by means of an aerial tramway, which has a rated capacity of 20 tons per hour. At present the mill is treating a silver-lead ore. Heads average 5 per cent lead and 12 ounces silver. Flotation concentrates run 68 per cent lead and 146 ounces silver. Mill is run on two shifts only. Twenty-five men employed at mine and mill. F. J. Hambly, president; C. A. Stockton, superintendent. Main office, San Jose, California.

Chemical Refining Co. Located 2 miles south of Keeler on east shore of Owens Lake. At present, plant is idle. Manufactures borax and potash from brine. When running has a capacity of 10 tons borax per day, and employs 15 to 20 men.

Main office: Hibernia Bank Building, San Francisco. E. J. Tobin, president; E. T. Royce, chemist.

Darwin Silver Co. Mines and mill are located in the Darwin Mining District, 24 miles southeast of Keeler. At present, the property is under lease to Mr. A. G. Kirby, former manager of the company. About 80 tons per day are being treated at the plant. 50 per cent is dump ore and 50 per cent comes from the Lucky Jim Mine. The heads average 8 per cent lead and 10 ounces silver per ton, making a concentrate running 40 per cent lead and 70 ounces silver. Sixty-three men employed at present.

The company had planned a very comprehensive system of developing its various mines. The ores from these were to be treated at one central plant of 300 tons capacity. Unfortunately, owing to financial troubles of the largest stockholder of the company, these plans for the present remain uncompleted. A. G. Kirby, lessee. Office, Darwin, Inyo County, California.

Reference: State Mineralogist Report XVII, pp. 289, 290.

Estelle Mining Co. Mines located 5 miles east of Keeler, on the west slope of Cerro Gordo Mountains.

Company owns 29 mineral claims containing veins of lead-silver ore. At present shipping about 100 tons a month from its Morning Star claim. Shipping ore averages 6 per cent lead, 55 ounces silver and .4 ounce gold per ton.

Property described in detail in Report XVII State Mineralogist.

R. C. Troeger, president and general manager; A. Ramish, treasurer; A. H. McAdoo, secretary. Office: 803 H. W. Hellman Building, Los Angeles.

Inyo Development Co. Plant about one mile northwest of Keeler on east shore of Owens Lake. The plant has a capacity of 20 tons soda ash per day. The company also shipped about 25 tons per day of pulverized crude 'Trona.' About 40 men employed at present.

Main office at 639 Holbrook Building, San Francisco. T. W. Decker, president; J. S. Hunter, superintendent.

Inyo Talc Co. Mines located 17 miles southeast of Keeler. The deposit occurs in a crushed zone of impure limestone. The vein averages 20 feet wide, and the ore body is developed for 240 feet in length. In the last 3½ years at least 30,000 tons of talc has been mined. A grinding plant of 30 tons capacity is located at Keeler. The ground talc is used for talcum powder, as a body for fancy soaps, and as a filler by the paper mills. A considerable business has also been developed in the use of talc by the electrical appliance industries. About 30 men employed.

Franklin Booth, president; W. A. Read, superintendent. Office: Equitable Bank Building, Los Angeles.

Leroy Mine. This was formerly known as the Old Daisy Mine and is located 24 miles southeast of Big Pine. Consists of 4 claims of lead-silver-gold bearing veins. Shipments sent to the Garfield smelter gave returns of 52 per cent lead, 32 ounces silver, and .8 ounce gold.

Property is owned and being developed by F. M. and D. T. Bedell.

Natural Soda Products Company. Plant situated two miles south of Keeler on east shore of Owens Lake. This is the largest of the chemical plants on Owens Lake, and manufactures bicarbonate of soda, as well as soda ash. Plant fully described in Report XVII of the State Mineralogist.

Employs about 150 men. Main office: Bishop, California. W. W. Waterson, president; Paul Waterson, superintendent.

Opal Mine. Property 26 miles southeast of Big Pine. Owned by Bedell Bros. Silver-lead. At present idle.

Imperial County.

California Gypsum Corporation. This company has gypsum deposits in the western part of Imperial County, near the San Diego line. It has asked permission of the Corporation Commission to sell $400,000 of its stock, so as to be able to install a transportation system consisting of a narrow gauge railway and in part an aerial tramway; also the first unit of a gypsum plant of approximately 500 tons capacity.

Los Angeles County.

Lost Treasure Mine. This property is situated six miles southwest of Azusa, in the San Gabriel Canyon. In consists of four claims: Lost Treasure No. 1 and No. 2 and Lazy Boy No. 1 and No. 2. A small open cut on the croppings is reported to have assayed 50 ounces silver from a six-inch streak. Fifty feet below this open cut a tunnel has been run on this same streak and the owners report this to have given values of 30 ounces silver per ton.

The property is owned by Messrs. Holcomb, Barber and Fairs, of Azusa, California.

About 20 years ago, an English company operated a silver mine on the opposite side of the canyon from the Lost Treasure Mine, known as the Victoria Mine. This had a small reduction plant to treat the ores at the mine.

Another company also operated the Kelsey Mine near the Victoria about the same time. This company also had a small treatment plant on the premises. As stated before, however, these properties have been idle now for the last twenty years.

Sunshine Mines. Messrs. Christman, Fuller and Meuer have located 10 claims, in Boquet Canyon, 17 miles from Saugus. These claims were abandoned about 10 years. The above named gentlemen relocated these several months ago and have been developing them since. They claim to have a quartz vein averaging 25 feet in width, which at a depth of 15 feet gave assay returns of $6.20 per ton, and at 50 feet in depth assayed $10.30 gold and 3.10 ounces silver. The closeness of this property to Los Angeles, being only 53 miles distant, will make mining men watch its development with much interest.

San Bernardino County.

California Rand Silver, Incorporated: This company paid a two cents per share regular dividend for the month of August, totaling $25,600 and an extra dividend of ten cents per share, totaling $128,000, or a total of $153,600. With this distribution, the total dividend of the mine since January 1st of this year is 68 cents per share, or $870,400, and the grand total of mine dividends to date is $1.51½ per share, representing a distribution of $1,939,200.

Below is an extract from the August report of this company, as sent to its stockholders:

"Ore Extraction and Advancement.

During August, tonnage extracted was as follows:

Shipping ore	989 tons
Milling ore	4749 tons
Waste	3329 tons
Total extraction	9067 tons

Advancements made were as follows:

Drifts	1030 feet
Crosscuts	258 feet
Raises	219 feet
Shafts	87 feet
Ore pockets	50 feet
Water sump	7 feet
Stations	50 feet
Total feet of advancement	**1701 feet**

Milling Operations.

A continuance of the satisfactory showing of the mill noted in last month's report is gained from the following figures for August:

Total ore milled	4649 tons
Daily average, 31 days	150 tons
Daily average, running time	160 tons
Running time	29 days 2 hours
Lost time	1 day 22 hours
Average gold heads	$1.96
Average silver heads	16.095
Total average value	18.055
Average gold tails	.39
Average silver tails	1.13
Total average value	1.52
Average gold extraction	80%
Average silver extraction	92.98%
Total average extraction	91.58%
Recovery per ton	$16.535
Total recovery on 4649 tons	76,871.21
Average concentrate value	346.51
Tons of concentrates produced at $346.51	222 tons
Cars of concentrates shipped	203 tons net

Betterments.

Plans for betterment along several important lines will soon be realized.

The long delayed mill machinery (which had to be built to order) has arrived and its installation will be but a matter of days. With said machinery in place, the capacity of the mill will have been increased from 140 or 150 tons per day to 200 tons per day.

The difficult and tedious laying of a pipe line over the gap in Red Mountain to our new water wells at Teagle Springs is nearly completed and we will shortly have a supply of 30,000 gallons of good mountain water in addition to our contracted supply from the Yellow Aster.

The machinery for the auxiliary hoist of Shaft No. 2 is on the ground and the work of installation is now in progress. The hoist will be located on our 12th level at a depth of 770 feet, and the new machinery will be utilized in connection with the sinking of the shaft to a depth of 1000 feet or more. This development is to be prosecuted to ascertain what values lie below the so-called water zone.

Uranium Seven and Ten.

The Coyote Company, which jumped our Uranium Claims, Seven and Ten, has as yet made no move to enforce its demand that we cease working on these properties. Good ore bodies have been developed on both of these claims and your present Board of Directors is convinced that it will be able to hold the ground for the Company as against any adverse contention. Our attorneys and engineers advise us that our rights to this property are unquestionable, and the only danger to the Company lies in a possible failure to vigorously defend those rights when they are assailed. In this connection your attention is again directed to the importance of electing a board of directors at the annual meeting on September 14th whose policy will be to protect, in all legal ways, the Company's rights to this ground.

Financial.

Receipts from the smelter for August (with strike conditions preventing shipments for eleven days of the month) were $150,596.18. After the payment of this dividend of $153,600, the company has cash on hand in the sum of $319,062.84."

Gold Mountain Mine. This property at Doble, north of Baldwin Lake, which for the past two years has been operated by James Hulmes, has recently been sold to a group of Arizona mining men.

The property was opened up over 30 years ago by 'Lucky' Baldwin and Bud Doble, and at one time was owned by Capt. J. D. de Lamar. It is equipped with a 40-stamp mill and has a capacity of 120 tons per day. The ore is low grade, about $4.00 gold per ton, and it is said there are very large bodies of this value still available.

South Rand Mines Co. This company has recently entered the Randsburg field. Its holdings lie between the Sunshine on the east and the White mines on the west, and comprise 80 acres of patented land, besides one mining claim location. It will develop its veins by shafts and drifts.

E. L. Burton, president; Dr. C. A. Rogers, vice president; I. E. Porter, secretary-treasurer. Office, Bakersfield, Cal.

San Luis Obispo County.

American Canadian Oil Products Co. This company proposes to erect a pilot plant of 100 tons per day capacity to work its oil and tar sands located near Tyber, in the Tyber oilfields. This is to be ready for operation within the next 90 days. It intends to use what is known as the McClave process, developed at Denver, Colo. If the pilot plant proves commercially successful, a large one of 1000 tons capacity is to be erected.

G. W. Stephenson, president. Office, Owl Building, San Diego, Cal.

La Panza Placers: A Mr. Pierce of Gilroy, Cal., has taken a lease on several miles of La Panza Creek. He has developed a dredge which he believes will successfully work these gravel deposits. Two of these dredges are now on the property but due to lack of water, the writer unfortunately could not witness their operation.

Patriquin Quicksilver Mine. This quicksilver property, 6 miles north of Parkfield, is being reopened by Chas. R. Mayhall and associates of San Luis Obispo. The company operates under the name of the Master Quicksilver Mining Company, and will use a new type of furnace called the Master furnace. This furnace will have a capacity of 30 tons per day of crude ore and will not cost when erected but one-fifth as much as a Scott furnace, the most efficient known furnace at present used in the quicksilver industry. The owners claim this furnace is fully as efficient as the Scott and its low cost, both as to initial installation and operation, should make those interested in the quicksilver industry watch actual results obtained from its operation closely.

OIL FIELD DEVELOPMENT OPERATIONS.

R. E. Collom, State Oil and Gas Supervisor.

From August 12, 1922, to and including September 9, 1922, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well No.	Field
FRESNO COUNTY:					
Paragon Oil Company	17	19	15	15	Coalinga
Salvia Oil Company	24	20	14	19	Coalinga
South Coalinga Oil Company	12	21	14	1	Coalinga
HUMBOLDT COUNTY:					
Humboldt Oil Company	6	2	1	2	
KERN COUNTY:					
Belridge Oil Company	34	30	24	15	Elk Hills
Pacific Oil Company	35	30	24	106	Elk Hills
Bangor Oil Company	24	28	27	3	Kern River
Gray Heirs	3	29	28	41	Kern River
Associated Oil Company	22	31	23	41	Midway
Caribou Oil Mining Company	28	31	23	6	Midway
Chanslor-Canfield Mid. Oil Co.	26	31	22	24	Midway
Chanslor-Canfield Mid. Oil Co.	26	31	22	25	Midway
Pacific Oil Company	27	31	23	1	Midway
Pacific Oil Company	35	31	23	42	Midway
Pacific Oil Company	1	32	23	104	Midway
Pacific Oil Company	11	32	24	31	Midway
Pacific Oil Company	15	32	24	20	Midway
Calitroleum Oil and Gas Co.	4	11	23	2	Sunset
El Dora Oil Company	6	11	23	1	Sunset
Midway Northern Oil Co.	32	12	23	10	Sunset
LOS ANGELES COUNTY:					
Bona Fide Oil Syndicate	20	4	12	2	Long Beach
Bush, R. R., Company	20	4	12	5	Long Beach
Calmont Oil Company	19	4	12	2	Long Beach
Capital Oil Company	29	4	12	1	Long Beach
Dabney Oil Syndicate	20	4	12	5	Long Beach
Dabney Oil Syndicate	29	4	12	15	Long Beach
Davis-MacMillan Syndicate	30	4	12	1	Long Beach
General Petroleum Corporation	19	3	12	4	Long Beach
Hockel, S.	19	4	12	1	Long Beach
Hughes Drilling Company	19	4	12	1	Long Beach
Huntington & North. Pet. Co.	30	4	12	1	Long Beach
Jergins, A. T., Tr.	19	4	12	2	Long Beach
Leonard Wells	30	4	12	3	Long Beach
Liberty Oil Syndicate	19	4	12	Harlow 1	Long Beach
Lyceum Oil Syndicate	19	4	12	1	Long Beach
Moore-Tobias	30	4	12	1	Long Beach
Mutual Oil Association	30	4	12	1	Long Beach
Petroleum Midway Co., Ltd.	19	4	12	Bauman 1-A	Long Beach
Prouhet & Troupe	20	4	12	1	Long Beach
Rice Ranch Oil Company	19	4	12	Kelly-Garner 1	Long Beach
Shell Co. of California	19	4	12	2	Long Beach
Shell Co. of California	29	4	12	1	Long Beach
Shell Co. of California	29	4	12	2	Long Beach
Union Oil Co. of California	30	4	12	L. B. Com. 6	Long Beach
United Oil Company	29	4	12	5	Long Beach
Western Star Oil Company	19	4	12	Gray 1	Long Beach
Windemere Oil Company	19	4	12	1	Long Beach
Amalgamated Oil Company	8	4	14	1	Redondo
Fullerton Oil Company	8	4	14	Lenz 1	Redondo
Chanslor-Canfield Mid. Oil Co.	8	4	14	Del Amo 1	Redondo
Chanslor-Canfield Mid. Oil Co.	15	4	14	Torrance 3	Redondo
Shell Co. of California	8	4	14	1	Redondo
Western Star Oil Company	8	4	14	1	Redondo
B. G. T. Oil Company	5	3	11	1-A	Santa Fe Springs
General Petroleum Corp.	5	3	11	60	Santa Fe Springs
General Petroleum Corp.	5	3	11	61	Santa Fe Springs
General Petroleum Corp.	6	3	11	2	Santa Fe Springs
Jameson Petroleum Company	6	3	11	3	Santa Fe Springs
Jameson Petroleum Company	6	3	11	4	Santa Fe Springs
Kirkpatrick Bros.	6	3	11	1	Santa Fe Springs
Petroleum Midway Co., Ltd.	5	3	11	Pierce-Crawford 1	Santa Fe Springs
Petroleum Midway Co., Ltd.	5	3	11	Spencer 1	Santa Fe Springs
Petroleum Midway Co., Ltd.	6	3	11	Baldwin 1	Santa Fe Springs

Company	Sec.	Twp.	Range	Well No.	Field
Petroleum Midway Co., Ltd.	6	3	11	Mattern 2-1	Santa Fe Springs
Petroleum Midway Co., Ltd.	6	3	11	Steinly 1	Santa Fe Springs
Santa Fe Springs Syndicate	6	3	11	2	Santa Fe Springs
Shell Co. of California	6	3	11	1	Santa Fe Springs
Standard Oil Company	5	3	11	Brownrigg-Keller 2	Santa Fe Springs
Universal Consolidated Oil Co.	6	3	11	3	Santa Fe Springs
Mascot Oil Company	32	1	16	1	----------
Mission Hills Oil Company	5	2	15	1	----------
Nevada-Ventura Oil Syndicate	16	3	11	Rebai 2	----------
Oak Ridge Oil Company	--	4	13	Dominguez 1	----------
Standard Oil Company	15	3	11	1	----------
NAPA COUNTY:					
Humboldt Trading Company	20	8	3	1	----------
ORANGE COUNTY:					
Shell Co. of California	2	3	10	9	Brea Canyon
Dolke-Thomas Oil Company	27	3	10	1-B	Coyote Hills
Central Oil Company	2	6	11	Talbert 1	Huntington Beach
Shell Co. of California	34	5	11	4-A	Huntington Beach
Standard Oil Company	29	5	11	Bolsa 9	Huntington Beach
Standard Oil Company	29	5	11	Lomita 2	Huntington Beach
Standard Oil Company	2	6	11	16	Huntington Beach
Standard Oil Company	12	6	11	Thomson 2	Huntington Beach
Union Oil Co. of California	13	6	11	Reed 1	Huntington Beach
Union Oil Co. of California	34	3	9	8	Richfield
SAN MATEO COUNTY:					
Olson & Sage	Sho ults Ra nch			1	----------
SANTA BARBARA COUNTY:					
Palmer Union Oil Company	26	9	33	7-B	Cat Canyon
Shell Co. of California	31	9	33	92	Santa Maria
Tobin, Wm. F.	Loo kout P ark			2	Summerland
Tobin, Wm. F.	Loo kout P ark			3	Summerland
SONOMA COUNTY:					
Sage & Olson	--	4	7	2	----------
VENTURA COUNTY:					
Camarillo Oil & Drilling Co.	12	1	20	1	Conejo
Montebello Oil Company	4	3	19	24-A	Burdsdale
Ventura Star	24	4	9	1	Piru
Lincoln Oil and Gas Co.	21	4	21	26	Santa Paula
Ivers, H. A.	1	4	20	6	Sespe
Shell Co. of California	28	3	23	Gosnell 5	Ventura
Carey, E. R.	33	4	23	1	----------

SECRETARY'S OFFICE.

W. W. THAYER, Secretary.

The California State Mining Bureau was created April 16, 1880, by legislative act. In March, 1893, the original act was repealed and an amended act approved and passed by the legislative body. Again on June 16, 1913, a new Mining Bureau Act was approved which became effective August 10, 1913, repealing all former acts, and forming the basic law under which the Bureau now functions.

It is doubtless true that both the mining and lay public have not in the past always recognized the part played by the Bureau in the development of the state's mineral resources. Innumerable inquiries regarding them, originating within and without its borders and in foreign countries, have been answered with ultimate results reflected by a consistent growth in the value of the state's mineral output since the records of production were first compiled by the Bureau in 1887.

It is believed that a better understanding of the economic position occupied by the Bureau will be imparted to the public whose funds support it, by embodying in the Monthly Chapter a review of the executive activities.

The responsibility for the coordination of effort of each department, to the end that the utmost efficiency may be maintained with the limited and variable appropriations accorded the Bureau by successive legislatures, rests upon the office of Secretary.

Activities referable to that office, such as reports of new maps and publications issued, amount of mail handled, changes and enlargements in offices, changes in personnel of the staff, property and equipment, financial statements, etc., are therefore included herein.

New Publications.

During the month the following Bureau publications have been made available for distribution:

Summary of Operations, California Oil Fields, June, 1922, Vol. 7, No. 12.
Mining in California, August, 1922 (Monthly), Vol. 18, No. 8.

Distribution of Publications.

The Bureau's publications are constantly in demand, requests for copies coming from all over the United States and foreign countries.

Publications were distributed during the month as follows:

Publications	Number distributed
Report XIV, State Mineralogist	6
Report XV, State Mineralogist	3
Report XVII, State Mineralogist	6
Mines and Mineral Resources of Del Norte, etc.	3
Mines and Mineral Resources of Fresno, etc.	1
Mines and Mineral Resources of Imperial, etc.	1
Mines and Mineral Resources of Alpine, etc.	4
Mines and Mineral Resources of El Dorado, etc.	1
Mines and Mineral Resources of Los Angeles, etc.	2
Mines and Mineral Resources of Monterey, etc.	3
Mines and Mineral Resources of San Bernardino, etc.	2
Mines and Mineral Resources of Nevada County	6

Publications	Number distributed
Mines and Mineral Resources of Plumas County	4
Mines and Mineral Resources of Sierra County	3
Bulletin No. 6, California Gold Mill Practices	3
Bulletin No. 37, Gems, Jewelers Materials, Ornamental Stones of California	6
Bulletin No. 50, Copper Resources of California (Revised)	1
Bulletin No. 72, Geologic Formations of California	11
Bulletin No. 75, United States and California Mining Laws	1
Bulletin No. 76, Manganese and Chromium in California	2
Bulletin No. 78, Quicksilver Resources of California	4
Bulletin No. 85, Platinum Resources of California	10
Bulletin No. 89, Petroleum Resources of California, with special reference to unproved areas	57
Mining in California (Monthly), June, 1922, Vol. 18, No. 6	2400
Summary of Operations, California Oil Fields (Monthly), June, 1922, Vol. 7, No. 12	2700
County Maps and Registers of Mines	1
Inyo Geological Map	3
Minaret Map	1
Forest Map, Mounted	2
Geological Map of California, Mounted	12
Map Accompanying Bulletin No. 89	10
Plumas County Map	2
Lake County Map	1
Oil Field Maps	452

Mails and Files.

The Bureau maintains in addition to its correspondence file a mine report file which includes reports on some 7500 mines and mineral properties in California. Also there is available to the public a file of the permits granted to mining and oil corporations by the State Commissioner of Corporations.

During the month 637 letters were received and answered. They are practically all requests for information and the inquiries cover all phases of prospecting, mining and developing mineral deposits, reduction of crude minerals and marketing of refined products.

Drafting.

The Bureau maintains an up-to-date drafting department, where topographic and geological maps, tracings, oil well logs, and oil field maps are prepared.

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Statistician and Curator.

STATISTICS.

MINERAL PRODUCTION OF CALIFORNIA IN 1921.

SECTION ONE —— SUMMARY.

The total value of the mineral output of California for the year 1921 was $268,157,472, being an increase of $26,057,805 over the 1920 total of $242,099,667. There were fifty-one different mineral substances, exclusive of a segregation of the various stones grouped under gems; and all of the fifty-eight counties of the state contributed to the list.

As revealed by the data following, herein, the salient features of 1921 compared with the preceding year, are: The continued increase in petroleum valuation; the increases in gold, silver, cement, crushed rock, and natural gas; decreases in copper, quicksilver, lead, the 'industrial' group, and the saline group. The net result was an increase in the grand total for all groups, of slightly over twenty-six million dollars value, as given above. Petroleum accounted for an increase of $24,743,288 due both to a larger quantity and a higher price per barrel.

With the exception of gold and silver, all other items in the metals group showed decreases. Of the 'structural' materials group, cement showed an increase of nearly 700,000 barrels in quantity and of $3,109,175 in value; miscellaneous stone (comprising crushed rock, sand, and gravel), an increase in aggregate tonnage and an increase of $1,031,083 in value; granite, an increase of $230,169 in value, magnesite, a decrease of 50% in value (to $511,102), with a 43% decrease in quantity.

Nearly all of the items in the 'industrial' materials group registered decreases, the heaviest loser being diatomaceous earth. With one exception, all of the products in the saline group decreased, especially borax, potash and soda. The exception was calcium chloride, a new item not previously reported to the State Mining Bureau as on the production list for California.

The figures of the State Mining Bureau are made up from reports received direct from the producers of the various minerals. Care is exercised in avoiding duplication, and any error is likely to be on the side of under- rather than over-estimation.

California yields commercially a greater number and variety of mineral products than any state in the United States, and probably more than any other equal area elsewhere of the earth. The total annual value of her output is surpassed by not more than four or five others, and those usually the great coal states of east of the Mississippi. Of one item, at least, borax, California has long been the sole producer; and for many years was also the sole domestic source of chromite and magnesite. We lead all other states in the production of gold, quicksilver, and platinum; and have alternated in the lead with Colorado in tungsten, and with Oklahoma in petroleum.

From data furnished the writer by the Industrial Accident Commission, it is estimated that there were employed in the mines, dredges, quarries, cement and brick plants, approximately 13,000 men during 1921, and approximately 25,000 men in the oil fields exclusive of refineries, making a total of approximately 38,000 men employed in

the mineral industries in California last year. The production for the year of $268,157,472 worth of minerals, therefore, represents, in round numbers, an average output of $7,000 for every man employed, or an average of $8,300 per man in the oil fields and $5,000 per man in the other branches.

The following table shows the comparative yield of mineral substances of California for 1920 and 1921, as compiled from the returns received at the State Mining Bureau, San Francisco, in answer to inquiries sent to producers:

Substance	1920		1921		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Asbestos	63 tons	$2,740	410 tons	$19,275	$16,535+
Barytes	3,029 tons	20,795	901 tons	4,899	15,896—
Bituminous rock	5,450 tons	27,825	8,298 tons	43,192	15,367+
Borax	127,065 tons	2,794,206	50,136 tons	1,096,326	1,697,880—
Calcium chloride			683 tons	22,980	22,980+
Cement	6,709,160 bbls.	14,962,945	7,404,221 bbls.	18,072,120	3,109,175+
Brick and tile		5,704,393		5,570,875	133,518—
Chromite	1,770 tons	43,031	347 tons	6,870	36,161—
Clay (pottery)	203,997 tons	440,689	225,120 tons	362,172	78,517—
Coal	2,078 tons	5,450	12,467 tons	63,578	58,128+
Copper	12,947,299 lbs.	2,382,303	12,088,053 lbs.	1,559,358	822,945—
Dolomite	42,388 tons	132,791	31,195 tons	99,155	33,636—
Feldspar	4,518 tons	26,189	4,349 tons	28,343	2,154+
Fuller's earth	600 tons	6,000	1,185 tons	8,295	2,295+
Gems		36,056		10,954	25,102—
Gold		14,311,043		15,704,822	1,393,779+
Granite		495,732		725,901	230,169+
Graphite	[a]	[a]	[b]	[b]	[b] —
Gypsum	20,507 tons	92,535	37,412 tons	78,875	13,660—
Infusorial and diatomaceous earths	60,764 tons	1,056,360	[b]	[b]	[b] —
Iron ore	5,975 tons	40,889	1,970 tons	12,030	28,859—
Lead	4,903,738 lbs	392,300	1,149,051 lbs.	51,707	340,593—
Lime	463,144 bbls.	557,232	463,534 bbls.	610,619	53,387+
Limestone	90,120 tons	298,197	75,921 tons	305,912	7,715+
Lithia	10,046 tons	153,502	[b]	[b]	[b] —
Magnesite	83,695 tons	1,033,491	47,837 tons	511,102	522,389—
Magnesium salts	3,150 tons	107,787	4,153 tons	106,140	1,647—
Manganese ore	2,892 tons	62,323	1,065 tons	12,210	50,113—
Marble	29,531 cu. ft.	92,899	30,232 cu. ft.	98,395	5,496+
Mineral paint	779 tons	8,477	446 tons	4,748	3,729—
Mineral water	2,391,491 gals.	421,643	3,446,278 gals.	367,476	54,167—
Natural gas	58,567,772 M cu. ft.	3,898,286	67,043,797 M cu. ft.	4,704,678	806,392+
Onyx			2,569 cu. ft.	1,294	1,294+
Petroleum	103,377,361 bbls.	178,394,937	112,599,861 bbls.	203,138,225	24,743,288+
Platinum	477 fine oz.	68,977	613 fine oz.	58,754	10,223—
Potash	26,298 tons	1,465,463	14,806 tons	390,210	1,075,253—
Pumice and volcanic ash	1,537 tons	25,890	406 tons	6,310	19,580—
Pyrites	146,001 tons	530,581	110,025 tons	473,735	56,846—
Quicksilver	10,278 flasks	775,527	3,157 flasks	140,654	634,861—
Salt	230,638 tons	972,648	197,989 tons	832,792	139,946—
Sandstone	10,500 cu. ft.	2,300	10,150 cu. ft.	2,112	188—
Silica (sand and quartz)	25,324 tons	96,793	10,560 tons	49,179	47,614—
Silver		1,859,896		3,629,223	1,769,327+
Soapstone and talc	11,327 tons	221,362	8,752 tons	130,078	91,284—
Soda	32,407 tons	1,164,898	14,828 tons	438,996	725,902—
Stone, miscellaneous		6,803,557		7,834,640	1,031,083+
Zinc	1,188,009 lbs.	93,229	846,184 lbs.	42,309	53,920—
Unapportioned	12,600	[a]12,600		[b]726,122	493,140—
Total value		$242,099,667		$268,157,472	
Net increase					$26,057,895+

[a]Unapportioned—includes graphite and columbite (tantalum ore).
[b]Unapportioned—includes graphite, diatomaceous earth, and lithia.
[c]Includes macadam, ballast, rubble, riprap, paving blocks, sand, gravel, and grinding-mill pebbles.

The following table shows the comparative value of the mineral production of the various counties in the state for the years 1920 and 1921:

County	1920	1921
Alameda	$1,947,880	$1,353,690
Alpine	840	925
Amador	2,010,200	2,368,464
Butte	641,562	669,830
Calaveras	1,880,050	1,525,201
Colusa	57,488	80,438
Contra Costa	2,082,053	1,622,732
Del Norte	11,781	6,029
El Dorado	186,432	112,756
Fresno	23,819,351	19,498,503
Glenn	134,707	103,197
Humboldt	159,796	138,597
Imperial	169,882	182,818
Inyo	3,889,400	1,460,218
Kern	89,121,581	100,840,933
Kings	29,870	5,722
Lake	63,553	174,389
Lassen	12,313	83,485
Los Angeles	26,975,163	31,704,941
Madera	122,925	467,667
Marin	335,745	318,776
Mariposa	271,031	342,601
Mendocino	26,110	44,722
Merced	24,800	33,550
Modoc	4,668	36,650
Mono	188,258	56,876
Monterey	126,449	170,155
Napa	230,141	195,239
Nevada	2,955,006	2,641,081
Orange	34,108,136	47,499,030
Placer	612,813	449,070
Plumas	2,082,662	1,798,461
Riverside	5,128,208	4,883,898
Sacramento	2,066,154	2,394,894
San Benito	1,483,024	1,386,093
San Bernardino	6,541,348	9,375,540
San Diego	794,229	501,393
San Francisco	80,353	41,562
San Joaquin	471,102	474,378
San Luis Obispo	405,604	129,791
San Mateo	293,103	257,092
Santa Barbara	10,538,611	10,190,929
Santa Clara	1,038,692	750,708
Santa Cruz	3,081,138	4,080,885
Shasta	1,108,538	841,262
Sierra	446,861	620,361
Siskiyou	229,115	93,147
Solano	2,930,614	3,030,198
Sonoma	287,245	175,551
Stanislaus	385,017	236,207
Sutter	54	54
Tehama	26,400	30,820
Trinity	562,105	456,882
Tulare	593,296	552,234
Tuolumne	513,914	554,483
Ventura	5,229,175	6,245,269
Yolo	9,472	14,829
Yuba	3,573,649	4,852,266
Total values	$242,099,667	$268,157,472

Total Mineral Production of California, by Years.

The following tabulation gives the total value of mineral production of California by years since 1887, in which year compilation of such data by the State Mining Bureau began. At the side of these figures the writer has placed the values of the most important metal and non-metal items—gold and petroleum.

In the same period copper made an important growth beginning with 1897 following the entry of the Shasta County mines. Cement increased rapidly from 1902, while crushed rock, sand and gravel parallels the cement increase. Quicksilver has been up and down. Mineral water and salt have always been important items, but the values fluctuate. Borax has increased materially since 1896. War-time increases, 1915–1918, were shown by chromite, copper, lead, magnesite, manganese, silver, tungsten and zinc, but all except silver have since declined; with structural materials and silver increasing in 1920–1921.

Total Mineral Production of California by Years, Since 1887.

Year	Total value of all minerals	Gold, value	Petroleum, value
1887	$19,785,868	$13,588,614	$1,357,144
1888	19,469,320	12,750,000	1,380,666
1889	16,681,731	11,212,913	368,048
1890	18,039,666	12,309,793	384,200
1891	18,872,413	12,728,869	401,264
1892	18,300,168	12,571,900	561,333
1893	18,811,261	12,422,811	608,092
1894	20,203,294	13,923,281	1,064,521
1895	22,844,663	15,334,317	1,000,235
1896	24,291,398	17,181,562	1,180,793
1897	25,142,441	15,871,401	1,918,269
1898	27,289,079	15,906,478	2,376,420
1899	29,313,460	15,336,631	2,660,793
1900	32,622,945	15,863,355	4,152,928
1901	34,355,981	16,989,044	2,961,102
1902	35,069,105	16,910,320	4,692,189
1903	37,759,040	16,471,264	7,313,271
1904	43,778,348	19,109,600	8,317,809
1905	43,069,227	19,197,043	9,007,820
1906	46,776,085	18,732,452	9,238,020
1907	55,697,949	16,727,928	16,783,943
1908	66,363,198	18,761,559	26,566,181
1909	82,972,209	20,237,870	32,398,187
1910	88,419,079	19,715,440	37,689,542
1911	87,497,879	19,738,908	40,552,088
1912	88,972,385	19,713,478	41,868,344
1913	98,644,639	20,406,958	48,578,014
1914	93,314,773	20,653,496	47,487,109
1915	96,663,369	22,442,296	43,503,837
1916	127,901,610	21,410,741	57,421,334
1917	161,202,962	26,087,504	86,976,209
1918	199,753,837	16,529,162	127,459,221
1919	195,830,002	16,695,955	142,610,563
1920	242,099,667	14,311,043	178,394,937
1921	268,157,472	15,704,822	203,138,225
Totals	$1,505,966,523	$587,548,208	$1,192,372,651

SECTION TWO —— FUELS.

Among the most important mineral products of California are its fuels. This subdivision includes coal, natural gas, and petroleum, the combined values of which made up nearly 78% of the state's entire mineral output for the year 1921.

There are deposits of peat known in several localities in California, small amounts of which are used as a fertilizer, and in stock-food preparations, but none has as yet been recorded as utilized for fuel.

Comparison of values during 1920 and 1921 is shown in the following table:

	1920		1921		Increase+ Decrease—
	Amount	Value	Amount	Value	Value
Coal	2,078 tons	$5,450	12,467 tons	$63,578	$58,128+
Natural gas	58,567,772 M cu. ft.	3,898,286	67,043,797 M cu. ft.	4,704,678	806,392+
Petroleum	103,377,361 bbls.	178,394,937	112,599,860 bbls.	203,138,225	24,743,288+
Total value		$182,298,673		$207,906,481	$25,607,808+

COAL (see April bulletin).

NATURAL GAS.

Bibliography: State Mineralogist Reports VII, X, XII, XIII, XIV. Bulletins 3, 16, 19, 69, 73, 89. Monthly Summary Oil & Gas Supervisor, Dec. 1919.

Statistics on the production of natural gas in California are in a considerable degree difficult to arrive at, as much of it that is utilized directly at the wells for heating, lighting, and driving gas engines is not measured. Hence, it is necessary to approximate the output of many of the operators in the oil fields, estimated on the number of lights, and on the number and horsepower of gas engines and steam boilers thus operated.

The figures here given are certainly not over estimated, particularly in the six oil-producing counties. It must be remembered that several of our important oil fields are removed many miles from the site of any other industry, and that the gathering of small amounts of gas and transporting it for any considerable distance may not always be profitable. Gas traps of various size and design are in use. The gas which accompanies oil is richer than the so-called 'dry gas' occurring in strata which do not produce oil. Wherever feasible, casing-head gas is used in driving gas engines for pumping and drilling, and in firing the boilers of steam-driven plants.

The most notable gas development in California in recent years has been by the Standard Oil Company in the Elk Hills field in Kern County, northeast of the Midway district. Construction work was started in 1921 by the San Joaquin Light and Power Company on a large power unit at Buttonwillow, for the utilization of the Elk Hills natural gas to produce electric power. Heavy gas pressures have also been encountered by the American Oil Felds Company in prospect wells in the Buttonwillow district which is northeast of Elk Hills.

The new oil fields at Long Beach and Santa Fe Springs in Los Angeles County are showing up new gas resources which are already being utilized commercially. The presence of gas was indicated by several wells which 'went wild' while being drilled. At present, the General Petroleum Corporation from its 'Well No. Santa Fe 2' is selling 8,000,000 cubic feet per day, under a casing pressure of 650 pounds per square inch and a tubing pressure of 450 pounds. This well is capable of yielding 25,000,000 cubic feet per day, open flow. Another well of the same company is stated to be yielding 5,000,000 cubic feet per day.

Several counties produce gas which is not accompanied by oil, particularly Sacramento and San Joaquin, where it is mixed with manufactured gas for domestic service. The Tulare Lake district in Kings and Tulare counties also does not yield oil.

There is rather a wide variation in prices quoted for natural gas because such a large proportion is used directly in the field for driving gas engines and firing boilers, and is therefore not measured nor sold. Such companies as have attempted to place a valuation on the gas that was thus used in 1921 gave from 3¢-20¢ per 1000 cubic feet. From the totals shown in the tabulation following herein, the average value for all fields in 1921 works out at approximately 7¢. Approximately 7000 cubic feet of gas is equal to one barrel of oil in heating value, and is so accounted for by many operators. In driving gas engines, about 4000 cu. ft. per 24 hr. are consumed by a 25 h.p. engine, and 63,700 cu. ft. per day for heating a 70 h.p. steam boiler, which figures have been used in compiling this report.

NATURAL GAS, 1921.

County	M cu. feet	Value
Fresno	1,886,081	$190,181
Kern	40,136,930	1,926,797
Kings	2,090	980
Los Angeles	6,944,277	638,936
Orange	14,097,639	1,312,704
San Joaquin	204,057	79,571
Santa Barbara	1,544,892	145,179
Tulare	380	190
Ventura	2,127,476	360,443
Butte, Humboldt, Lake, Mendocino, Sacramento, Sutter, Yuba*	99,975	49,697
Totals	67,043,797	$4,704,678

*Combined to conceal output of an individual producer in each.

Natural Gas Production in California, Since 1888.

The production of natural gas in California by years since 1888 is given in the following table. The first economic use of natural gas in California was from the famous Court House well at Stockton, bored in 1854–1858. Beginning about 1883 and for several succeeding years, a number of gas wells were brought in around Stockton. Natural gas was known in a number of other localities, and occasionally utilized in a small way, notably at Kelseyville in Lake County, and in Humboldt County near Petrolia and Eureka, but there are no available authentic records of amounts or values previous to the year 1888. The most

important developments in the commercial production of natural gas have been coincident with developments in the oil fields, by utilizing the casing-head gas as well as that from dry-gas wells.

Year	M cubic feet	Value	Year	M cubic feet	Value
1888	[a]12,000	$10,000	1906	168,175	$109,489
1889	[a]14,500	12,680	1907	169,991	114,759
1890	[a]41,250	33,000	1908	842,883	474,584
1891	[a]39,000	30,000	1909	1,148,467	616,932
1892	[a]75,000	55,000	1910	10,579,933	1,676,367
1893	[a]84,000	68,500	1911	[a]5,000,000	491,859
1894	[a] [b]85,080	79,072	1912	[a]12,600,000	940,076
1895	[a] [b]110,800	112,000	1913	14,210,836	1,053,292
1896	[a] [b]131,100	111,457	1914	16,529,963	1,049,470
1897	[a]71,300	62,657	1915	21,992,892	1,706,480
1898	[a]111,165	74,424	1916	28,134,365	2,871,751
1899	115,110	95,000	1917	44,343,020	2,964,922
1900	40,566	34,578	1918	46,373,052	3,289,524
1901	120,800	92,034	1919	52,173,503	4,041,217
1902	120,968	99,443	1920	58,567,772	3,898,286
1903	120,134	75,237	1921	67,043,797	4,704,678
1904	144,437	91,035			
1905	148,345	102,479	Totals	381,464,204	$31,242,282

[a]Quantity, in part, estimated, where values only were reported.
[b]Includes natural CO_2 from a mine in Santa Clara County.

Gasoline From Natural Gas.

More or less gas usually accompanies the petroleum in the oil fields. More than 50 plants are in operation manufacturing gasoline by compression or absorption from this 'casing-head gas.' After the gasoline is extracted, the remaining 'dry gas' is taken into the pipe lines, by which it is distributed to consumers, both domestic and commercial.

In the Midway field, some of the casing-head gasoline is obtained as an incidental product to the compressing of the natural gas preliminary to transmission through the gas pipe lines. Some concerns market casing-head gasoline separately, while others turn it into the oil pipe lines, thus mixing this high-gravity gasoline with the crude oil for transportation to the refinery, where it is later regained. A total of 53,699,797 gallons of casing-head gasoline from all fields was reported by 47 companies, as made during 1921. This compares with 54,817,467 gallons by 39 companies in 1920. It was distributed by counties, as follows:

County	Gallons gasoline
Fresno	388,881
Kern	26,016,401
Los Angeles	1,528,764
Orange	12,739,714
Santa Barbara	10,527,321
Ventura	2,498,716
Total	53,699,797

The usual recoveries of gasoline from natural gas vary from ½ gal. to 3 gal. per 1000 cu. ft. of gas handled, the average being about 1 gal. per 1000 cu. ft.

Fields.

The largest natural gas field of commercial importance thus far developed in California is in western Kern County, followed by Orange, Los Angeles, Ventura, Fresno and Santa Barbara counties. The Midway Gas Company operates a 12-inch pipe line from the Midway field, a distance of 107 miles, to Los Angeles, where it supplies gas to local distributing companies. The Valley Natural Gas Company supplies gas to consumers in the Midway field and to local distributing companies at Fellows, Taft, Maricopa, Bakersfield, and the Kern River fields. One hundred million cubic feet of gas is daily run into commercial gathering lines from the Buena Vista and Elk Hills areas, Kern County. The greater part of this gas is used in the San Joaquin Valley for operating steam plants to generate electric power and for other industrial and domestic purposes. About one-third of that output is transported for use in the Los Angeles district.

Practically all of the gas consumed in Northern California and a large proportion of the gas used in the gas producing counties, including Los Angeles, is manufactured from crude petroleum or refinery residuum. Natural gases now being produced and utilized range in heat value from 800 to 1200 b. t. u. which is considerably higher than that of manufactured gas. In many cases the consumer buys a mixture of natural and manufactured gas. Under ordinary conditions, therefore, the price and the heat value of most of our gas for domestic and industrial uses is not only dependent upon available supplies of natural gas but also upon petroleum. The Santa Maria Gas and Power Company distributes gas around Santa Maria, from wells in the neighboring oil fields.

PETROLEUM.

Bibliography: State Mineralogist Reports IV, VII, X, XII, XIII. Bulletins, 3, 11, 16, 19, 31, 32, 63, 69, 73, 82, 84, 89. Reports of Oil and Gas Supervisor 1915 to date (issued in monthly chapters since April, 1919). U. S. Geol. Surv., Bulletins, 213, 285, 309, 317, 321, 322, 340, 357, 398, 406, 431, 471, 541, 581, 603, 621, 623, 653, 691; Prof. Papers, 116, 117.

Petroleum is the chief fuel resource of California, and California led all other states of the Union in the number of barrels of crude oil produced in 1921. California, with Oklahoma, has enjoyed the distinction in recent years of standing at the head of the oil list, on several occasions. Reports of the U. S. Geological Survey credit California and Oklahoma, each, with 23.83% and 23.84%, respectively, of the total petroleum yield of the United States in 1920. Texas was third with 21.65%. California's oils are nearly all of asphalt base.

The California law providing for the regulation of drilling and maintenance of oil and gas wells by the State Mining Bureau has been in effect since 1915, the chief aim being to protect the oil deposits from damage by water, and to aid producers in their work. A staff of technically trained men maintain offices in the various fields.

The crude oil production of California for 1921, as shown by the sworn statements made to the State Mineralogist for the Department of Petroleum and Gas, by the producers from 10,211 wells (except part

of the Los Angeles City field, not under jurisdiction of the State Oil and Gas Supervisor), amounted to 112,406,847 barrels net. 'Net' means that a deduction of approximately 2% has been made for water. The oil consumed for fuel at the wells is also included. This shows an increase of 9,222,113 barrels over the similar net figures of 1920.

To the above amount, we have here added 193,013 barrels, being the output of various small operators in the Los Angeles City, not included in the reports to the Oil and Gas Supervisor, making a total for the year 1921 of 112,599,860 barrels, valued at $203,138,225. Compared with 1920, this is an increase of 9,222,499 barrels in quantity, and of $24,743,288 in value.

Features of 1921.

As in 1920, Kern, Orange and Ventura were the only counties which showed marked increases in the number of barrels of oil produced during 1921 over the previous year. Los Angeles County, though reporting a decrease in quantity, shows a higher total value than in 1920. In Fresno County, the quantity decreased over 3,000,000 barrels, and in Santa Barbara, approximately 338,000 barrels. But for the strike of oil-field workers in September-October in Kern and Fresno counties, the state's total yield for 1921 would probably have exceeded 120,000,000 barrels. The highest month's production during the year was 10,450,131 barrels in May. During that month, 42 wells in the easterly portion of the Elk Hills, Kern County, yielded 1,794,156 barrels of oil; which meant that for that period less than 0.5% of the total number of oil wells of California produced 17% of the oil.

[1]"From the viewpoint of the oil industry as a whole, including producing and marketing interests alike, the strike resulted beneficially. It caused a large quantity of oil, not needed in the market, to be left in its natural underground storage. Surface storage was being filled at a rapid rate and the general industrial dullness threatened further reductions in the price of crude at the well. The price was reduced 25 cents per barrel on May 13, 1921, and another 25 cents per barrel on August 3, 1921. Considering total lifting costs, the smaller operator, at least, was facing almost the minimum price per barrel at which he could operate with profit and a further drop in the price of crude would have caused him either to shut down or operate at a loss.

"During the period January 1 to June 30, 1921, the fields later affected by the strike produced 40,071,977 barrels of oil and 32,179,694 barrels of water. This represented two-thirds of the oil produced in the state and almost four-fifths of the water lifted during the process of producing oil."

The subsequent investigations by engineers of the Department of Petroleum and Gas have shown that, as a whole, the strike shut-down simply deferred production without greatly affecting the ultimate recovery of oil. In many cases there was a flush production for several months, after operations were resumed, which almost enabled producers to regain, during those months, the production deferred during suspension of operations. The investigation also shows that there has been no marked change in water conditions following restoration of normal operations.

The record of operations during 1921 shows that 55 per cent of the drilling, in proved fields, was concentrated in the four newer fields, Elk Hills, Huntington Beach, Long Beach and Richfield. One hundred thirty-one notices were filed for wildcat wells and 181 notices were filed for drilling shallow wells at Devils Den and Conejo. Twelve hundred eighty-seven notices for new wells were filed during 1921.

[1]Collom, R. E., Resumé of oil operations in 1921. Summary of Operations, Feb., 1922, p. 8.

Outlook for 1922.

For the first six months of 1922, the average production per day for California was 338,000 barrels, as against an average daily consumption of 293,000 barrels; a difference of 45,000 barrels, daily, attributable partly to over-production and partly to subnormal consumption. Although oil has been continuously run into storage since January, 1921, and is being stored at the present time at a rate of nearly 3,000,000 barrels monthly, practically as many new wells have been reported ready to drill during the first six months of 1922 as for a similar period in 1921.

In July of the current year (1922) the three new fields, Huntington Beach, Long Beach and Santa Fe Springs were producing 25,000 barrels, 66,000 barrels, and 15,000 barrels, daily, respectively. At Santa Fe Springs, a reasonable estimate based on yield of wells being completed and at least 60 more being drilled, is that 28 new wells will be brought in by the end of September with about 32,000 barrels per day.

As to quantities of oil destined for storage the potentialities of the situation are summarized[1] as follows:

"One thousand producing wells are now shut down in certain fields of the San Joaquin valley and in Santa Barbara County. The combined production from these wells averages 36,500 barrels daily. Present active production averages 45,000 barrels daily in excess of consumption. Estimated new production due within the next 60 days from Santa Fe Springs and Long Beach adds 62,000 barrels per day. The possible production from other new drilling such as at Huntington Beach and in Naval Reserves No. 1 and No. 2 in Kern County is not included in the estimate.

"By the middle of September, at rates of consumption which have obtained during the first six months of 1922 oil should be moving into storage at the rate of at least 100,000 barrels daily or over 3,000,000 barrels per month. The rate of elimination of this hundred thousand barrels excess will depend upon the rapidity of decline of flush production of new fields. With this excess eliminated there will still be a potential over-production of 36,500 barrels per day in the older producing wells which have been shut down."

In June a total of 620 wells had been shut in, mainly in the older fields of the San Joaquin Valley and in the Santa Maria district, Santa Barbara County. (See p. 269, *ante*.)

Production Figures.

The following table gives the production and value by counties for 1921, compared with the 1920 figures:

TABLE A.

Production and Value of Oil, by Counties.

County	1920		1921	
	Barrels	Value	Barrels	Value
Fresno	15,375,454	$22,801,798	12,161,565	$18,643,679
Kern	50,660,438	86,831,991	57,434,945	97,639,407
Los Angeles	14,026,536	21,488,653	12,395,605	25,795,254
Orange	15,462,741	33,059,340	22,929,466	45,996,509
San Luis Obispo	42,511	59,515	30,725	43,691
San Mateo	322	966	322	966
Santa Barbara	5,803,583	9,140,643	5,465,942	9,122,657
Santa Clara	16,095	23,901	13,964	26,943
Ventura	1,989,681	4,988,130	2,167,326	5,869,119
Totals	103,377,361	$178,394,937	*112,599,860	$203,138,225

*See p. 437, *ante*.

[1]Collom, R. E., Weekly Press Bulletin, Dept. Oil and Gas, Cal. State Mining Bureau, July 15, 1922.

TABLE B.

Average Price of Oil per Barrel, by Counties, 1914-1921.

County	1914	1915	1916	1917	1918	1919	1920	1921
Fresno	$0.452	$0.545	$0.516	$0.825	$1.191	$1.293	$1.483	$1.533
Kern	.409	.423	.641	.893	1.252	1.350	1.714	1.700
Los Angeles	.556	.629	.651	1.176	1.340	1.380	1.532	2.081
Orange	.675	.512	.663	1.003	1.412	1.860	2.138	2.006
San Luis Obispo			.450	.926	.905	1.040	1.400	1.422
Santa Barbara	.460	.611	.794	.808	1.235	1.125	1.575	1,669
Santa Clara	.530	.666	.666	1.387	1.700	1.600	1.485	1.930
Ventura	1.050	.855	1.045	1.318	1.480	1.635	2.507	2.708
State average	$0.461	$0.479	$0.636	$0.908	$1.278	$1.409	$1.726	$1.804

The low price in Santa Barbara County for 1919 and 1920 was due to a large production of 8° to 10° gravity oil from the Casmalia field, which brought only about 50¢ per barrel in 1919 and 39¢ in 1920. For several years previous to 1919, the state average value per barrel at the well for crude oil as determined by the statistical returns was noted to practically coincide with the quotations during the same years for 23° gravity oil. In 1919, the average value for all grades worked out at a figure corresponding to the quotations for 28° oil, due to the fact that the increased output of that year was mainly from the Montebello field in Los Angeles County which yielded high-gravity oil. The 1920 figure of $1.726 corresponds approximately to the average of quotations for 24°-25° oil for the year; and the 1921 figure of $1.804, to 26° quotations.

Figures published by the Standard Oil Company[1] give a total for the state of 114,849,924 barrels in 1921 as against their total of 105,721,186 barrels for 1920. The Independent Producers Agency reports[2] 114,566,901 barrels for 1921, compared with 105,618,706 barrels for 1920. The reason that the State Mining Bureau's totals are less than those of the Standard and Agency is due to the fact that a deduction of approximately 2% has been made for water content in the oil as pumped and as reported from pipe-line runs.

TOTAL PETROLEUM PRODUCTION OF CALIFORNIA.

The presence of oil seepages and springs in Los Angeles and Ventura counties was known and even utilized in a small way early in the history of California. According to Hanks,[3] in 1874 production amounted to 36 bbl. per day from natural flows in Pico Cañon (Newhall), and at Sulphur Mountain (Ventura County), the oil being of 32° gravity average.

[4]"Work was commenced in Pico Cañon in 1875, by drilling three shallow wells with spring pole, all of which yielded oil at depths of from 90 to 250 feet. Actual work of development commenced with steam machinery in 1877."

In 1877, Pico averaged 40-50 bbl. daily, and Ventura, 80 bbl. daily. In 1878, there was some production (@ 60 bbl. per day, for a time)

[1]Standard Oil Bulletin, January, 1922, p. 11.
[2]Press Bulletin, January, 1922.
[3]Hanks, Henry G., Report IV of State Mineralogist, p. 298, 1884.
[4]*Idem*, p. 301.

from wells in Moody Gulch, near Los Gatos, Santa Clara County, the oil being of 46° Baumé.

The first wells in the Coalinga, Fresno County, and Summerland, Santa Barbara County, fields were drilled in 1890, but Coalinga did not make its influence felt conspicuously on the state's annual output until 1903. The Summerland yield never has been large. The Salt Lake field near Los Angeles began production in 1894 and in 1897 reached over a million barrels annually.

In the Kern County fields, the first well was drilled in Sunset in 1891, Midway in 1900, McKittrick in 1892, Kern River in 1899. The Sunset-Midway district attained a yield of over 4,000,000 bbl. in 1909, and over 20,000,000 bbl. in 1910. Kern River field produced over 3,000,000 bbl. in 1901.

The first well in the Santa Maria-Lompoc group, Santa Barbara County, was drilled in 1901, and the district advanced to a yield of over 3,000,000 bbl. annually in 1905.

The Whittier-Fullerton field in Los Angeles and Orange counties became an important factor in 1902. The Montebello field, Los Angeles County, was the conspicuous addition in 1918-1919; and Elk Hills, Kern County, with Huntington Beach and Richfield, Orange County, in 1920. In 1921, the new fields added were Long Beach and Santa Fe Springs, Los Angeles County.

The effect of the advent of these various fields to the producing column will be noted in the tabulation herewith, by years:

TABLE C.

Total Petroleum Production in California.

Year	Barrels	Value	Year	Barrels	Value
To and inc. 1875	[a]175,000	[b]$472,500	1900	4,329,950	$4,152,928
1876	12,000	30,000	1901	7,710,315	2,961,102
1877	13,000	29,250	1902	14,356,910	4,692,189
1878	15,227	30,454	1903	24,340,839	7,313,271
1879	19,858	39,716	1904	29,736,003	8,317,809
1880	40,552	60,828	1905	34,275,701	9,007,820
1881	99,862	124,828	1906	32,624,000	9,238,020
1882	128,636	257,272	1907	40,311,171	16,783,943
1883	142,857	285,714	1908	48,306,910	26,566,181
1884	262,000	655,000	1909	58,191,723	32,398,187
1885	325,000	750,750	1910	77,697,568	37,689,542
1886	[a]377,145	[b]870,205	1911	84,648,157	40,552,088
1887	678,572	1,357,144	1912	89,689,250	41,868,344
1888	690,333	1,380,666	1913	98,494,532	48,578,014
1889	303,220	368,048	1914	102,881,907	47,487,109
1890	307,360	384,200	1915	91,146,620	43,503,837
1891	323,600	401,264	1916	90,262,557	57,421,334
1892	385,049	561,333	1917	95,396,309	86,976,209
1893	470,179	608,092	1918	99,731,177	127,459,221
1894	783,078	1,064,521	1919	101,182,962	142,610,563
1895	1,245,339	1,000,235	1920	103,377,361	178,394,937
1896	1,257,780	1,180,793	1921	112,599,860	203,138,225
1897	1,911,569	1,918,269			
1898	2,249,088	2,376,420	Totals	1,456,185,961	$1,195,979,174
1899	2,677,875	2,660,793			

[a]U. S. G. S., Min. Res. of U. S., 1886, p. 440, for quantities to and including 1886.

[b]Values have been estimated for the years to and including 1886, after consulting a number of contemporaneous publications, including the Mining & Scientific Press, Reports of the State Mineralogist, and U. S. Reports. The figures for 1887 to date are from records of the State Mining Bureau.

The following table is compiled from the monthly statements contained in the Standard Oil Bulletin:

TABLE D.

Well Operations, by Fields, 1921.

	Producing Dec., 1920	Producing Dec., 1921	Completed during year	Abandoned during year	Barrels per well produced per day, Dec., 1920
Kern River	2,152	2,207	75	2	8.7
McKittrick	352	350	3	4	16.9
Midway-Sunset	2,509	2,707	260	17	47.1
Lost Hills-Belridge	591	612	15	1	16.3
Coalinga	1,293	1,176	54	12	28.9
Santa Maria-Lompoc	406	416	20	2	34.3
Ventura and Newhall	513	526	43		12.8
Los Angeles and Salt Lake	666	671	9	1	5.2
Whittier-Fullerton	980	1,116	147	8	79.7
Huntington Beach		51	78		292.9
Summerland	140	137			1.1
Watsonville and miscellaneous	9	9			7.2
Totals	9,621	9,978	704	47	*32.6

*State average.

Specific Gravities of Oils Produced.

The proportion of heavy and light oil produced in the various fields is shown in Table E, following, for which we are indebted to the Standard Oil Company. Oil below 18° Baumé may be considered as largely unrefinable, or fuel oil, while the lighter oils yield varying amounts of refined products with corresponding proportions of residuum and fuel oil. Specific gravities in California range from 8° Baumé in the Casmalia field, Santa Barbara County, to 56° Baumé in Ventura County.

TABLE E.

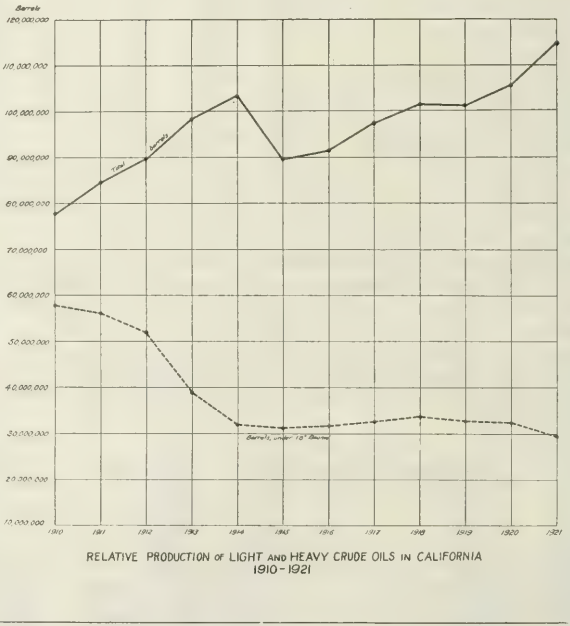
Production of Light and Heavy Oil, by Fields, 1921.

Field	Under 18° (barrels)	18° and over (barrels)	Total (barrels)
Kern River	6,715,680		6,715,680
McKittrick	2,056,101		2,056,101
Midway-Sunset	9,473,951	37,397,789	46,871,740
Lost Hills-Belridge	984,034	2,277,247	3,261,281
Coalinga	4,681,777	7,658,860	12,340,637
Santa Maria-Lompoc	2,604,866	2,958,458	5,563,324
Ventura County and Newhall	88,861	2,286,618	2,375,479
Los Angeles and Salt Lake	1,213,291	131,635	1,344,926
Whittier-Fullerton	1,292,885	30,388,532	31,681,417
Huntington Beach-Signal Hill	104,744	2,456,405	2,561,149
Summerland	54,155		54,155
Watsonville	24,035		24,035
Totals	29,294,380	85,555,544	114,849,924

Reference to the accompanying chart reveals the fact that a decided change has taken place in the relative proportions of light and heavy crudes produced in California since 1910, taking 18° Baumé as the

dividing line. The upper line represents the total number of barrels of crude oil of all grades produced each year; and the lower line, the number of barrels each year of oil below 18° Baumé. The area between the base line and the first 'curve' represents the quantity of heavy oil, and the area between the two 'curves' represents the quantity of light crudes.

A marked drop took place in the low-gravity yield from 1910 to and including 1914. From 1914, it has remained almost stationary, with



RELATIVE PRODUCTION OF LIGHT AND HEAVY CRUDE OILS IN CALIFORNIA
1910-1921

a slight drop in 1921, while the high-gravity yield has increased at a rapid rate since 1915. The proportions have been reversed from approximately 75% low–25% high in 1914 to 25% low–75% high in 1921. This has been an important factor in its effect upon the average price per barrel of the state's output in these years, as noted in a preceding paragraph. Its effect upon the relative situation between production and consumption has also been important. It has been a fortunate development, especially the past four years, in view of the

increased demand for refinery products (gasoline, in particular), and the lessened demand for fuel oil the past two years owing in part to the shutting down of the western copper smelters which were large consumers of California fuel oil.

The beginning of 1921 was marked by the discontinuance of drawing on storage, owing to the current production of crude oil overbalancing consumption. This still continues, so that on December 31, 1921, the stock on hand amounted to 35,021,912 barrels[1], an increase of 12,781,641 barrels over the 22,240,271 barrels on hand December 31, 1920.

Operating Data.

The following tabulation (Table F) is compiled from data published by the Department of Petroleum and Gas,[2] semiannually, and here combined to show the entire year's operations for all the fields. The 'districts' are the geographical subdivisions as administered by the Department.

The second column in the second half, designated 'potential,' was inserted to show the potential number of wells in the areas affected by the strike of September-October as compared with the number actually producing during that period.

It will be noted that the state average yield of oil per well per day was 39.5 barrels for the first six months and 40.4 barrels for the second. This is somewhat higher than the figure of 32.6 barrels average for December derived from Standard Oil Company data and shown in Table D, on a preceding page. This is probably due to using a 30-day basis in Table D for the operating period, whereas Table F takes account of the days that wells were nonproducing owing to repairs or other causes.

Financial and Operating Conditions of California Oil Fields, 1921.

Financial results of the oil business during 1921 are shown by the following tables. The features worthy of mention are: (1) the higher price received for the year as shown by the state average of all grades; this, too, in spite of the average being slightly lower for some fields in 1921 compared with 1920, also notwithstanding two drops of 25¢ per barrel, each, in quotations during the year. (2) a slight increase in the total amount of dividends paid. (3) decreases in the number of barrels per well per day yield (see Table I), for all 'fields' except Orange County which increased, and the Sunset-Maricopa field which held its own. (4) slightly higher operating costs in most fields.

With reference to Table I, it should be noted that although it lacks data from the larger operators who have refineries and with interests in more than one field, yet the data given are of economic value and interest in that they indicate the conditions prevailing among the smaller companies and operators.

[1]Standard Oil Bulletin, January, 1922.
[2]Seventh Annual Report: Monthly summary of operations, Aug., 1921, p. 11; Feb., 1922, pp. 6–7.

TABLE F.

Production and Operating Data of California Oil Fields, 1921.

Field	January 1 to June 30						July 1 to December 31						
	Average number of producing wells	Oil (bbl.)	Number of days producing	Production per well per day, barrels		Percentage of time wells produced	Average number of producing wells		Oil (bbl.)	Number of days producing	Production per well per day, barrels		Percentage of time wells produced
				Oil	Water		Actual	Potential			Oil	Water	
District No. 1—													
Beverly Hills	15	82,362	2,554	32.3	38.7	94.1	15	.....	70,137	2,538	27.6	34.2	92.0
Brea-Olinda	405	3,162,573	68,389	46.5	9.5	93.1	396	.....	2,973,352	66,282	44.8	9.6	90.9
Coyote Hills	220	3,698,048	36,687	100.8	21.9	92.5	228	.....	3,634,469	39,831	92.0	22.7	95.0
Huntington Beach	16	612,469	1,188	51.5	52.5	41.1	59	.....	1,975,757	6,271	315.1	5.4	57.7
Long Beach	1	2,318	5	463.6	.....	100.0	4	.....	82,460	271	304.1	1.0	36.8
Montebello	131	4,633,406	22,774	203.4	21.1	96.1	143	.....	4,366,804	24,786	176.9	26.5	93.8
Newhall	76	48,612	11,943	4.1	13.1	86.2	74	.....	44,583	12,138	3.7	13.0	89.1
Richfield	83	3,347,998	11,951	280.5	10.9	79.5	184	.....	4,761,763	19,412	245.3	6.7	85.1
Salt Lake	249	446,568	37,765	11.7	9.8	83.7	252	.....	454,268	42,565	10.7	9.0	91.8
Santa Fe Springs	1	13,557	177	76.6	0.9	97.8	2	.....	195,239	112	1,743.3	9.3	30.4
Whittier	167	433,964	26,014	16.6	21.1	77.6	173	.....	576,359	26,527	21.7	20.4	83.3
Totals	1,364	16,479,869	219,447	117.1	18.1	88.8	1,470	.....	19,165,212	240,623	79.6	14.7	89.0
District No. 2—													
Bardsdale	136	216,878	23,221	9.3	1.1	93.0	138	.....	212,439	23,995	8.8	1.2	94.0
Concejo	29	14,958	1,429	10.4	25.1	56.0	28	.....	3,691	4,544	0.8	3.1	88.0
Ojai	61	40,378	10,517	3.8	2.6	97.0	59	.....	39,733	9,987	5.9	2.5	92.0
Piru	78	60,089	13,282	4.5	5.3	84.0	80	.....	60,007	13,888	4.3	6.1	94.0
Santa Paula	50	18,764	8,365	2.2	0.8	91.0	50	.....	18,085	8,177	2.2	0.8	89.0
Sespe	14	23,139	4,147	5.5	0.8	92.0	25	.....	23,712	4,421	5.3	0.7	94.0
Simi	53	58,388	8,956	6.5	1.5	87.0	55	.....	55,136	9,630	5.7	1.6	94.0
South Mountain	26	547,870	4,265	128.0	.....	80.0	28	.....	663,569	4,280	155.7	.....	94.0
Ventura	21	82,240	3,469	23.7	89.4	87.0	22	.....	69,725	3,353	19.6	61.0	89.6
Totals	468	1,062,704	77,582	13.6	6.3	92.0	485	.....	1,146,097	83,085	13.7	4.7	94.0
District No. 3—													
Arroyo Grande	19	22,547	2,217	10.3	5.0	64.0	22	.....	19,631	2,831	6.7	12.0	68.0
Casmalia	90	772,503	14,113	54.6	187.5	87.0	92	.....	771,595	15,831	48.7	168.5	93.0
Cat Canyon	44	411,864	6,850	60.0	9.9	86.0	47	.....	396,016	7,052	56.2	12.0	80.0
Half Moon Bay	2	127	187	0.7	.....	52.0	2	.....	461	368	1.2	.....	50.0

Lompoc	27	244,524	4,018	61.0	101.4	82.0	27	----------	243,245	3,990	62.3	86.0	77.0
Santa Maria	234	1,378,294	36,218	38.0	33.4	83.0	240	----------	1,295,398	36,967	35.0	33.8	84.0
Sargent	9	11,465	1,629	7.1	0.1	100.0	8	----------	8,983	1,361	6.6	----------	93.0
*Summerland	135	27,859	22,754	1.2	13.2	93.0	135	----------	27,760	22,754	1.0	12.3	93.0
Totals	560	2,868,983	87,986	32.7	53.4	80.0	573	----------	2,762,489	91,004	30.3	51.4	80.0
District No. 4—													
Belridge-Lost Hills	580	1,906,439	96,725	19.7	19.0	92.1	485	598	1,277,056	69,162	18.5	17.2	82.8
Elk Hills	68	10,193,318	10,386	891.4	0.6	84.0	121	123	7,797,144	19,373	402.5	1.6	82.3
Kern River	2,123	3,687,425	358,092	10.3	43.6	92.2	2,114	2,191	2,743,290	295,696	9.3	48.5	73.3
McKittrick-Temblor	325	1,253,487	53,783	23.3	78.2	91.4	268	318	872,940	38,294	22.8	71.9	65.4
Midway-Sunset	2,486	15,462,682	416,423	37.1	19.4	92.5	2,555	2,637	13,167,946	342,468	38.5	20.0	70.6
Totals	5,582	32,503,351	935,409	34.75	31.8	92.6	5,543	5,872	25,858,376	764,993	33.8	32.9	70.8
District No. 5—													
Coalinga	1,329	7,468,026	219,897	33.9	11.0	91.4	1,233	1,360	5,181,151	159,555	32.47	9.61	70.3
Grand totals	9,176	60,383,533	1,540,351	39.5	26.6	92.2	9,304	----------	54,113,325	1,339,330	40.4	26.4	78.2

[1]Includes Puente field. *Estimated.

Operating cost per well is not always lower for the dividend companies than others. Profitable operations seem to depend generally upon large wells, high-grade oil, and proximity to market. There is nothing to indicate that unnatural causes or manipulation have affected the profits of one producer against another. It may be noted that both price and profits have usually been greater in the Los Angeles-Orange-Ventura fields than in others, doubtless largely due to the proximity to market and higher grades of oil. Crude oil testing as high as 56° Baumé is obtained from some of the Ventura wells.

TABLE G.

Capitalization.

Field	Number of companies considered*	Per cent of total product of field	Capital	
			Cash	Property
Fresno County—				
Coalinga	64	25	$2,851,778	$31,245,719
Kern County—				
Kern River	55	32	6,399,668	5,162,694
Midway	69	23	6,687,655	48,961,549
Sunset-Maricopa	32		2,882,914	6,775,518
McKittrick, Lost Hills, Belridge, Devils Den, Elk Hills	61	52	2,690,394	13,914,465
Los Angeles County	63	16	6,570,759	13,452,081
Orange County	58	21	10,147,169	12,053,349
Santa Barbara County	21	31	2,378,681	6,288,228
Ventura County	46	74	1,365,207	10,025,171
Subtotals	469		$41,974,165	$147,878,774
Miscellaneous and marketing companies[1]	117	70	177,932,004	117,931,014
Totals	586		$219,906,169	$265,809,788

*See Table I, following.

[1]Includes companies having refineries and those operating in several fields whose data could not be segregated as to counties or fields.

TABLE H.

Dividends Paid by Oil Companies, 1916-1921.

Field	1916		1917		1918		1919		1920		1921	
	Companies	Value	Companies	Value	Companies	Value	Companies	Value	Companies	Value	Companies	Value
Coalinga	12	$217,949	20	$712,331	23	$1,055,600	24	$1,352,969	29	$1,297,694	24	$1,142,767
Kern River	23	405,556	22	306,508	31	609,293	27	1,335,877	26	783,625	28	390,794
Midway	29	1,207,974	34	1,038,769	42	3,015,862	32	8,360,447	39	7,096,819	34	4,311,539
Sunset and Maricopa	5	241,200	14	682,644	15	638,926	16	595,535	14	691,611	18	960,459
McKittrick, Belridge, Lost Hills, Devils Den, Elk Hills	7	434,184	14	837,129	12	768,984	9	548,224	12	1,231,045	13	2,603,490
Santa Barbara County	7	293,025	6	923,228	5	286,768	5	355,490	7	312,332	5	400,535
Ventura County	5	126,812	3	71,637	2	4,400	4	120,584	5	559,942	6	1,362,210
Los Angeles County Orange County	12	1,222,598	16	3,079,447	14	1,201,021	17	2,373,403	20	3,282,497	11 11	562,224 1,395,158
Subtotals	100	$4,149,298	129	$8,551,693	144	$7,520,854	133	$14,942,529	152	$15,255,565	150	$13,129,176
Miscellaneous and marketing companies[1]	13	*$38,383,270	12	#40,981,214	11	19,984,138	26	20,476,322	9	31,072,321	11	35,86,119
Totals	113	$42,532,568	141	$49,532,907	155	$27,504,992	159	$35,418,851	161	$46,327,886	161	$49,015,295

*Includes a 50 per cent stock dividend of the Standard Oil Company.
#Includes a 33⅓ per cent stock dividend of the Standard Oil Company.
[1]See Table G, preceding.

TABLE I.

Average Prices of Light and Heavy Oils, and Operating Data, 1921.

Field	Price				Operating data					
					All companies considered*			Dividend companies‡		
	Under 18° Baume	18° and over	Average price	Price to dividend companies	Barrels per well per day yield	Operating cost per well day	Operating cost per barrel	Barrels per well per day yield	Operating cost per well day	Operating cost per barrel
Coalinga	$1.429	$1.786	$1.533	$1.521	16.7	$10.24	$0.613	16.5	$10.18	$0.617
Kern River	1.390		1.390	1.430	8.0	3.40	0.425	9.9	4.63	0.468
Midway	1.381	1.883	1.765	1.942	23.0	10.07	0.438	30.7	14.95	0.487
Sunset and Maricopa	1.593	2.183	1.764	1.622	19.1	13.52	0.708	14.8	9.61	0.649
McKittrick, Lost Hills, Belridge, Devils Den, Elk Hills	1.387	1.920	1.691	1.684	18.5	6.68	0.361	19.0	5.70	0.300
Los Angeles County	1.617	2.156	2.081	2.063	11.5	13.21	1.149	16.0	17.71	1.107
Orange County	1.085	2.128	2.066	2.239	42.1	37.05	0.880	28.6	28.20	0.986
Santa Barbara County	1.422	1.764	1.669	1.926	25.3	13.16	0.520	19.8	10.71	0.541
Ventura County	1.542	2.726	2.708	2.723	19.6	15.97	0.815	17.9	12.01	0.671

*See Table G, preceding. Does not include companies with refineries, nor those operating in several fields whose data could not be segregated as to counties or fields. The data given are of value, however, as showing the conditions obtaining among the smaller operators.

‡See Table H, preceding.

It should be noted that in the case of a county like Ventura, with only a few producers, the averages are not so significant as in other fields with a large number of operators. The figures of a single large operator in such a case can materially affect the general average if they should be much above or below the average of the others.

Proved Oil Land.

The area of proved oil land increased during 1921 to a total of 109,214 acres compared with 94,567 acres in 1920. Kern, Los Angeles, Orange and Ventura counties were the important contributors to the increase. The acreage was distributed by counties as follows:

TABLE J.

County	Land (acres)	County	Land (acres)
Fresno	14,356	Santa Barbara	9,343
Kern	68,700	Santa Clara	80
Los Angeles	4,613	Ventura	3,940
Orange	7,410		
San Luis Obispo	772	Total	109,214

SECTION THREE —— METALS.

The total value of metals produced in California during 1921 was $21,211,079. The chief of these is, and always has been, gold, followed in order in 1921 by silver, copper, quicksilver, platinum, lead, zinc, manganese ore, and iron ore. There was no production of antimony, cadmium, molybdenum, tin, nor tungsten, which have in the past been on the active list. Deposits of ores of nickel and vanadium have also been found in the state; although there has as yet been no commercial output of them. The above-noted total for this group is a net increase of $1,221,592 over the 1920 total of $19,989,487, due to increases registered by both gold and silver while the rest showed decreases.

California leads all states in the Union in her gold production, and the precious metal is widely distributed throughout the state. Thirty-one of the fifty-eight counties reported an output in 1921 from either mines or dredges.

Copper, which is second in importance among the metals of the state, occurs in the following general districts: the Shasta County belt, which has been by far the most important; the Coast Range deposits, extending more or less continuously from Del Norte in the north to San Luis Obispo County in the south; the Sierra Nevada belt, starting in Plumas and running in a general southerly and southeasterly direction through the Mother Lode counties and ending in Kern; the eastern belt in Mono and Inyo counties; and the southern belt, in San Bernardino, Riverside and San Diego counties.

Silver is not generally found alone in the state, except notably in the new Rand district, San Bernardino County; but is associated to a greater or less extent with gold, copper, lead and zinc.

Quicksilver has for many years been one of the state's staple products and California has supplied approximately 75% of the nation's output of this metal.

Tungsten is found in but few other localities of importance in the United States.

Large deposits of iron ore have been known in several sections of the state, but for various economic reasons this branch of the mineral industry thus far has made only slight progress on the Pacific Coast.

A comparison of the 1921 metal output with that of the 1920 is afforded by the following table:

	1920		1921		Increase+ Decrease—
	Amount	Value	Amount	Value	Value
Copper	12,947,299 lbs.	$2,382,303	12,088,053 lbs.	$1,559,358	$822,945—
Gold		14,311,043		15,694,822	1,383,779+
Iron ore	5,975 tons	40,889	1,970 tons	12,030	28,859—
Lead	4,903,738 lbs.	392,300	1,149,051 lbs.	51,707	340,593—
Manganese ore	2,892 tons	62,323	1,005 tons	12,210	50,113—
Platinum	477 fine oz.	68,977	613 fine oz.	58,754	10,223—
Quicksilver	10,278 flasks	775,527	3,157 flasks	140,666	634,861—
Silver		1,859,896		3,629,223	1,769,327+
Zinc	1,188,009 lbs	96,229	846,184 lbs.	42,309	53,920—
Total value		$19,989,487		$21,211,079	
Net increase					$1,221,592+

ALUMINUM (see May bulletin).

ANTIMONY (see May bulletin).

ARSENIC (see May bulletin).

BISMUTH (see May bulletin).

CADMIUM (see May bulletin).

COBALT (see May Bulletin).

COPPER.

Bibliography: State Mineralogist Reports VIII–XVII (inc.) Bulletins 23, 50.

Copper is second only to gold, among the metals produced in California. For many years Shasta was the leading county in the output of the red metal, but in 1919 Plumas advanced to first place, which it has since retained. This was due to the maintenance of output level by the Engels property in Plumas County and to the shutting down of the Mammoth, Mountain and Afterthought groups in Shasta County. The Engels ore is treated by flotation and the concentrate shipped to Utah plants for smelting. The fact that the Engels ore carries appreciable values in gold and silver is an important factor in the company's maintenance of operations. A small yield of copper in 1921 was also reported from Inyo, San Bernardino and Mono counties.

Although the copper property of the Mountain Copper Company was nonproductive in 1921, a part of the year's copper credited to Shasta County was obtained as a by-product from pyrite which had been sold and utilized in the manufacture of sulphuric acid, after which the cinder was smelted at other plants. Some copper was also obtained from matte made by the Shasta Zinc and Copper Company at Winthrop (Bully Hill) in their reverberatory operations for the production of zinc oxide.

The state's total for 1921 amounted to 12,088,053 pounds, valued at $1,559,358, being slightly less than the 1920 figure of 12,947,299 pounds, and 33% less in total value, due to the lower average prices for the metal prevailing in 1921—12.9¢ as against 18.4¢ in 1920. This

was lower than the pre-war price of 13.3¢ of the year 1913. The high-level year was 1917 with an average of 27.3¢. With the notable exception of the Engels group in Plumas County, all of California's important copper producers have been closed down for over two years owing to the unfavorable market, a condition which is world-wide. The other western copper-producing states, Arizona, Montana, Nevada and Utah, are in a similar position.

Distribution of the 1921 copper output, by counties, was as follows:

County	Pounds	Value
Inyo	45,725	$5,898
Mono	2,940	379
Plumas	11,584,216	1,494,364
San Bernardino	17,054	2,200
Shasta	437,593	56,449
Calaveras, Orange*	525	68
Totals	12,088,053	$1,559,358

*Combined to conceal output of a single operator in each.

Copper Production of California, by Years.

Amount and value of copper production in California annually since such records have been compiled by the State Mining Bureau is given in the following tabulation:

Year	Pounds	Value	Year	Pounds	Value
1887	1,600,000	$192,000	1906	28,726,448	$5,522,712
1888	1,570,021	235,303	1907	32,602,945	6,341,387
1889	151,505	18,180	1908	40,868,772	5,350,777
1890	23,347	3,502	1909	65,727,736	8,478,142
1891	3,397,455	424,675	1910	53,721,032	6,680,641
1892	2,980,944	342,808	1911	36,838,024	4,604,753
1893	239,682	21,571	1912	34,169,997	5,638,049
1894	738,594	72,486	1913	34,471,118	5,343,023
1895	225,650	21,901	1914	30,491,535	4,055,375
1896	1,992,844	199,519	1915	40,968,966	7,169,567
1897	13,638,626	1,540,666	1916	55,809,019	13,729,017
1898	21,543,229	2,475,168	1917	48,534,611	13,249,948
1899	23,915,486	3,990,534	1918	47,793,046	11,805,883
1900	29,515,512	4,748,242	1919	22,162,605	4,122,246
1901	34,931,788	5,501,782	1920	12,947,299	2,382,303
1902	27,860,162	3,239,975	1921	12,088,053	1,559,358
1903	19,113,861	2,520,997			
1904	29,974,154	3,969,995	Totals	828,331,555	$138,203,090
1905	16,997,489	2,650,605			

GOLD (see July bulletin).

IRIDIUM (see under Platinum).

IRON (see April bulletin).

LEAD.

Bibliography: State Mineralogist Reports IV, VIII–XV (inc).

Lead production in California in 1920 decreased to less than one-fourth that of the preceding year. The principal yield was from

lead-silver ores from Inyo, Mono and San Bernardino counties. The average price for the year was 4.5¢ per pound, as compared with 3.9¢ in 1913, and the high-level average of 8.7¢ per pound in 1917.

The 1921 production was distributed by counties, as follows:

County	Pounds	Value
Inyo	1,052,253	$47,351
Mono	42,962	1,933
Plumas	2,961	133
San Bernardino	22,812	1,027
Calaveras, Orange and Shasta*	28,063	1,263
Totals	1,149,051	$51,707

*Combined to conceal output of a single operator in each.

Lead Production of California, by Years.

Statistics on lead production in California were first compiled by this Bureau in 1887. Amount and value of the output, annually, with total figures, to date, are given in the following table:

Year	Pounds	Value	Year	Pounds	Value
1887	1,160,000	$52,200	1906	338,718	$19,307
1888	900,000	38,250	1907	328,681	16,690
1889	940,000	35,720	1908	1,124,483	46,663
1890	800,000	36,000	1909	2,685,477	144,897
1891	1,140,000	49,020	1910	3,016,902	134,082
1892	1,360,000	54,400	1911	1,403,839	63,173
1893	666,000	24,975	1912	1,370,067	61,653
1894	950,000	28,500	1913	3,640,951	160,202
1895	1,592,400	49,364	1914	4,697,400	183,198
1896	1,293,500	38,805	1915	4,796,299	225,426
1897	596,000	20,264	1916	12,392,031	855,049
1898	655,000	23,907	1917	21,651,352	1,862,016
1899	721,000	30,642	1918	13,464,869	956,006
1900	1,040,000	41,600	1919	4,139,562	219,397
1901	720,500	28,820	1920	4,903,738	392,300
1902	349,440	12,230	1921	1,149,051	51,707
1903	110,000	3,960			
1904	124,000	5,270	Totals	96,754,940	$5,990,776
1905	533,680	25,083			

MANGANESE (see August bulletin).

MOLYBDENUM (see May bulletin).

NICKEL (see May bulletin).

OSMIUM (see under Platinum).

PALLADIUM (see under Platinum).

PLATINUM (see August bulletin).

QUICKSILVER (see August bulletin).

SILVER (see July bulletin).

TIN (see May bulletin).

TUNGSTEN (see May bulletin).

VANADIUM (see May bulletin).

ZINC.

Bibliography: State Mineralogist Reports XIV, XV, XVII. Bulletins 38, 67.

The production of zinc in California in 1921 amounted to 846,184 pounds, worth $42,309 at the average price of 5.0¢ quoted for the metal. This output represents the metal contained in zinc oxide prepared at the plant of the Shasta Zinc and Copper Company. The oxide was obtained directly from zinc-copper ore by roasting in a reverberatory, collecting in a bag-house, and subsequent refining. The resultant product was sold to paint and rubber manufacturers; and there appears to be a promising future for such business on the Pacific Coast. There are already several automobile tire plants in operation in California.

The zinc ores of Shasta and Calaveras counties are associated with copper, while those of Inyo and San Bernardino are associated principally with lead-silver and zinc-silver ores.

The principal uses of zinc are for 'galvanizing' (plating on iron to prevent rust), for zinc oxide (used in rubber goods and paint), and for brass (an alloy of copper and zinc). These outlets for the metal take approximately 80% of the quantity produced. Of the remaining 20%, a large portion is rolled into plates and sheets, and utilized in the building industry for sheathing, roofing, leaders, and eaves-troughs. Zinc is particularly desirable and efficient for roofing and siding where corrosive gases are present, as at smelters, refineries and chemical plants.

Total Zinc Production of California.

Total figures for zinc output of the state are as follows, commercial production dating back only to 1906:

Year	Pounds	Value	Year	Pounds	Value
1906	206,000	$12,566	1915	13,043,411	$1,617,383
1907	177,759	10,598	1916	15,950,565	2,137,375
1908	54,000	3,544	1917	11,854,804	1,209,190
1909			1918	5,565,561	506,466
1910			1919	1,384,192	101,046
1911	2,679,842	152,751	1920	1,188,009	96,229
1912	4,331,391	298,866	1921	846,184	42,309
1913	1,157,947	64,845			
1914	399,641	20,381	Totals	58,839,306	$6,273,549

SECTION FOUR —— STRUCTURAL MATERIALS.

Bibliography: State Mineralogist Reports XIV, XV, XVII. Bulletin 38. See also under each substance.

As indicated by this subdivision heading, the mineral substances herein considered are those more or less directly used in building and structural work. California is independent, so far as these are concerned, and almost any reasonable construction can be made with materials produced in the state. This branch of the mineral industry for 1921 was valued at $33,477,120, as compared with a total value of

$29,723,405 for the year 1920, the increase being due to continued activity in all building and construction operations which followed the release of war-time restrictions.

Deposits of granite, marble and other building stones are distributed widely throughout this state, and transportation and other facilities are gradually being extended so that the growing demand may be met. The largest single item, cement, has had an interesting record of growth since the inception of the industry in California about 1891. Not until 1904 did the annual value of cement produced reach the million-dollar mark, following which it increased 500% in nine years; though from 1914 to 1918 there was a falling off common to all building materials. The 1921 output established a new high-level mark, both in quantity and value.

Crushed rock production is yearly becoming more worthy of consideration, due to the strides recently taken in the use of concrete, as well as to activity in the building of good roads. Brick, with an average annual output for a number of years worth approximately $2,000,000, had difficulty in holding its own, due to the popularity of cement and concrete. In 1920, however, the sales increased to nearly double the previous record figure of the year 1907, with only a slight decrease in 1921. This item will, no doubt, continue to be an important one, and of course a market for fire and fancy brick of all kinds will never be lacking.

Fifty-five counties contributed to this structural total for 1921, and there is not a county in the state which is not capable of some output of at least one of the materials under this classification.

The following table gives the comparative figures for the amounts and value of structural materials produced in California during the years 1920 and 1921:

Substance	1920		1921		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Bituminous rock	5,450 tons	$27,825	8,298 tons	$43,192	$15,367+
Brick and tile		5,704,393		5,570,875	133,518—
Cement	6,709,160 bbls.	14,962,945	7,404,221 bbls.	18,072,120	3,109,175+
Chromite	1,770 tons	43,021	347 tons	6,870	36,161—
Granite		495,732		725,901	230,169+
Lime	463,144 bbls.	577,232	463,534 bbls.	610,619	53,387+
Magnesite	83,695 tons	1,033,491	47,837 tons	511,102	522,389—
Marble	29,531 cu. ft.	92,899	30,232 cu. ft.	98,395	5,496+
Onyx			2,569 cu. ft.	1,294	1,294+
Sandstone	10,500 cu. ft.	2,300	10,150 cu. ft.	2,112	188—
Miscellaneous stone		6,863,557		7,834,640	1,031,083+
Total value		$29,723,405		$33,477,120	
Net increase					$3,753,715+

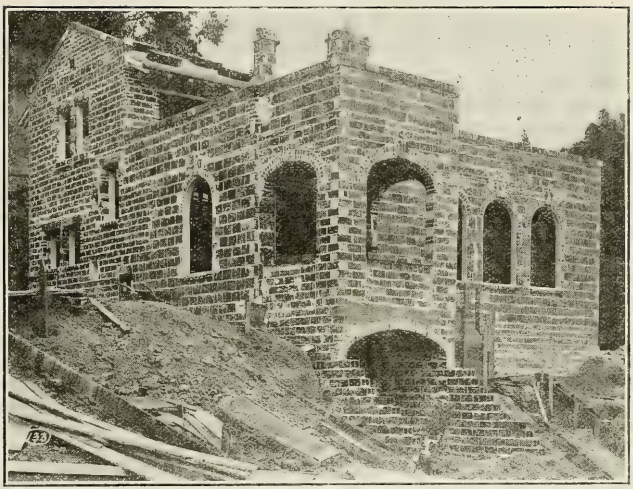
ASPHALT (see July bulletin).

BITUMINOUS ROCK (see July bulletin).

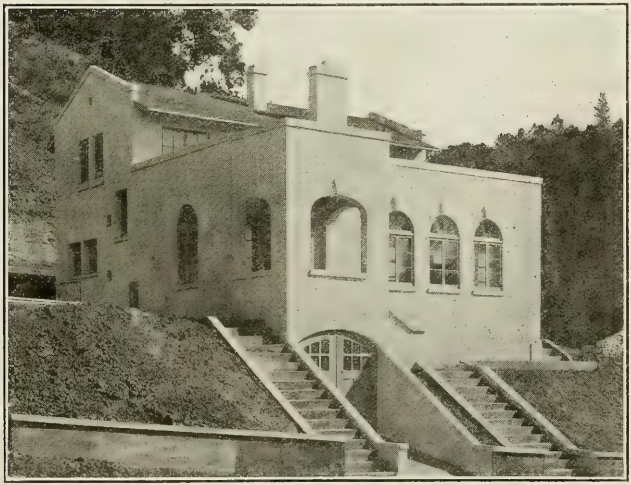
BRICK and TILE.

Bibliography: State Mineralogist Reports VIII, X, XII–XV (inc.), XVII. Bulletin 38. Preliminary Report, No. 7.

As would be expected in a state with diversified and widespread mineral resources, bricks of many varieties and in important quantities are annually produced in California. The varieties include common,



Residence in Piedmont, Alameda County, showing construction with hollow building tile ("Dickey Mastertile"), made by the California Brick Company, Niles, California.



Residence in Piedmont (same as in preceding photograph), showing finished appearance of tile construction. Photos by courtesy of the California Brick Company.

fire, pressed, glazed, fancy, vitrified, and others. So far as possible the different kinds have been segregated in the tabulation accompanying herewith.

We also include under this heading the various forms of hollow building 'tile' or blocks, instead of under 'industrial' pottery clays as in the statistical reports previous to 1915. The application of these tile to residence construction is illustrated by the photographs reproduced herewith. As noted in a previous report,[1] they have been so utilized in residences in the southern part of the state for a number of years, but are now coming into vogue in northern California. The first cost is stated to be but slightly more than for a frame residence, and the tile have the advantage of permanency, requiring a minimum of repairs, being also fireproof, and keep a house warmer in winter and cooler in summer.

The clay industries throughout the country were adversely affected by the war-time restrictions on building operations, and particularly during 1918 by a 50% cut in their fuel and power allowances by the Federal Fuel Administrator. That they have recovered from that condition, is shown by comparison of the 1919-1921 figures with those of previous years. The total value of the 1920 product was considerably more than the previous record figure of the year 1907. The aggregate value for all kinds of brick in 1921 shows a slight decrease from the 1920 total. Glazed, pressed, and fancy varieties, also common brick, showed increases; but fire-brick and building blocks decreased.

The detailed figures of brick and tile production for 1921, by counties, are given in the following tabulation:

[1]State Mineralogist Report XV, p. 497, 1916.

Brick and Tile Production for 1921, by Counties.

County	Common		Fire		Glazed, pressed, fancy, vitrified paving		Hollow building tile or blocks		Total value
	Amount, M	Value	Amount, M	Value	Amount, M	Value	Tons	Value	
Alameda	4,701	$70,693	1,776	$126,533	1,495	$58,570			$255,196
Contra Costa	4,281	78,731							78,731
Fresno	7,905	114,187					680	$8,113	122,300
Imperial	654	6,363							6,363
Kern	5,840	85,820							85,820
Los Angeles	141,947	1,985,095	8,965	463,211	7,688	454,222	26,889	305,920	3,208,448
Orange	2,994	47,720							47,720
Riverside			3,930	167,912					167,912
Santa Clara	7,501	110,961							110,961
Humboldt, Marin, Mendocino, Riverside, Sacramento, San Diego, San Joaquin, San Mateo, Siskiyou, Tehama, Tulare, Ventura*	26,594	381,154							
Amador, Contra Costa, Fresno, Placer, San Joaquin, Ventura*			6,901	428,994					
Contra Costa, Fresno, Placer, Riverside, Sacramento, Ventura*					4,850	226,273			
Alameda, Contra Costa, Placer, Riverside, Sacramento, San Diego*							39,531	451,003	1,487,424
Totals	202,417	$2,880,124	21,572	$1,186,650	14,033	$739,065	67,100	$765,036	$5,570,875

*Combined to conceal output of a single operator in each.

Brick and Tile Production of California, by Years.

Record of brick production in the state has been kept since 1893 by this Bureau, the figures for building tile being also included since 1914. The annual and total figures, for amount and value, are given in the following table:

Year	Brick, M	Building blocks, tons	Value
1893	103,900		$801,750
1894	81,675		457,125
1895	131,772		672,360
1896	24,000		524,740
1897	97,468		563,240
1898	100,102		571,362
1899	125,950		754,730
1900	137,191		905,210
1901	130,766		860,488
1902	169,851		1,306,215
1903	214,403		1,999,546
1904	281,750		1,994,740
1905	286,618		2,273,786
1906	277,762		2,538,848
1907	362,167		3,438,951
1908	332,872		2,506,495
1909	333,846		3,059,929
1910	340,883		2,934,731
1911	327,474		2,638,121
1912	337,233		2,940,290
1913	358,754		2,915,350
1914	270,791		2,288,227
1915	180,538		1,678,756
1916	206,966		2,096,570
1917	192,269	29,348	2,532,721
1918	136,374	34,818	2,363,481
1919	156,328	36,026	3,087,067
1920	245,842	99,208	5,704,393
1921	238,022	67,100	5,570,875
Totals	6,183,561	266,500	$61,980,097

CEMENT (see June bulletin).

CHROMITE (see June bulletin).

GRANITE.

Bibliography: State Mineralogist Reports X, XII, XVII (inc.). Bulletin 38.

In the statistical reports of the State Mining Bureau for several years previous to 1916, granite was recorded as a subdivision under 'Stone Industry' or under 'Miscellaneous Stone.' Since 1916, we have given it a separate heading, as has always been done with marble and sandstone. Crushed rock, rubble, and paving blocks derived from granite quarries are continued under the heading of 'Miscellaneous Stone.'

The value of the granite output for 1921 was the highest of any year since 1892 with the exception of the year 1913. This is in part due

Granite Production by Counties, for 1921.

County	Building stone		Monumental		Curbing		Unclassified		Total value
	Cubic feet	Value	Cubic feet	Value	Linear feet	Value	Cubic feet	Value	
Fresno			7,800	$28,050	160	$560			$28,610
Madera	63,261	$418,043	11,999	37,444	53	168	6,000	$6,167	461,822
Placer	3,527	21,670	3,938	19,972	333	333	4,057	6,353	48,328
Riverside	1,900	3,350	3,700	8,250	75	102	2,150	1,150	12,852
Sacramento	6,121	20,783	250	500			6,382	18,186	39,469
San Diego			5,848	17,544					17,544
Inyo[1] and San Diego*	100,650	31,900							31,900
Nevada, Plumas, Tulare, Tuolumne*			9,245	40,376					40,376
San Bernardino[2] and San Diego*							86,000	45,000	45,000
Totals	175,459	$495,746	42,780	$152,136	621	$1,163	104,589	$76,856	$725,901

*Combined to conceal output of a single operator in each.
[1]Includes various rocks utilized for building stone, but not specified as to kind.
[2]Includes 'fire-stone' (granite) used for cement kiln liners.

to the resumption of building construction following the war-time curtailment, and in part due to the higher unit prices received for the 1921 product. Among the new buildings finished with granite, last year, should be mentioned the Bank of Italy in San Francisco, at the corner of Powell, Market and Eddy streets.

In so far as it has been possible to do so, granite production has been segregated in the preceding table into the various uses to which the product was put. It will be noted, however, that a portion of the output has been entered under the heading 'unclassified.' This is necessary because of the fact that some of the producers have no way of telling to what specific use their stone was put after they had quarried and sold the same in the rough.

Varieties.

For building purposes, the granites found in California, particularly the varieties from Raymond in Madera County, Rocklin in Placer County, and near Porterville in Tulare County, are unexcelled by any similar stone found elsewhere. The quantities available, notably at



Carved vase and plaque of 'silver-gray' granite from Lakeside Quarry, San Diego County, California. (See text.)

Raymond, are unlimited. Most of California's 'granite,' particularly that found in the Sierra Nevada Mountains, is technically 'granodiorite' (that is, both plagioclase and orthoclase feldspars are present).

Granites of excellent quality for building and ornamental purposes are also quarried in Riverside and San Diego counties. Near Lakeside, San Diego County, the McGilvray-Raymond Granite Company of San Francisco has recently taken over and enlarged operations at the quarry formerly worked by the Simpson-Pirnie Company. This is a fine-grained, 'silver-gray' granite of uniform texture and color, especially suited for monumental and ornamental work. A beautifully carved and polished vase and plaque executed from this stone by Mr. Walter Ghetti of the Western Granite Company, San José, is illustrated herewith. It was loaned to the State Mining Bureau recently for exhibit purposes (see page 278, *ante*).

The Fresno County stone is a dark, hornblende diorite, locally called 'black granite,' whose color permits of a fine contrast of polished and unpolished surfaces, making it particularly suitable for monumental and decorative purposes. There is also a similar 'black granite' in Tulare County.

Granite Production of California, by Years.

The value of granite produced, annually, since 1887, has been as follows:

Year	Value	Year	Value
1887	$150,000	1906	$344,083
1888	57,000	1907	373,376
1889	1,329,018	1908	512,923
1890	1,200,000	1909	376,834
1891	1,300,000	1910	417,898
1892	1,000,000	1911	355,742
1893	531,322	1912	362,975
1894	228,816	1913	981,277
1895	224,329	1914	628,786
1896	201,004	1915	227,928
1897	188,024	1916	535,339
1898	147,732	1917	221,997
1899	141,070	1918	139,861
1900	295,772	1919	220,743
1901	519,285	1920	495,732
1902	255,239	1921	725,901
1903	678,670		
1904	467,472	Total	$16,189,985
1905	353,837		

LIME (see July bulletin).

MAGNESITE (see April bulletin).

MARBLE.

Bibliography: State Mineralogist Reports XII–XV (inc.), XVII. Bulletin 38. U. S. Bur. of Mines, Bull. 106.

Marble is widely distributed in California, and in a considerable variety of colors and grain. During 1921, production from one operator each in Inyo and San Diego counties, and two in Tuolumne,

amounted to 30,232 cubic feet, valued at $98,395, being a slight increase both in quantity and value over the 1920 figures. This is still below what might be considered the normal output of earlier years, and certainly far below our possibilities.

California has many beautiful and serviceable varieties of marble, suitable for almost any conceivable purpose of construction or decoration. In the decorative class are deposits of onyx marble of beautiful coloring and effects. There is also serpentine marble suitable for electrical switchboard use.

Marble Production of California, by Years.

Data on annual production since 1887, as compiled by the State Mining Bureau, follows. Previous to 1894 no records of amount were preserved.

Year	Cubic feet	Value	Year	Cubic feet	Value
1887	----------	$5,000	1906	31,400	$75,800
1888	----------	5,000	1907	37,512	118,066
1889	----------	87,030	1908	18,653	47,665
1890	----------	80,000	1909	79,600	238,400
1891	----------	100,000	1910	18,960	50,200
1892	----------	115,000	1911	20,201	54,103
1893	----------	40,000	1912	27,820	74,120
1894	38,441	98,326	1913	41,654	113,282
1895	14,864	56,566	1914	25,436	48,832
1896	7,889	32,415	1915	22,136	41,518
1897	4,102	7,280	1916	25,954	50,280
1898	8,050	23,594	1917	24,755	62,950
1899	9,682	10,550	1918	[a]17,428	49,898
1900	4,103	5,891	1919	25,020	74,482
1901	2,945	4,630	1920	[b]29,531	92,899
1902	19,305	37,616	1921	30,232	98,395
1903	84,624	97,354			
1904	55,401	94,208	Total value	----------	$2,320,800
1905	73,303	129,450			

[a]Includes onyx and serpentine.
[b]Includes onyx.

ONYX and TRAVERTINE.

Bibliography: State Mineralogist Reports XII–XV (inc.). Bulletin 38.

Onyx and travertine are known to exist in a number of places in California, but there has been only a small and irregular production since the year 1896. As there was but a single operator, the Tolenas Springs quarry, Solano County, in 1918 and 1920, the figures for those years were combined with those of the marble output. In 1921, there were two operators in Solano County and one in Mono, and a total of 2569 cubic feet, valued at $1,294, was shipped. In the latter county, the travertine deposits near Bridgeport are being reopened, after an idleness of some years, by the Dineen Marble Company of Oakland. Operations are also reported under way at Kernville in Kern County.

Onyx Production of California, by Years.

Production by years was as follows:

Year	Value	Year	Value
1887	$900	1895	$12,000
1888	900	1896	24,000
1889	900	1918	*
1890	1,500	1919	*
1891	2,400	1920	
1892	1,800	1921	1,294
1893	27,000		
1894	20,000	Total	$92,694

*See under Marble.

SANDSTONE.

Bibliography: State Mineralogist Reports XII–XV, XVII. Bulletin 38. U. S. Bur. of M., Bull. 124.

An unlimited amount of high-grade sandstone is available in California, but the wide use of concrete in buildings of every character, as well as the popularity of a lighter-colored building stone, has curtailed production in this branch of the mineral industry during recent years almost to the vanishing point. In 1921 two counties—Santa Barbara and Ventura—turned out 10,150 cubic feet, valued at $2,112; compared with 10,500 cubic feet and $2,300 in 1920. This is considerably less than former years. The main feature of the loss since 1914 is the closing of the well-known Colusa quarries, on account of the competition of lighter-colored materials.

Sandstone Production of California, by Years.

Amount and value, so far as contained in the records of this Bureau, are presented herewith, with total value from 1887 to date:

Year	Cubic feet	Value	Year	Cubic feet	Value
1887		$175,000	1906	182,076	$164,068
1888		150,000	1907	159,573	148,148
1889		175,598	1908	93,301	55,151
1890		100,000	1909	79,240	37,032
1891		100,000	1910	165,971	80,443
1892		50,000	1911	255,313	127,314
1893		26,314	1912	66,487	22,574
1894		113,592	1913	62,227	27,870
1895		35,373	1914	111,691	45,322
1896		28,379	1915	63,350	8,438
1897		24,086	1916	17,270	10,271
1898		46,384	1917	31,090	7,074
1899	56,264	103,384	1918	900	400
1900	378,468	254,140	1919	5,400	3,720
1901	266,741	192,132	1920	10,500	2,300
1902	212,123	142,506	1921	10,150	2,112
1903	353,002	585,309			
1904	363,487	567,181	Total value		$4,094,883
1905	302,813	483,268			

SERPENTINE.

Bibliography: State Mineralogist Report XV. Bulletin 38.

Serpentine has not been produced in California to a very large extent at any time. A single deposit, that on Santa Catalina Island, has yielded the principal output to date. Some material was shipped from there in 1917 and 1918, being the only output recorded since 1907. It was used for decorative building purposes and for electrical switchboards. As there was but a single operator, the figures were combined with those of marble output for those years.

Serpentine Production of California, by Years.

The following table shows the amount and value of serpentine from 1895 as recorded by this Bureau:

Year	Cubic feet	Value	Year	Cubic feet	Value
1895	4,000	$4,000	1904	200	$2,310
1896	1,500	6,000	1905		
1897	2,500	2,500	1906	847	1,694
1898	750	3,000	1907	1,000	3,000
1899	500	2,000	1917	[1]	[1]
1900	350	2,000	1918	[2]	[2]
1901	89	890	1919		
1902	512	5,065			
1903	99	800	Totals	12,347	$33,259

[1]Under 'Unapportioned.'
[2]See under Marble.

SLATE.

Bibliography: State Mineralogist Report XV. Bulletin 38.

Slate was first produced in California in 1889. Up to and including 1910 such production was continuous, but there has been none since, except in 1915, and a small amount in 1920. Large deposits of excellent quality are known in the state, especially in El Dorado, Calaveras and Mariposa counties, but the demand has been light owing principally to competition of cheaper roofing materials.

A square of roofing slate is a sufficient number of pieces of any size to cover 100 square feet of roof, with allowance generally for a three-inch lap. The sizes of the pieces of slate making up a square range from 7 x 9 inches to 16 x 24 inches, and the number of pieces in a square ranges from 85 to 686. The Ferry Building, San Francisco, is roofed with Eureka slate from El Dorado County.

The permanency of slate for roofing is well known. It is stated that there are slate roofs in Pennsylvania and Maryland over 100 years old.

[1]"In England and Wales, and in France, many buildings constructed in the 15th and 16th centuries were roofed with slate, and the roofs are still in excellent condition. There is a record of a chapel in Bedford-on-Avon in Wiltshire, England, roofed with slate in the 8th century, and after 1200 years of climatic exposure is moss-covered but in good condition."

Contrary to the general impression, however, the major portion of the slate produced in the United States is used on the inside rather than

[1]Bowles, O., Slate as a permanent roofing material: U. S. Bur. of M., Reports of Investigations, Serial No. 2267, July, 1921, p. 4.

the outside of buildings. Its interior uses include stationary washtubs, electrical switchboards, and blackboards.

In California, at present, the outlook is for some commercial output in 1922. The Losh quarry near Placerville, El Dorado County, was opened up in 1921, and some material prepared for market during the course of development work but not sold. The Pacific quarry at Hornitos, Mariposa County, is also being reopened.

Total Production of Slate in California.

A complete record of amount and value of slate produced in California follows:

Year	Squares	Value	Year	Squares	Value
1889	4,500	$18,089	1904	6,000	$50,000
1890	4,000	24,000	1905	4,000	40,000
1891	4,000	24,000	1906	10,000	100,000
1892	3,500	21,000	1907	7,000	60,000
1893	3,000	21,000	1908	6,000	60,000
1894	1,800	11,700	1909	6,961	45,660
1895	1,350	9,450	1910	1,000	8,000
1896	500	2,500	1911		
1897	400	2,800	1915	1,000	5,000
1898	400	2,800	1916		
1899	810	5,900	1920	8	80
1900	3,500	26,250	1921		
1901	5,100	38,250			
1902	4,000	30,000	Totals	88,829	$676,479
1903	10,000	70,000			

MISCELLANEOUS STONE.

Bibliography: State Mineralogist Reports XII–XVII. Bulletin 38.

'Miscellaneous stone' is the name used throughout this report as the title for that branch of the mineral industry covering crushed rock of all kinds, paving blocks, sand and gravel, and pebbles for grinding mills. The foregoing are very closely related from the standpoint of the producer. Thus it has been found to be most satisfactory to group these items as has been done in recent reports of this Bureau. In so far as it has been possible to do so, crushed rock production has been subdivided into the various uses to which the product was put. It will be noted, however, a very large percentage of the output has been tabulated under the heading 'Unclassified.' This is necessary because of the fact that many of the producers have no way of telling to what specific use their rock was put after they have quarried and sold the same.

In addition to amounts produced by commercial firms, both corporations and individuals, there is hardly a county in the state but uses more or less gravel and broken rock on its roads. Of much of this, particularly in the country districts, there is no definite record kept. Estimates have been made for some of this output, based on the mileage of roads repaired.

For the year 1921 miscellaneous stone shows an increase both in total tonnage and value over the preceding year, being $7,834,640 as compared with $6,803,557 in 1920. No doubt the increase would have been even greater both in this item and in cement, brick and other clay products, had it not been for the strike of the building trades in the San Francisco Bay district in the spring and summer of 1921. In addition to building work in the cities, construction on several hydroelectric power installations have been important factors contributing to the increase. Of these, mention should be made of the Pit River project of the Pacific Gas and Electric Company, the Hetch Hetchy dam of San Francisco on the Tuolumne River, and the Scott dam of the Snow Mountain Water and Power Company in Gravelly Valley, Lake County. The Dom Pedro dam of the combined Modesto-Turlock irrigation districts is also an important piece of work. Highway construction continues to utilize large tonnages of rock, gravel, and cement throughout the state.

In 1921, as has been the case for some years past, Los Angeles County led all others by a wide margin, with an output valued at $1,763,180; followed by Alameda, second, with $513,641; Fresno, third, $486,057; Riverside, fourth, $431,671; Contra Costa, fifth, $415,127; and Sacramento, sixth, $386,911.

Paving Blocks.

The paving block industry has decreased materially of recent years, almost to the vanishing point, because of the increased construction of smoother pavements demanded by motor-vehicle traffic. The blocks made in Solano County were of basalt; those from Sonoma are of basalt, andesite, and some trachyte, while those from Placer, Riverside, San Bernardino, and San Diego are of granite.

Production in 1921 amounted to only 4 M., valued at $280.

The amount and value of paving block production annually since 1887 has been as follows:

Year	Amount M	Value	Year	Amount M	Value
1887	*10,000	$350,000	1906	4,203	$173,432
1888	10,500	367,500	1907	4,604	199,347
1889	7,303	297,236	1908	7,660	334,780
1890	7,000	245,000	1909	4,503	199,803
1891	5,000	150,000	1910	4,434	198,916
1892	*3,000	96,000	1911	4,141	210,819
1893	2,770	96,950	1912	11,018	578,355
1894	2,517	66,981	1913	6,364	363,505
1895	2,332	73,338	1914	6,053	270,598
1896	4,161	77,584	1915	3,285	171,092
1897	1,711	35,235	1916	1,322	54,362
1898	1,144	21,725	1917	938	38,567
1899	305	7,861	1918	372	17,000
1900	1,192	23,775	1919	27	1,350
1901	1,920	41,075	1920	63	3,155
1902	3,502	112,437	1921	4	280
1903	4,854	134,642			
1904	3,977	161,752	Totals	135,577	$5,308,799
1905	3,408	134,347			

*Figures for 1887–1892 (inc.) are for Sonoma County only, as none are available for other counties during that period; though Solano County quarries were then also quite active.

Grinding Mill Pebbles.

Production of pebbles for tube and grinding mills began commercially in California in 1915. Owing to the decreased imports and higher prices of Belgium and other European flint pebbles, there was a serious inquiry for domestic sources of supply. One of the shipments made in that year was of pebbles selected from gold-dredger tailings in Sacramento County, for use in a gold mill in Amador County employing Hardinge mills.

The important development in this item, however, took place in San Diego County. At several points along the ocean shore from Encinitas south to near San Diego, there are beaches of washed pebbles varying from 1 inch to 6 inches in diameter, which come from conglomerate beds made up of well-rounded water-worn pebbles of various granitic and porphyritic rocks with some felsite and flint. The wave action has broken down portions of the cliffs for considerable distances and formed beaches of the pebbles which are well washed and cleaned of the softer materials. The rocks sorted out for shipment are mainly basalt and diabase, with an occasional felsite and flint pebble. There is a tough black basalt which is stated to give satisfactory results. In Fresno County pebbles have been selected from the gravel beds of the San Joaquin River near Friant. Shipments have been made to metallurgical plants in California, Nevada, Montana and Utah.

There was some resumption of imports in 1919, amounting to 17,677 long tons, valued at $250,096, increasing to 23,782 tons and $338,630 in 1920; but dropping to 9,004 tons and $116,157 in 1921. California output for 1921 was 247 tons, valued at $1,418, all from San Diego County.

The amount and value of grinding mill pebbles, annually, follows:

Year	Tons	Value
1915	340	$2,810
1916	20,232	107,567
1917	21,450	90,538
1918	8,628	61,268
1919	2,607	19,272
1920	2,104	17,988
1921	247	1,418
Totals	55,608	$230,861

Sand and Gravel.

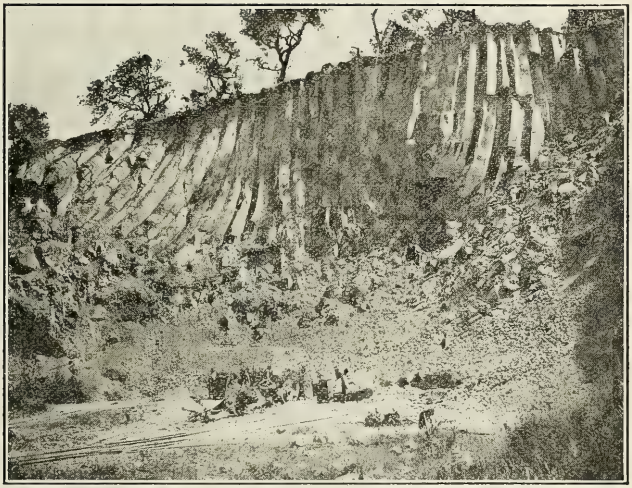
The distribution of the 1921 output of sand and gravel, by counties, is given in the following table:

County	Tons	Value	County	Tons	Value
Alameda	[a]257,232	$207,856	Riverside	19,722	$15,633
Alpine	200	150	Sacramento	[a]159,216	73,070
Butte	119,052	38,100	San Diego	[a]125,522	137,014
Calaveras	10,953	8,215	San Joaquin	149,361	67,415
Colusa	53,333	80,000	San Mateo	15,205	10,354
Contra Costa	[b]42,577	20,232	Santa Barbara	50,000	53,800
Del Norte	5,000	2,500	Santa Clara	122,350	98,584
El Dorado	2,600	1,250	Santa Cruz	17,000	8,700
Fresno	672,976	343,107	Shasta	14,000	8,000
Glenn	200,916	103,197	Sierra	1,240	858
Humboldt	81,563	80,688	Siskiyou	46,798	18,810
Imperial	375,240	65,967	Solano	8,000	3,400
Inyo	6,627	4,000	Sonoma	110,133	95,009
Lake	161,809	146,508	Stanislaus	167,267	157,214
Los Angeles	1,810,188	1,070,940	Tehama	18,683	14,750
Marin	28,667	14,323	Tulare	524,111	254,457
Mariposa	500	200	Tuolumne	69,840	76,850
Mendocino	29,000	17,500	Yolo	22,673	14,829
Merced	37,000	21,300	Yuba	133,285	73,387
Modoc	633	350	Kern, Lassen, Plumas, San Benito, Trinity, Ventura*	45,898	19,169
Monterey	[c]109,173	59,316			
Napa	127,902	67,405			
Nevada	9,833	3,820			
Orange	[d]107,133	68,801	Totals	6,174,581	$3,631,538
Placer	[a]4,170	4,500			

*Combined to conceal output of a single operator in each.
[a]Includes molding sand.
[b]Includes sand used for asphalt mix.
[c]Includes molding, building, blast, filter, and roofing sand, mainly from ocean beaches.
[d]Includes beach sand.

Crushed Rock.

To list the kinds and varieties of rocks utilized commercially under this heading would be to run almost the entire gamut of the classification scale. Much depends on the kind available in a given district. Those which give the most satisfactory service are the basalts and other hard, dense, igneous rocks which break with sharp, clean edges. In many localities, river-wash boulders form an important source of such material. In such cases, combined crushing and washing plants obtain varying amounts of sand and gravel along with the crushed sizes. In Sacramento and Butte counties the tailings piles from the gold dredgers are the basis for like operations.



Stony Point Quarry of Petaluma and Santa Rosa Electric Railway Company, near Roblar, Sonoma County, California. Rock is trachytic tuff, used for ballast and macadam. An excellent example of columnar structure.

Crushed Rock Production, by Counties, for 1921.

County	Macadam and ballast		Rubble and riprap		Concrete		Unclassified		Totals	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value	Tons	Value
Alameda	179,428	$128,448	2,000	$533	103,464	$105,374	[a]64,450	$71,430	349,342	$305,785
Alpine	1,500	700			100	75			1,600	775
Amador	2,500	1,125							2,500	1,125
Butte	238,366	165,800							238,366	165,800
Calaveras							[b]3,552	9,312	3,552	9,312
Contra Costa	25,613	33,507	572	536	36,276	40,810	357,388	320,042	419,849	394,895
Del Norte	5,000	3,000					100	80	5,100	3,080
El Dorado	1,500	1,500							1,500	1,500
Fresno	2,700	1,350					236,000	141,600	238,700	142,950
Humboldt	7,000	21,000	50,000	30,000					57,000	51,000
Imperial	21,333	44,000	116,472	26,206	36,700	35,000			174,505	105,206
Lassen	29,925	39,433			1,733	975			31,658	40,408
Los Angeles	33,333	36,000	71,451	114,322	244,591	263,092	451,376	278,326	800,751	692,240
Madera			8,747	4,765					8,747	4,765
Merced	6,000	6,000			7,000	3,000			13,000	9,000
Modoc	28,000	31,500			1,466	3,080			29,466	34,580
Napa	10,286	19,488			13,653	20,871	1,893	3,336	25,832	43,695
Nevada	22,260	15,280							22,260	15,280
Orange					59,999	62,500			59,999	62,500
Placer	11,017	9,500	11,806	7,490					22,823	16,990
Riverside	103,000	102,000	73,000	60,500	238,694	238,858	[c]1,500	14,400	416,194	415,758
Sacramento	386,091	308,000	7,485	5,841					393,576	313,841
San Bernardino	108,061	57,438	70,290	70,290	4,434	4,877	24,466	12,967	207,251	145,572
San Francisco	30,253	41,562							30,253	41,562
San Luis Obispo					52,000	80,000			52,000	80,000
San Mateo	15,402	21,100	324	364	15,039	22,558	7,152	7,321	37,917	51,343
Santa Barbara	8,800	11,800							8,800	11,800
Santa Clara	30,000	23,000			15,000	17,000			45,000	40,000

Santa Cruz	3,000	2,000			6,627	12,131	51	64	9,678	14,195
Shasta	36,973	21,545			4,133	2,400			41,106	23,945
Siskiyou	[d]40,522	25,533							40,522	25,533
Sonoma	13,232	11,169	255	191	642	482	45,989	44,449	60,118	56,291
Tulare	15,000	25,500	2,303	2,015	2,150	2,150			19,453	29,665
Tuolumne	3,170	2,335			133,000	150,000			136,170	152,335
Inyo, Kern, Mariposa, Mendocino, Plumas, San Benito, Sierra, Solano, Tehama, Trinity, Ventura*	427,085	355,750								
Lassen and Marin*			12,400	18,150						
Inyo, Marin, Monterey, San Diego, San Joaquin, Tehama*					214,804	237,890				
Inyo, Monterey, Nevada, San Diego,[c] Solano, Stanislaus, Ventura*							80,690	86,888	734,979	698,678
Totals	1,846,350	$1,566,363	427,105	$341,203	1,191,505	$1,303,123	1,274,607	$990,715	4,739,567	$4,201,404

*Combined to conceal output of a single operator in each.
[a]Includes red shale for roofing.
[b]Includes 'greenstone' (amphibolite) schist for roofing.
[c]Includes roofing granules.
[d]Includes volcanic 'cinders' (pumice) used for railroad ballast.

Miscellaneous Stone Production of California, by Years.

The amount and value, annually, of crushed rock (including macadam, ballast, rubble, riprap, and that for concrete), and sand and gravel, since 1893, follow:

Crushed Rock, Sand and Gravel, by Years.

Year	Tons	Value	Year	Tons	Value
1893	371,100	$456,075	1909	5,531,561	$2,708,326
1894	661,900	664,838	1910	5,827,828	2,777,690
1895	1,254,688	1,095,939	1911	6,487,223	3,610,357
1896	960,619	839,884	1912	8,044,937	4,532,598
1897	821,123	600,112	1913	9,817,616	4,823,056
1898	1,177,365	814,477	1914	9,288,397	3,960,973
1899	964,898	786,892	1915	10,879,497	4,609,278
1900	789,287	561,642	1916	9,951,089	4,009,590
1901	530,396	641,037	1917	8,069,271	3,505,662
1902	2,056,015	1,249,529	1918	6,641,144	3,325,889
1903	2,215,625	1,673,591	1919	6,919,188	3,678,322
1904	2,296,898	1,641,877	1920	9,792,122	6,782,414
1905	2,624,257	1,716,770	1921	10,914,145	7,834,640
1906	1,555,372	1,418,406			
1907	2,288,888	1,915,015	Totals	132,731,394	$75,476,653
1908	3,998,945	3,241,774			

A comparison of the above table of annual productions of these materials with the similar table for cement (see *ante*), reveals the fact that the important growth of the crushed rock and gravel business has been coincident with the rapid development of the cement industry from the year 1902.

SECTION FIVE —— INDUSTRIAL MATERIALS.

Bibliography: Reports XIV, XV. Bulletin 38. Min. & Sci. Press, Vol. 114, March 10, 1917. See also under each substance.

The following mineral substances have been arbitrarily arranged under the general heading of Industrial Materials, as distinguished from those which have a clearly defined classification, such as metals, salines, structural materials, etc.

These materials, many of which are mineral earths, are, with four or five exceptions, as yet produced on a comparatively small scale. The possibilities of development along several of these lines are large and with increasing transportation and other facilities, together with steadily growing demands, the future for this branch of the mineral industry in California is promising. There is scarcely a county in the state but might contribute to the output.

Up to within the last few years, at least, production has been in the majority of instances dependent upon more or less of a strictly local market, and the annual tables show the results of such a condition, not only in the widely varying amounts of a certain material produced from year to year, but in widely varying prices of the same material. Furthermore, the quality of this general class of material will be found to

fluctuate, even in the same deposit. The war in Europe affected some of these items, but not to the striking degree that it did the metal markets.

The more important of these minerals thus far exploited, so far as shown by value of the output, are limestone, mineral water, pyrite, pottery clays, diatomaceous earth, and dolomite.

This group as a whole showed a decrease in the total value from $3,583,100 for 1920 to $2,675,438 in 1921, a difference of nearly a million dollars. The principal losses were by diatomaceous earth, talc, pottery clay, pyrites, mineral water, and dolomite.

The following summary shows the value of the industrial material produced in California during the years 1920–1921, with increase or decrease in each instance:

Substance	1920		1921		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Asbestos	66 tons	$2,740	410 tons	$19,275	$16,535+
Barytes	3,029 tons	20,795	901 tons	4,809	15,986—
Clay (pottery)	203,997 tons	440,689	225,120 tons	362,172	78,517—
Dolomite	42,388 tons	132,791	31,195 tons	99,155	33,636—
Feldspar	4,518 tons	26,189	4,349 tons	28,343	2,154+
Fuller's earth	600 tons	6,000	1,185 tons	8,295	2,295+
Gems		36,656	*	10,954	25,702—
Graphite	*	*	*	*	—
Gypsum	20,507 tons	92,535	37,412 tons	78,875	13,660—
Infusorial and diatomaceous earths	60,764 tons	1,056 260	*	*	—
Limestone	50,120 tons	298,197	75,921 tons	305,912	7,715+
Lithia	10,046 tons	153,562	*	*	—
Mineral paint	779 tons	8,477	446 tons	4,748	3,729—
Mineral water	2,391,791 gals.	421,643	3,446,378 gals.	387,476	54,167—
Pumice and volcanic ash	1,537 tons	25,890	406 tons	6,310	19 580—
Pyrites	146,001 tons	530,581	110,025 tons	473,735	56 846—
Silica (sand and quartz)	25,324 tons	93,793	10,569 tons	49 179	47,614—
Soapstone and talc	11,327 tons	221,362	8,752 tons	130,078	91,284—
Unapportioned[1]		12,690		726,122	496,140—
Total value		$3,583,100		$2,675,438	
Net decrease					$907,662—

*Combined under 'unapportioned.'

[1]In 1920 includes graphite and columbite (tantalum ore); in 1921 includes graphite, diatomaceous earth and lithia.

ASBESTOS (see April bulletin).

BARYTES (see April bulletin).

CLAY (pottery).

Bibliography: State Mineralogist Reports I, IV, IX, XII–XV, XVII. Bulletin 38. Preliminary Report, No. 7.

At one time or another in the history of the state, pottery clay has been quarried in thirty-three of its counties. In this report pottery clay refers to all clays used in the manufacture of red and brown earthenware, china and sanitary ware, flowerpots, ornamental tiling, architectural terra cotta, sewer pipe, drain and roof tile, etc., and the figures for amount and value are relative to the crude material at the pit, without reference to whether the clay was sold in the crude form, or whether it was immediately used in the manufacture of any of the above finished products by the producer. It does not include clay used in making brick and building blocks.

There are many other important uses for clays besides pottery manufacture. Among these may be enumerated, paper, cotton goods, and chemicals. Being neutral, clay does not have an injurious effect upon other constituents used in the manufacture of such articles. In paper making, clay is used as a filler in news and similar grades, and as a coater or glazer in the more highly finished art papers. A large part of the china clay used in the United States is imported from England. Clays of the montmorillonite and halloysite group ('rock soap') are being utilized successfully in the manufacture of soaps.

During 1921, a total of 36 producers in 12 counties reported an output of 225,120 short tons of pottery clays, having a total value of $362,172 f.o.b. rail-shipping point, for the crude material, as compared with the 1920 production of 203,997 tons worth $440,689.

Because of the fact that a given product often requires a mixture of several different clays, and that these are not all found in the same pit, it is necessary for most clay-working plants to buy some part of their raw materials from other localities. For these reasons, in compiling the clay industry figures, much care is required to avoid duplications. So far as we have been able to segregate the figures, from the data sent in by the operatives, we have credited the clay output to the counties from which the raw material originated; and have deducted tonnages used in brick manufacture, as bricks are classified separately, herein.

A tabulation of the direct returns from the producers, by counties, for the year 1921, is shown herewith:

Pottery Clay in 1921.

County	Tons	Value	Used in the manufacture of—
Alameda	6,079	$7,405	Sewer and chimney pipe, drain tile, flue lining, et al.
Amador	22,124	46,684	Architectural terra cotta, porcelain, stoneware, fire-clay products and various.
Humboldt	75	190	Art pottery and drain tile.
Los Angeles	[b][c]29,055	62,866	Architectural terra cotta, floor and roofing tile, sewer et al. pipe, conduit.
Placer	[d]76,665	95,930	Architectural terra cotta; drain, floor, mantel and roofing tile; chimney, flue and sewer pipe; garden furniture.
Riverside	[e]84,224	111,219	Architectural terra cotta, floor and faience tile, conduit, sewer pipe, chemical stoneware, and fire-clay products.
San Diego	440	2,600	Porcelain ware and various.
Santa Clara	1,126	2,300	Red earthenware and tile.
Contra Costa[a], Fresno[b], Orange, San Bernardino, San Joaquin, Ventura*	5,332	32,998	Terra cotta, drain tile, chinaware, and various.
Totals	225,120	$362,172	

*Combined to conceal output of a single operator in each.
[a]Includes shale.
[b]Includes crushed brick for roofing, et al.
[c]Includes kaolin used in a cleaning and polishing compound.
[d]Includes ground fire clay.
[e]Includes ball clay.



Haulage system in clay pit of Lincoln Clay Products Company, near Lincoln, Placer County, California.

Pottery Clay Products.

The values of the various pottery clay products made in California during 1921, totaled $5,478,848, compared with $3,923,518 in 1920, their distribution being shown in the following tabulation:

Values of Pottery Clay Products, 1921.

Product	No. of producers	Value
Architectural terra cotta	7	$1,477,948
Chimney pipe, terra cotta, and flue linings	2	97,822
Drain tile	10	79,394
Roofing tile	5	495,963
Sewer pipe	8	1,329,300
Stoneware, chemical and sanitary ware	9	1,226,727
Red earthenware	3	120,406
Floor, faience, glazed and hand-made tile	12	502,159
Miscellaneous, art pottery, terra cotta, garden furniture, mortar colors, vitrified conduit, bisque ware and doll heads	9	149,129
Total value		$5,478,848

Pottery Clay Production of California, by Years.

Amount and value of crude pottery clay output in California since 1887 are given in the following table:

Year	Tons	Value	Year	Tons	Value
1887	75,000	$37,500	1906	167,267	$162,283
1888	75,000	37,500	1907	160,385	254,454
1889	75,000	37,500	1908	208,042	325,147
1890	100,000	50,000	1909	299,424	465,647
1891	100,000	50,000	1910	249,028	324,099
1892	100,000	50,000	1911	224,576	252,759
1893	24,856	67,284	1912	199,605	215,683
1894	28,475	35,073	1913	231,179	261,273
1895	37,660	39,685	1914	179,948	167,552
1896	41,907	62,900	1915	157,866	133,724
1897	24,592	30,290	1916	134,636	146,538
1898	28,947	33,747	1917	166,298	154,602
1899	40,600	42,700	1918	112,423	166,788
1900	59,636	60,956	1919	135,703	245,019
1901	55,679	39,144	1920	203,997	440,689
1902	67,953	74,163	1921	225,120	362,172
1903	90,972	99,907			
1904	84,149	81,952	Totals	4,299,713	$5,138,876
1905	133,805	130,146			

DOLOMITE (see July bulletin).

FELDSPAR (see July bulletin).

NOTE.—Value of the 1921 output as given on pages 328-329, *ante*, shou'd be $28,343, instead of $28,333.

FLUORSPAR (see April bulletin).

FULLER'S EARTH (see July bulletin).

GEMS (see July bulletin).

GRAPHITE (see April bulletin).

GYPSUM (see July bulletin).

INFUSORIAL and DIATOMACEOUS EARTHS (see July bulletin).

LIMESTONE (see July bulletin).

LITHIA (see August bulletin).

MICA (see August bulletin).

MINERAL PAINT (see August bulletin).

MINERAL WATER (see August bulletin.)

PHOSPHATES (see August bulletin).

PUMICE and VOLCANIC ASH (see August bulletin).

PYRITES (see April bulletin).

SILICA (Sand and Quartz).

Bibliography: State Mineralogist Reports IX, XIV, XV, XVII. Bulletins 38, 67.

We combine these materials, because of the overlapping roles of vein quartz which is mined for use in glass making and as an abrasive, and that of silica sand which, although mainly utilized in glass manufacture, also serves as an abrasive. Both varieties are also utilized to some extent in fire-brick manufacture.

A portion of the tonnage of vein quartz in California in 1916 and 1917 was employed in the preparation of ferro-silicon by the electric furnace. Some also is utilized as a foundry flux, and for steel casting moulds. A portion of the silica sold (both sand and quartz) is also used in glazes for porcelain, pottery and tile; and some of the sand for the preparation of sodium silicate ('water glass').

We do not include under this heading such forms of silica as: quartzite, sandstone, flint, tripoli, diatomaceous earth, nor the gem forms of 'rock crystal,' amethyst, and opal. Each of these has various industrial uses, which are treated under their own designations.

The production of silica in California in 1921 amounted to 10,569 tons, valued at $49,179, from eleven properties in six counties, distributed as follows:

County	Tons	Value
Amador	1,802	$20,646
Riverside	1,625	6,357
San Diego	370	725
Kern, Monterey, Placer*	6,772	21,451
Totals	10,569	$49,179

*Combined to conceal output of a single operator in each.

Of the above total, 5,940 tons were of sand, and 4,629 tons of vein and boulder quartz. For making the higher grades of glass, most of the sand is imported from Belgium. There are various deposits of quartz in California which could be utilized for glass making, but to date they have not been so used owing to the cost of grinding and the difficulty of preventing contamination by iron while grinding.

Silica sand has been produced in the following counties of the state: Alameda, Amador, El Dorado, Los Angeles, Monterey, Orange, Placer, Riverside, San Joaquin, and Tulare. The chief producing centers have been Amador, Monterey, and Los Angeles counties. The industry is of limited importance, so far, because of the fact that much of the available material is not of a grade which will produce first-class colorless glass; for such, it must be essentially iron-free. Even a fractional per cent of iron imparts a green color to the glass.

Total Silica Production of California.

Total silica production in California since the inception of the industry, in 1899, is shown below, being mainly sand:

Year	Tons	Value	Year	Tons	Value
1899	3,000	$3,500	1912	13,075	$15,404
1900	2,200	2,200	1913	18,618	21,899
1901	5,000	16,250	1914	28,538	22,688
1902	4,500	12,225	1915	28,964	34,322
1903	7,725	7,525	1916	20,880	48,908
1904	10,004	12,276	1917	19,376	41,166
1905	9,257	8,121	1918	23,257	88,930
1906	9,750	13,375	1919	18,659	101,600
1907	11,065	8,178	1920	25,324	96,793
1908	9,255	22,045	1921	10,569	49,179
1909	12,259	25,517			
1910	19,224	18,265	Totals	319,059	$679,038
1911	8,620	8,672			

SOAPSTONE and TALC.

Bibliography: State Mineralogist Reports XII, XIV, XV, XVII. Bulletins 38, 67. U. S. Bur. of Mines, Rep. of Investigations, Serial No. 2253, May, 1921.

Talc—also called soapstone or steatite—occurs widely distributed throughout California. It is found as a hydration product in the alteration of magnesian silicates, and is often associated with serpentine and actinolite. A few deposits have been proven of especial value to date, and there is an undoubted future for this branch of the mineral industry in the state. Deposits of high-grade white talc, the equal of the imported Italian article, are being worked in Inyo and San Bernardino counties. It is used in making paper, rubber, toilet articles, soap, rice polishing, lubricants, tiling, as a paint filler, etc., and for such is ordinarily ground to about 200 mesh before marketing. In this condition it brings $15 per ton and upwards, depending on quality. Some of the Inyo talc is turned and bored to various shapes for electrical insulation in such appliances as coffee percolators, heaters, and the like.

Commercially, the higher grades are called talc, and the lower, soapstone. Soapstone blocks are used in fireless cookers, electric switchboards, laboratory table tops and laundry tubs; and the crushed material is used in roofing papers.

There was a total output in 1921 of 8,752 tons, valued at $130,078, from two producers each, in El Dorado, Inyo, and San Bernardino counties. This is a decrease both in tonnage and value from the 1920 figures of 11,327 tons and $221,362, due largely to the competition of foreign imports.

The 1921 output was distributed by counties, as follows:

County	Tons	Value
El Dorado	1,652	$9,453
Inyo	4,350	77,250
San Bernardino	2,750	43,375
Totals	8,752	$130,078

Foreign importations of high-grade white talc suitable for the manufacture of toilet powder have come mainly from Canada, Italy and France. A small, irregular production of white talc was obtained from certain eastern states, but the material fluctuated in quality and quantity to such an extent that it was not largely used by manufacturers of the better-grade toilet powders. Gradually a wall of prejudice against all domestic talcs grew up in the trade, and this has been fostered by people interested in the sale of the imported article.

Deposits of high-grade talc in California have been known for several years, but little interest was shown in them until 1911-1912. The lack of importations during 1917–1919, gave California an opportunity to demonstrate the quality of her goods. According to Ladoo:[1]

"In the essential qualities of pure white color, freedom from grit, and fine-grain size it is a well-established fact that the best California talcs equal or surpass the best imported talcs. In the debatable qualities of slip and freedom from lime some of the best California talcs equal some of the best imported talcs and in other cases excel other imported talcs. Some of the very largest consumers of toilet-grade talc have expressed complete satisfaction with the high-grade California talcs and have used them regularly in preference to Italian talc.

"Therefore, it can not be truthfully said that the United States produces no talcs equal in quality to imported talcs. Unfortunately many domestic consumers have been so thoroughly imbued with the alleged superiority of imported talcs that domestic talcs have not been given a fair chance. It is even reported that unscrupulous dealers have relabeled domestic talc and sold it as Italian talc, with perfect satisfaction to the consumers. Such dishonest trade practices are probably not common, but they serve to refute the erroneous statments regarding the quality of domestic talc."

Foreign producers have the benefit of cheap labor, and a low tariff import duty. In addition to these disadvantages, the California operators are up against high transcontinental freight rates. In 1921 imports amounted to 11,456 tons of ground talc, valued at $238,581.

It is stated that in Italy the mines are all small tunnel workings, operated in the main by people of limited capital. Few of the companies have their own mills, the mills being separate enterprises, located at a central point, to which all the lump talc is hauled by teams. Practically all of these mines are in the northwestern corner of Italy, in the district of Pinerolo (Val Chisone), near Turin (Torino), in the province of Piedmont.

Talc Production of California, by Years.

Production has been intermittent in the state since 1893, as shown in the following table:

Year	Tons	Value	Year	Tons	Value
1893	400	$17,750	1909	33	$280
1894			1910	740	7,260
1895	25	375	1911		
1896			1912	1,750	7,350
1897			1913	1,350	6,150
1898			1914	1,000	4,500
1899			1915	1,663	14,750
1900			1916	1,703	9,831
1901	10	119	1917	5,267	45,279
1902	14	288	1918	11,760	85,534
1903	219	10,124	1919	8,764	115,091
1904	228	2,315	1920	11,327	221,362
1905	300	3,000	1921	8,752	130,078
1906					
1907			Totals	55,308	$681,484
1908	3	48			

[1]Ladoo, R. B., High-grade talc and the California talc industry: U. S. Bur. of M., Reports of Investigations, Serial No. 2253, May, 1921.

STRONTIUM.

Bibliography: Bulletin 67. U. S. G. S., Bull. 540; 660-I.

There was no production of strontium minerals in California in 1919–1921, though in 1918 both celestite ($SrSO_4$), and the carbonate, strontianite ($SrCO_3$) were shipped. The first recorded commercial output of strontium minerals in California was in 1916. The occurrence of the carbonate is particularly interesting and valuable, as it appears to be the first considerable deposit of commercial importance so far opened up in the United States. Shipments reported as averaging 80% $SrCO_3$ have been made. The deposit is associated with deposits of barite, near Barstow, San Bernardino County. The carbonate has also been found in massive form near Shoshone, Inyo County. Specimens from this deposit have been received and identified at the laboratory of the State Mining Bureau.

In addition to Imperial County, celestite is found near Calico and Ludlow, and in the Avawatz Mountains in San Bernardino County, but as yet undeveloped. The above noted output was converted to the nitrate.

Production of strontium minerals in California, by years, has been as follows:

Year	Tons	Value
1916	57	$2,850
1917	3,050	37,000
1918	2,900	33,000
1919		
Totals	6,007	$72,850

The principal use for strontium in the United States is in the form of the nitrate in the manufacture of red flares, or Costen and Bengal lights and fireworks. Previous to 1914, the nitrate was imported from Germany, England, and Sicily. In Germany and Russia, strontium in the form of the hydroxide is used in the manufacture of beet sugar. It is stated that strontia is more efficient and satisfactory in that process than lime, as it gives an additional recovery of 6% to 8%.

Of the two minerals, strontianite (carbonate) and celestite (sulphate), the carbonate is the more desirable as it is easier to convert to other salts; but it is scarcer. Celestite is found with limestone and sandstone and is sometimes associated with gypsum. Strontianite is also found with limestone, but associated with barite and calcite.

SULPHUR.

Bibliography: State Mineralogist Reports IV, XIII, XIV. Bulletins 38, 67.

There has not been, for many years, any commercial output of native sulphur in California, although this mineral has been found to some extent in Colusa, Imperial, Inyo, Kern, Lake, Mariposa, San Bernardino, Shasta, Sonoma, Tehama, and Ventura counties. Operations were begun late in 1917, on a property in Inyo County, and some

material stated to assay 40% sulphur was mined. Difficulties were encountered in refining it, so that only a small production was made, but none shipped.

At the Elgin mine, near Wilbur Springs, in Colusa County, a small tonnage of sulphur was prepared toward the close of 1918, but not shipped. The ore body is stated to assay 52.6% S. over a width of 22 feet. Two retorts, steam-heated, were installed, with a capacity of 4500 pounds of ore, each, per charge. There is a large body of material, in a zone at least 75 feet wide, impregnated with native sulphur crystals, which can be cheaply mined, if certain mechanical difficulties of melting and cleaning can be economically overcome.

Sulphur was produced at the famous Sulphur Bank mine, in Lake County, during the years 1865–1868 (inc.) totaling 941 tons, valued at $53,500; following which the property became more valuable for its quicksilver. The Elgin mine, noted above, is a similar occurrence.

There are prospects for some production for 1922, as a plant has been built by the California Sulphur Company, to handle material from a deposit near Maricopa in Kern County. The principal sources in the United States are the stratified deposits in Louisiana and Texas, extraction being accomplished by a unique system of wells with steam pipes. It is stated that the three large companies operating there are capable of producing more than 1,000,000 tons annually in excess of our normal consumption in the United States, which averages about 600,000 tons.

Formerly considerable sulphur was imported from Italy and from Japan; but the situation is now reversed, so that in 1921, a total of 285,762 long tons valued at $4,524,788 was exported, with only 4 tons worth $226 imported into the United States.

SECTION SIX —— SALINES.

Bibliography: State Mineralogist Reports XIV, XV, XVII. Bulletin 24.

Under this heading are included borax, common salt, soda, potash, and other alkaline salts. The first two have been produced in a number of localities in California, more or less regularly since the early sixties. Except for a single year's absence, soda has had a continuous production since 1894. Potash, magnesium chloride and sulphate, and calcium chloride have only recently been added to the commercial list, while the nitrates are still prospective.

Our main resources of salines are the lake beds of the desert regions of Imperial, Inyo, Kern, Los Angeles, San Bernardino, San Luis Obispo, and Siskiyou counties, and the waters of the Pacific Ocean.

The following tabulation shows amount and value of the saline minerals produced in California during the years 1920 and 1921, with increase or decrease in value for 1921, as compared with the previous year:

Substance	1920		1921		Increase+ Decrease−
	Tons	Value	Tons	Value	Value
Borax	127,065	$2,794,206	50,136	$1,096,326	$1,697,880—
Calcium chloride			683	22,980	22,980+
Magnesium salts	3,150	107,787	4,153	106,140	1,647—
Potash	26,298	1,465,463	14,806	390,210	1,075,253—
Salt	230,638	972,648	197,989	832,702	139,946—
Soda	32,407	1,164,898	14,828	438,996	725,902—
Total value		$6,505,002		$2,887,354	
Net decrease					$3,617,648—

BORAX (see June bulletin).

CALCIUM CHLORIDE.

Calcium chloride ($CaCl_2$) was reported for the first time to the State Mining Bureau as produced commercially, in 1921, from plants in San Bernardino County. It is obtained as a by-product in the refining of salt from deposits in certain of the desert dry lakes. The total for 1921 amounted to 683 tons, valued at $22,980.

Calcium choride is hygroscopic, that is, it has an affinity for water. This property is taken advantage of by utilizing this salt as a drying agent. It is also sprinkled on dirt roads and playgrounds to keep down dust by absorbing moisture. In refrigerating machinery for ice factories, meat-packing houses and cold-storage warehouses, a calcium-chloride solution is stated to have some advantages over salt brine. In fire buckets this solution has an advantage over pure water, in that it has a lower freezing point, does not corrode metal, and tends to keep the buckets full due to its absorbing moisture from the atmosphere. Powdered calcium chloride is used in drying gases, fruits and vegetables.

MAGNESIUM SALTS (see August bulletin).

NITRATES (see August bulletin).

POTASH (see August bulletin).

SALT.

Bibliography: State Mineralogist Reports II, XII, XV, XVII. Bulletin 24.

Most of the salt produced in California is obtained by evaporating the waters of the Pacific Ocean, plants being located on the shores of San Francisco Bay, Monterey Bay, Long Beach, and San Diego Bay. Additional amounts are derived from lakes and lake beds in the desert regions of the state. The salt production of San Bernardino County is mainly derived from deposits of rock salt which are worked by means of quarrying and steam shovels. A small amount of valuable medicinal salts is occasionally obtained in Mono and Tehama counties, by evaporation from Mono Lake and mineral springs respectively.

Formerly a considerable proportion of the table salt consumed in California was shipped in from Eastern points; but, at present, California salt refineries supply not only our own needs but export a fair tonnage to other markets.

It may appear at first thought superfluous to enumerate the uses of so well-known an item as 'common' salt, one whose history antedates the written page; but it is employed for many purposes other than culinary. A bulletin of the U. S. Geological Survey states that there was produced in the United States in 1920 sufficient salt to supply each one of the 106,000,000 inhabitants with 150 pounds apiece. Besides its culinary uses, salt is employed in packing meat, curing fish and hides, dairying, refrigerating, preserving products from deterioration, pottery glazing, enameling, pickle making, salting live stock, and in some chemical industries, as in preparing soda ash and caustic soda.

Distribution of the 1921 salt production of California, by counties, was as follows:

County	Tons	Value
Alameda	108,925	$370,296
Kern	18,500	93,500
San Bernardino	13,279	67,782
San Mateo	32,587	167,022
Los Angeles, Mono[a], Modoc, Monterey, San Diego*	24,698	134,102
Totals	197,989	$832,702

[a]Medicinal salts.
*Combined to conceal output of a single operator in each.

The above returns show decreases both in tonnage and value from the 1920 figures of 230,638 tons and $972,648. In 1921 there were 8 plants operating in Alameda, and a total of 13 plants in the other counties tabulated.

Production of Salt in California, by Years.

Amount and value of annual production of salt in California from 1887 is shown in the following tabulation:

Year	Tons	Value	Year	Tons	Value
1887	28,000	$112,000	1906	101,650	$213,228
1888	30,800	92,400	1907	88,063	310,967
1889	21,000	63,000	1908	121,764	281,469
1890	8,729	57,085	1909	155,680	414,708
1891	20,094	90,303	1910	174,920	395,417
1892	23,570	104,788	1911	173,332	324,255
1893	50,500	213,000	1912	185,721	383,370
1894	49,131	140,087	1913	204,407	462,681
1895	53,031	150,576	1914	223,806	583,553
1896	64,743	153,244	1915	169,028	368,737
1897	67,851	157,520	1916	186,148	455,695
1898	93,421	170,855	1917	227,825	584,373
1899	82,654	149,588	1918	212,076	806,328
1900	89,338	204,754	1919	233,994	896,963
1901	126,218	366,376	1920	230,638	972,648
1902	115,208	205,876	1921	197,989	832,702
1903	102,895	211,365			
1904	95,968	187,300	Totals	4,087,310	$11,259,136
1905	77,118	141,925			

SODA.

Bibliography: State Mineralogist Reports XII, XIII, XV, XVII. Bulletins 24, 67.

The production of carbonates of sodium in California in 1920 included soda ash from plants at Owens Lake, Inyo County, and crude 'trona' from Searles Lake, San Bernardino County. There were no shipments in 1921 of sulphate from the deposit on Carrizo Plains, San Luis Obispo County. The total amounted to 14,828 tons, valued at $438,996, being less than one-half the record output of 1920 which was 32,407 tons worth $1,164,898, and the smallest yield of any year since 1916.

These 'sodas' produced in California have been used in the manufacture of glass, soap, and paper, as well as for washing and baking soda, in sugar refining, and in various chemical industries. The crude trona shipped in 1921 was used for neutralizing in flotation concentration in place of soda ash. For several years a portion of California's product was exported, but since the latter part of 1920, the export demand has fallen off.

The war stimulated the chemical industry in the United States to produce materials that were formerly imported and to supply them to foreign countries, as well as to devise new uses for chemical products, also to replace more expensive by less expensive chemicals. Sodium compounds replaced potassium compounds, either wholly or in part, in glass and soap making, in photography, in match making, in tanning, and in the manufacture of cyanide for extracting gold and silver from their ores.

Soda Production of California, by Years.

The total output, showing amount and value of these materials in California since the inception of the statistical records of the State Mining Bureau, is given in the table which follows:

Year	Tons	Value	Year	Tons	Value
1894	1,530	$20,000	1909	7,712	$11,593
1895	1,900	47,500	1910	8,125	11,862
1896	3,000	65,000	1911	9,023	52,887
1897	5,000	110,000	1912	7,200	37,094
1898	7,000	154,000	1913	1,861	24,936
1899	10,000	250,000	1914	6,522	115,396
1900	1,000	50,000	1915	5,799	83,485
1901	8,000	400,000	1916	10,593	264,825
1902	7,000	50,000	1917	24,505	928,578
1903	18,000	27,000	1918	20,447	855,423
1904	12,000	18,000	1919	21,294	721,958
1905	15,000	22,500	1920	32,407	1,164,898
1906	12,000	18,000	1921	14,828	438,996
1907					
1908	9,600	14,400	Totals	281,346	$5,958,331

MUSEUM.

The Museum of the State Mining Bureau possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the first five of such collections located in North America; and contains not only one or more samples of most of the

known minerals found in California, but many specimens from other states and foreign countries as well.

Aside from its purely educational features, the Museum daily attracts throngs of tourists and travelers, and furnishes visual evidence of the immense mineral resources of California. The State Mining Bureau supplies a collection of forty typical minerals and ores, appropriately labeled, to any public school in the state upon request.

Mineral specimens suitable for exhibit purposes are solicited and their donation will be appreciated by the State Mining Bureau, as well as by those who utilize the facilities of the collection.

During the month a total of 535 visitors signed their names to the Museum register, and in addition there are many others daily who fail to take note of our request for their signatures.

LABORATORY.

FRANK SANBORN, Petrologist.

The number of new mineral species in California is slowly increasing as the state becomes more settled. Each year several are added to the list which, when first compiled in 1866, contained about seventy-five. At the present time the occurrence of over three hundred minerals is known; of this number more than fifty are of commercial importance.

During the thirty-day period covered by this report 285 samples were received and determined. From this number a list is appended, which, judging from the sample submitted only, may possibly be of commercial value if in sufficient quantity.

The Bureau will supply the name and address of the party who sent in any sample listed, upon request, if the reference number is given.

05–258 Feldspar.
05–259 Copper ore; also kaolinite.
05–260 Kaolin-like mineral.
05–261 Highly kaolinized rock.
05–262 Gold ore.
05–263 Black sand containing gold and platinum group metals.
05–264 Sand containing gold and platinum.
05–265 Copper-gold ore.
05–266 Copper-gold ore.
05–267 Lead-silver ore.
05–268 Thenardite; good grade of sodium sulphate.
05–269 Sphalerite; some silver present.
05–270 Realgar (arsenic sulphide).
05–271 Gold ore; also impure talc.
05–272 Malachite; copper carbonate containing some gold and silver.
05–273 Malachite; some gold present.
05–274 Iron oxides and sulphides; small amount of platinum present.
05–275 Gold quartz.
05–276 Barite.
05–277 Silver-copper ore.
05–278 Limestone.
05–279 Gold ore; contains gold and silver.
05–280 Arsenopyrite.
05–281 Iron alum (coquimbite).
05–282 Sulphides of lead and silver with copper carbonate.

LIBRARY.

E. Cooney, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received during the month, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the State are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geological Survey Bulletins:

Bulletin 686-Z. Structure and Oil and Gas Resources of the Osage Reservation, Oklahoma. By P. U. Roundy, K. C. Heald and G. B. Richardson.

Bulletin 730-C. The Shapes of Pebbles. By Chester K. Wentworth.

Bulletin 735-E. Primary Native Silver Ores near Wickenburg, Arizona. By E. S. Bastin.

Bulletin 736-B. Oil and Gas Prospects in and near the Crow Indian Reservation, Montana. By W. T. Thom, Jr.

Bulletin 707. Guide Book of the Western United States. Part E. The Denver and Rio Grande Western Route. By Marius R. Campbell.

U. S. Geological Survey Professional Papers:

Professional Paper 131-A. Additions to the Flora of the Wilcox Group. By Edward Wilbur Berry.

U. S. Geological Survey Mineral Resources:

Asphalt and Related Bitumens in 1921. By K. W. Cottrell.

Magnesite in 1921. By Charles G. Yale.

Tin in 1921. By Bertrand Leroy Johnson.

Mica in 1921. By B. H. Stoddard.

Talc and Soapstone in 1920. By Edward Sampson.

Bauxite and Aluminum in 1921. By James M. Hill.

Quicksilver in 1921. By F. L. Ransome, with a Supplementary Bibliography by Isabel P. Evans.

Clay-working Industries, Clay and Silica Brick in 1919 and 1920. By Jefferson Middleton.

Feldspar in 1921. By Frank J. Katz.

U. S. Bureau of Mines Technical Papers:
No. 276. Safe Mechanical Equipment for Use in Shaft Sinking. By R. H. Kudlich.
No. 277. Application of the Geophone to Mining Operations. by Alan Leighton.
No. 307. Permissible Explosives, Mining Equipment, and Apparatus, Approved Prior to March 15, 1922. By S. P. Howell, L. C. Ilsley, D. J. Parker and A. C. Fieldner.
No. 311. Factors in the Spontaneous Combustion of Coal. By O. P. Hood.

U. S. Bureau of Mines Reports of Investigations:
Serial No. 2371. Why Miners' Portable Electric Lamps Require Safety Devices. By L. C. Ilsley, Electrical Engineer, U. S. Bureau of Mines.
Serial No. 2372. Keeping up to Date in Safety Methods in Coal Mining. By D. Harrington, Supervising Mining Engineer, Bureau of Mines.
Serial No. 2373. Fuel Economy from Old Plant Equipment. By A. R. Mumford, Assistant Fuel Engineer, U. S. Bureau of Mines.
Serial No. 2374. Summary of Investigations of Dust and Ventilation in Metal Mines. By D. Harrington, Supervising Mining Engineer, U. S. Bureau of Mines.
Serial No. 2375. Approval of Concordia Hand and Trip Lamp for Mines. By L. C. Ilsley, Electrical Engineer, U. S. Bureau of Mines.
Serial No. 2376. Explosives Used in May, 1922. By W. W. Adams, Statistician, U. S. Bureau of Mines.
Serial No. 2377. Storage and Transportation of Portland Cement. By W. M. Myers, Assistant Mineral Technologist, U. S. Bureau of Mines.
Serial No. 2378. Determination of Suspended Matter in Gases by Collection on Filter Paper. By S. H. Katz, Assistant Physical Chemist, Pittsburgh Experiment Station, U. S. Bureau of Mines, and G. W. Smith, Junior Chemist, Pittsburgh Experiment Station, U. S. Bureau of Mines.
Serial No. 2379. Fatalities at Coal Mines in June, 1922. By W. W. Adams, Statistician, Bureau of Mines.

U. S. Bureau of Standards Technologic Papers. No. 214. Durability of Cement Drain Tile and Concrete in Alkali Soils. Third Progress Report (1919–1920). By C. M. Williams, Associate Engineer.

U. S. Bureau of Standards Scientific Papers: No. 435. Metallographic Etching Reagents for Copper Alloys, Nickel and the Alpha Alloys of Nickel. By Henry S. Rawdon, Physicist, and Marjorie G. Lorentz, Assistant Physicist.

U. S. Bureau of Standards Circular No. 90. U. S. Government Specifications for Red Lead—Dry and Paste.

U. S. Department of Commerce—Bureau of the Census:
Fourteenth Census of the United States. Mines and Quarries 1919. Petroleum and Natural Gas—Iron Ore.

U. S. Department of Commerce:
Commerce Reports, August 14, 1922.
Commerce Reports, September 4, 1922.
Commerce Reports, September 11, 1922.
Monthly Summary of Foreign Commerce of the U. S., Part II, June, 1922.

Smithsonian Institution, United States National Museum Bulletin 122. A Monograph of the American Shipworms. By Paul Bartsch.

Smithsonian Institution, United States National Museum. Contributions from the United States National Herbarium, Vol. 24, Part 2; Vol. 24, Part 4.

Florida State Geological Survey. Fourteenth Annuad Report.

Kentucky Geological Survey. Series VI. Oil Field Stratigraphy of Kentucky. by Willard Rence Jillson.

Scientific and Industrial Research Council of Alberta, Edmonton, Canada:
Second Annual Report.
First Annual Report on the Mineral Resources of Alberta. By John A. Allen.
Second Annual Report on the Mineral Resources of Alberta, 1920. By John A. Allen.
Third Annual Report on the Mineral Resources of Alberta—Geology of Drumheller Coal Field.

Canada Department of Mines. Geological Survey: Reports 1921. Parts A–D.

Memoir 131. No. 112 Geological Series: Kenogami, Round and Larder Lake Areas, Temiskaming District, Ontario. By H. C. Cooke.
New Zealand Department of Mines—Geological Survey Branch.
Palaeontological Bulletin No. 9. The Upper Cretaceous Gastropods of New Zealand, by Otto Wilckens, Ph.D.
Alphabetical List of New Zealand Tertiary Mollusca. By Henry Suter.
Transvaal Chamber of Mines. Monthly Analysis of Gold Production in the Transvaal, June, 1922.
Secretario De Industria, Commercio, Y. Trabajo, Instituto Geologico De Mexico. Boletin Num. 37 Estudio Geologico Minero de los Districtos De El Oro Y Tealpujahua.

Societies and Educational Institutions.

Colorado School of Mines: Alumni Magazine, Vol. 4, No. 2, Asbestos.
Pennsylvania State College, Mining Experiment Station of the School of Mines: Bulletin No. 1. An Investigation of the Properties of Smithing Coals. By H. J. Sloman.
University of Illinois: Illinois Athletics.
McGill University: Bulletin of General Information, 1922–23.
American Mineralogist—Journal of the Mineralogical Society of America. August, 1922.
Philippine Journal of Science. April, 1922.
Engineering Society of Western Pennsylvania. Proceedings February, March and April, 1922.
Mining and Metallurgical Society of America. June 1, 1922.
California Academy of Sciences. Proceedings. Fourth Series, Vol. XI, Nos. 18, 19, 20 and 21.

Books.

Material Handling Cyclopedia.
Engineering Index, 1921.

Maps.

Official Railroad Map of California. State Railroad Commission.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

Architect and Engineer, San Francisco.
Arizona Mining Journal, Phoenix, Arizona.
Asbestos, Philadelphia, Pennsylvania.
American Petroleum Institute, New York.
Brick and Clay Record, Chicago.
Chemical Engineering and Mining Review, London, England.
Cement, Mill and Quarry, Chicago, Illinois.
Engineering and Mining Journal-Press, New York.
Financial Insurance News, Los Angeles, California.
Hercules Mixer, Washington, Delaware.
Journal of Electricity and Western Industry, San Francisco.
Metallurgical and Chemical Engineering, New York.
Mining and Oil Bulletin, Los Angeles.
Mining and Engineering Record, Vancouver, B. C.
Oildom, New York.
Oil Weekly, Houston, Texas.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil, Paint and Drug Reporter, New York.
Oil Trade Journal, New York.
Oil Age, Los Angeles.
Oil News, Galesburg, Illinois.
Petroleum Record, Los Angeles.
Petroleum Refiner, Kansas City, Missouri.
Petroleum Age, New York.
Petroleum World, Los Angeles.

Queensland Government Mining Journal, Brisbane, Australia.
Rock Products, Chicago, Illinois.
Southwest Builder and Contractor, Los Angeles.
Stone, New York.
Salt Lake Mining Review, Salt Lake City, Utah.
Standard Oil Bulletin, San Francisco.
Safety News, Industrial Accident Commission, San Francisco.
The Record, Associated Oil Company, San Francisco.

Newspapers.

The following papers are received and kept on file in the library:

Amador Dispatch, Jackson, Cal.
Arkansas Oil and Mineral News, Hot Springs National Park (Arkansas).
Bakersfield Morning Echo, Bakersfield, Cal.
Blythe Herald, Blythe, Cal.
Bridgeport-Chronicle-Union, Bridgeport, Mono Co., Cal.
California Oil World, Los Angeles, Cal.
Colusa Daily Sun, Colusa, Cal.
Daily Midway Driller, Taft, Cal.
Del Norte Triplicate, Crescent City, Cal.
Exeter Sun, Exeter, Cal.
Georgetown Gazette, Georgetown, Cal.
Gateway Gazette, Beaumont, Cal.
Gilroy Gazette, Gilroy, Cal.
Goldfield News, Goldfield, Nevada.
Guerneville Times, Guerneville, Cal.
Humboldt Standard, Eureka, Cal.
Healdsburg Enterprise, Healdsburg, Cal.
Inyo Independent, Independence, Cal.
Inyo Register, Bishop, Cal.
Lake County Bee, Lakeport, Cal.
Mariposa Gazette, Mariposa, Cal.
Mining and Financial Record, Denver, Colo.
Mountain Democrat, Placerville, Cal.
Mountain Messenger, Downieville, Cal.
Nevada Mining Press, Reno, Nevada.
Oroville Daily Register, Oroville, Cal.
Oatman Mining Press, Oatman, Arizona.
Oregon Observer, Grants Pass, Oregon.
Petroleum Reporter, Etna Mills, Cal
Plumas National Bulletin, Quincy, Cal.
Plumas Independent, Quincy, Cal.
Placer Herald, Auburn, Cal.
Sacramento Union, Sacramento, Cal.
San Diego News, San Diego, Cal.
Santa Barbara Daily News, Santa Barbara, Cal.
Shasta Courier, Redding, Cal.
Siskiyou News, Yreka, Cal.
Siskiyou Standard, Fort Jones, Cal.
Stockton Record, Stockton, Cal.
Sunset Journal, Sunset District, San Francisco, Cal.
Tuolumne Prospector, Tuolumne, Cal.
Ventura Daily Post, Ventura, Cal.
Weekly Trinity Journal, Weaverville, Cal.
Western Sentinel, Etna Mills, Cal.

PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of consumers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

Sufficient publicity has not heretofore been given to this feature of the Bureau's work, but in 'Mining in California' a suitable medium is provided for current inquiries of this nature, and, therefore, written or verbal inquiries that come to the attention of the Bureau are summarized in each issue.

The name of the product wanted or offered, only, is published; the name of the owner of the deposit, or buyer, and other details being supplied upon request.

In writing, the reference number of the item should be given.

Mineral Products or Deposits for Sale.

02–115 Ancient channel drift placer. Gravel 2′–6′ deep, 25′ wide. Drain tunnel 400′ in length. Gravity proposition.
02–116 Oil land 4 to 6 miles southwest of Kern River Field.
02–117 500–600 tons high grade orthoclase feldspar.
02–118 Four quartz claims; 2 ledges average 2′ wide; assays $12.50 gold. Considerable development. Small mill near property. Mariposa County.
02–119 Drift placer mine, Lowell Hill, Nevada County. Easy terms.
02–120 Asbestos, barite, and dolomite deposits.
02–121 Wollastonite deposit.
02–122 Magnesite.
02–123 Patented placer mine in Fresno County. 14 claims.

Mineral Products or Deposits Wanted.

03–107 Gypsum deposit; must have merit and price within reason.
03–108 Gypsum deposit.
03–109 Platinum group metals.
03–110 Clear quartz crystals.
03–111 Gypsum, for plaster of Paris; deposit or tonnage near San Francisco market.
03–112 Limestone deposit; for fertilizer. Near transportation on east side San Joaquin Valley.
03–113 Chrysotile asbestos; for magnesite cement; deposit.
03–114 Glass sand deposit.
03–115 Strontium ore; tonnage.

EMPLOYMENT SERVICE.

Following the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

The Bureau registers technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

A list of applicants for positions and 'positions open,' received by the Bureau during each 30-day period preceding the date of publication of the Monthly Chapter is carried in each issue.

Each notice is designated by a key number, and communications sent to the Bureau in reply to any notice will be forwarded to the proper party without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau, to avoid possible loss.

Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

01–33 Assistant in office or field with mining company, anywhere. Technical education, civil engineer. Knowledge of typing, bookkeeping and cost-accounting. Experience covers period from 1910 to 1921; details on file. Age 33. Married. References. Salary open.

01–34 Mining Engineer. Nineteen years in managerial and examination work. Experience in Alaska, Canada, Mexico and Central America, in addition to the United States. Age 43. Married. Salary open.

01–35 Plant Engineer-Geologist. Ten years experience with chemical company, copper mine, and in Orient. Age 35. Married. References. Salary wanted $175.

01–36 Mechanical Engineer. Three years experience as tool maker, lathe operator and mechanical engineer with oil and maufacturing companies. Age 25. Single. References. Salary open.

01–37 Superintendent-Manager. Exploration, development or production of gold. Twenty years general engineering experience in gold and coal mining operations. Interview requested for details. Age 43 Married. Salary open.

POSITIONS OPEN.

04–10 Mill Foreman. Take charge of 50-ton mill using ball mill, Overstrom tables and K and K flotation machines. Must be experienced mill man with ability to work out flotation problems. Salary to start $200, less $40 per month for board. Decided chance for advancement.

During the month three openings have been found for registered men.

OCTOBER, 1922

REPORT XVIII OF THE STATE MINERALOGIST

DISTRICT REPORTS OF MINING ENGINEERS.

In 1919–1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each divison working out from a local branch office.

This move brought the Bureau into close personal contact with operators, but did not materially shorten the time between the gathering of data in the field and their publication in the Report of the State Mineralogist at the end of an annual or biennial period.

Mining activities and development noted by district engineers in their respective fields are now embodied in monthly reports published in each issue of 'Mining in California,' thus making these data available within a maximum period of thirty days, and the Monthly Chapter as far as possible a compendium of current mining progress throughout the State.

The counties included in each field division and the location of the local offices are shown on the accompanying outline map of the State. (Frontispiece.)

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the State's oil fields is included under this heading.

REDDING FIELD DIVISION.

W. B. TUCKER, Mining Engineer.

Shasta County.

Bell Cow Mine, formerly known as *Arbuckle Mine*, is situated on the southwest slope of Arbuckle Mountain, in sections 35 and 36, T. 30 N., R. 9 W., 18 miles southwest of Ono. Owners: J. W. Carter, J. P. Erhart, Frank A. Greene, S. H. Fisk, and Herbert Fisk of Redding.

Holdings consist of 16 claims, comprising 332 acres. On the property, there is a series of parallel siliceous dikes, the most prominent being west of No. 2 tunnel workings. The general trend of the main veins is northwest and southeast, and dip at from 30 to 40 degrees westerly, toward a massive siliceous dike which is schistose in structure. This dike is 6 to 10 feet in width and extends over the full length of the Bell Cow No. 1 claim and into adjacent claims.

The different veins have been developed by 9 tunnels, at different elevations on the slope of the ridge south of the Middle Fork of Cottonwood Creek. At an elevation of 1800 feet, No. 1 tunnel is a crosscut tunnel driven 500 feet to cut vein opened up in No. 2 tunnel. About 50 feet above No. 1 tunnel, is No. 2 tunnel, driven 203 feet on the main vein. In this tunnel a vein of quartz was developed from 2 to 4 feet in width. Reported to assay from $10 to $20 per ton. The shoot is 200 feet long. No. 3 tunnel is a crosscut tunnel, driven 165 feet to cut the same vein, and southeast of this tunnel is No. 4 tunnel, 75 feet in length to the vein. The other tunnels are caved, but reported to be from 20 to 150 feet in length. Total lineal feet of drifts and crosscuts is 1273 feet.

There is a 5-stamp mill on the property, 1050-pound stamps, 7″x9″ Dodge crusher, Challenge ore feeder, amalgamating plates, Woodbury concentrator, all driven by 15-h.p. Fairbanks Morse gas engine.

Idle.

Central Mine. The property is situated in the Old Diggins district, in Sections 33 and 34, T. 33 N., R. 5 W., 8 miles north of Redding. Holdings consist of the following claims: Bertha May, Central, South Central, and Shasta; 60 acres. Owner: A. A. Anthony of Redding. Elevation, 800 feet.

Two parallel veins occur in the meta-andesite, strike being north and south, and dip 65 degrees east. All work has been confined to the Central vein. At an elevation of 1000 feet, a crosscut tunnel has been driven N. 65° E., 200 feet, where it cut the vein, with drifts on the vein, 500 feet north and 200 feet south. Vertical depth below outcrop is 175 feet. Pay shoot developed was 230 feet long and 6 feet wide. Ore was free milling. At an elevation of 800 feet, a lower crosscut tunnel has been driven, 956 feet to the vein, with drift north on vein 644 feet, and 218 feet south. In the south drift, the vein was cut off by an east and west fault. Here a crosscut was driven, 75 feet west and 171 feet east, but it did not cut the vein. The vein in the south drift is 3 to 10 feet wide, but low grade. In the north drift, 208 feet north of crosscut, an ore shoot, 165 feet long was cut which was stoped in places to the upper tunnel. The vein is from 4 to 15 feet wide. This ore was shipped to the smelter at Kennett and is reported to have averaged from 80 cents to $20 per ton. The vein quartz is white, carrying chalcopyrite, and pyrite in small proportions. The gold values are in the sulphides. Equipment consists of cars, track, blacksmith shop, and tools. In 1912, the production was $45,000 and total production is reported to have been $500,000. Two men employed.

Bibliography: State Mineralogist Reports VIII, pp. 565-566; X, p. 631; XII, p. 246; XIII, p. 351; XIV, p. 781.

Florida and Big Gem Group of Mines. This group of mines is situated in Sections 7, 12, 18, T. 31 N., R. 5 W., in Middletown Mining district, 7 miles west of Redding. Elevation, 1000 feet. Owner: G. W. Boswell, of Redding. Holdings consist of 12 claims, totalling 240 acres.

On this group of claims, there are two principal quartz veins, and a series of smaller ones, which occur either on the contact of meta-andesite and slate, or confined entirely to the meta-andesite. The quartz is considerably shattered and iron stained in the fractures. Gold is free and in the sulphides. The Miners Dream vein, is very strong, and can be traced by its extensive outcrop the entire length of the claim. Strike N. 80° E., dip north. Several shafts have been sunk on the vein to a depth of 40 to 50 feet, and in one, a drift has been driven about 100 feet, from which a winze was sunk 50 feet. Here the vein is 12 feet wide. Assays along this vein are said to run from $8 to $20 per ton. The Big Gem ledge, apparently the strongest and most persistent of the group, lies south of the Miners Dream, striking N. 30° W. Its croppings vary from 5 to 15 feet in width and outcrop the whole length of the claim, and beyond its southeasterly limit. It has been developed only by means of some shallow shafts, the deepest being sunk to a depth of 70 feet. Besides the veins described, the others are all well defined quartz ledges, but only developed to a small extent. One man employed.

The Gold Leaf Mine, situated 4 miles west of Redding, has been transferred to the Gold Leaf Mining Company by Ira Judson Coe, Richard F. Tomlinson, and F. W. Heron of San Francisco. Under the supervision of E. L. Anderson, the shaft is being unwatered. It is 400 feet deep. Water has been bailed out to a depth of 221 feet. Two shifts are employed.

H. E. Schoonover, F. C. Walker, Chas. P. Heaney, and B. A. Furcell of McCloud, have located six quartz mines in the Old Star City district. The claims are: Shasta Lily, Tiger Lily, Pond Lily, Heaney, Purcell, and Skoog; known as the *Star City Group* of mines.

William Arps of Copper City, has located five claims in the Pittsburg Mining district, named: Old Massachusetts, A. B. F., Caution, Gay Queen, and Croesus.

The *Shasta Mines and Reduction Company* of Weed, Siskiyou County, has been incorporated to develop the diatomaceous earth deposits in the northeastern part of Shasta County. T. F. Mouche of Weed, Tunis Heyton of Portland, Oregon, and A. D. Fish of Oakland are directors.

The *United States Smelting, Refining and Mining Company,* owner of the Mammoth, and other mines near Kennett, have filed for record, a United States patent for these mines in the Flat Creek mining district, near Kennett: McKinley, Evening Star, Backbone, Storm King, Link, Red Queen, Wedge, Spread Eagle, Ridge, Tom Boy, Canon, Grey Eagle, Connecting Link, Extension, Jumbo, Copper King, Copper Queen, Great View, Good Hope, Summit, American Girl, Merry Mack, and North Pole. The claims embrace portions of Section 18, T. 33 N., R. 5 W., and Sections 14, 15, 23 and 24, T. 33 N., R. 6 W.

Yankee John Mine, situated 6 miles southwest of Redding, and owned by the Yankee John Development Company, home office, Pittsburg, Pennsylvania, is being reopened. Several men are employed on development work, under the supervision of W. L. Clark.

The Lost Channel Gravel Mine, situated near Igo, and owned by C. W. Russell of Igo, is under operation. Several men are employed on development work. Operations are under the supervision of C. W. Russell.

Siskiyou County.

A. Jacquemart of San Francisco, has purchased the *Paddy Cronin Placer Group* of mines, composed of five claims, located five miles below Sawyers Bar, and is making preparations to work this fall

At present, he is building five miles of ditch which will take water out out of the North Fork of the Salmon. It is reported that the gravel goes over 50 cents per cubic yard.

The *Homestake Quartz Mine,* owned by R. S. Taylor of Yreka, and situated 10 miles southeast of Etna Mills, is being operated and the 2-stamp mill is running. Eleven men are employed.

The *Cub Bear Mine,* situated 12 miles southeast of Etna Mills, is being developed by the Siskiyou Syndicate, Irving J. Luce of Los Angeles, president. In recent development work, a very strong vein showing good values has been opened up.

Fred Myers has leased the *Hickey Homestead Hydraulic Mine*, situated 2 miles west of Sawyers Bar. The property has been operated for the past three months, with encouraging results.

Miles Neilon and W. Putman are developing some claims which they located in 1921, in Counts Gulch. They have uncovered a 4-foot vein of ore, carrying high values in gold.

The *June Bride Mine*, at the head of Trail Creek, is being operated by Benjamin Bull of Cecilville.

S. D. Bradley of Yakima, Washington, and C. W. Welch are operating the *Progressive Placer Mine* in the Beaver Creek district.

Highland Mine, at the head of Trail Creek, a tributary of the East Fork of the Salmon River, about 12½ miles west of Callahan, has been taken over by T. M. Taylor, C. Wilson, and J. R. Porter. Six men are employed on development work, and making repairs to the old mill and pipe line.

Ball Quartz Mine, situated 3½ miles southwest of Sawyers Bar, has been bonded by Fred Gowing of Berkeley. In recent development work on the property, a vein 3 feet wide has been opened, which is reported to run $25 per ton. The 5-stamp mill is being operated steadily on good ore. Twelve men are employed.

The Hoboken Mine, situated 11 miles north of Fort Jones, has been bonded by Diggles and A. H. Bowie to Oakland people, who have eight men working on the property. In a lower tunnel, they have developed a vein having a width of 12 inches to 6 feet. Ore being milled from this vein averages $12 per ton.

Tehama County.

The well of the *Tuscan Oil Company*, 6 miles north of Red Bluff, is down 1800 feet. Superintendent L. F. Richardson, reports that steady progress is being made in the drilling operations. Two shifts are working.

Trinity County.

During the early part of October, the dredge owned by *Lewis Gardella* of Oroville, which is located on the Paulson ranch across the river from Lewiston, started operation. Claude Enslow, superintendent.

The *Unity Hydraulic Mine*, situated 4 miles north of Minersville, on the East Fork of Stewarts Fork, in Sections 27, 28, T. 35 N., R. 8 W., has been recently purchased by the *Nugget Bar Placer Company* of Oakland. J. A. Gillice is president and general manager. Fred Kendall, superintendent.

Holdings consist of following claims: Rowles Placer Mine, Minersville Placer Mining Claim, Italian Placer Mine, Shady Gulch Placer Mine, Oak Placer Mine, Hayward No. 2 Placer Mine; comprises 610 acres. Elevation, 2200 feet. In previous years, the property was worked by two hydraulic pits, on the west side of the East Fork of Stewarts Fork.

Bedrock is diorite and slate. There is 20 to 60 feet of gravel, with clay soil overburden. Course of channel is north and south. Water is secured from the East Fork of Stewarts Fork, through a ditch 3½ miles

long. Gravel wash shows granite, slate, and porphyry boulders, with a small amount of large boulders.

Twenty-five men are employed building a flume and getting ready to operate the property, this winter.

Gifford Mine. It is situated 5 miles northeast of Lewiston, in Section 3, T. 33 N., R. 8 W., on the slope of the ridge south of Eastman Gulch. Elevation 3050 feet. Claims: Blue Jay, Confidence, Mountain Echo, and Battle Axe; comprises 70 acres.

A series of parallel veins of quartz occur in granite-porphyry, in close proximity to the contact with granite-porphyry and meta-andesite. The general course of the veins is N. 40° E., dips 45° to 70° southeast. Width from 12 inches to 2 feet.

Developments consist of four crosscut tunnels, driven at different elevations. Recent development work has been confined to driving the Richards & Lindermuth crosscut tunnel to develop the shoot of ore worked in the upper tunnels. At an elevation of 3050 feet, the tunnel is driven S. 19° W., 700 feet, at 180 feet from the portal it cut the contact of meta-andesite and granite-porphyry. Porphyry lies on the west with meta-andesite on the east. Contact strikes N. and S., dips 60° E. At 680 feet it cut an E. and W. fault, dip 75° S. The vein is faulted 29 feet to the south. A drift has been run 40 feet west on this fault where it cut a vein which strikes N. E.–S. W. and dips 45° S. E. The vein has a width of 16 inches and is reported to assay $250 per ton.

Quartz contains a large percentage of sulphides, showing free gold, pyrite, galena and arsenopyrite. At 600 feet from the portal, the tunnel cut a N. and S. fault. In an upraise, 30 feet above the drift, a vein of quartz was cut which strikes N. 30° E. and dips 80° E. Width 12 inches to 2 feet. Assays taken along the vein for a distance of 40 feet, gave an average value of $20 per ton. Above the Richards tunnel 115 feet is the Lane tunnel, which is driven south 400 feet, then southeast 280 feet. At 560 feet from the portal of this tunnel, it cut a contact between meta-andesite and porphyry. Drift runs 80 feet to southwest, where it cut an E.–W. fault. A raise on the fault cut a vein 5 feet wide. The Wilson and Ehrman tunnel is 155 feet above the Lane tunnel. It is driven southeast 280 feet to the vein, turned southwest 100 feet and then 80 to the northeast on the vein. There is reported to be a large amount of ore in the upper workings, as only a high-grade streak was mined.

Assay value of shipments made from the property from January, 1907, to October, 1920, ran from 10 to 20 ounces in gold. The mine has a reported production of $75,000.

Equipment consists of cars, track, blacksmith shop, tools, and bunk house. J. F. Gifford of Lewiston, owner. Property under option to Clyde P. Richards and associates of Los Angeles. Two men are employed on development work.

Venicia Mine. The property is situated 6 miles northeast of Lewiston, on the ridge between Eastman Gulch and Jennings Gulch, in Secs. 2 and 3; T. 33 N., R. 8 W., elevation 3300 feet. Owner, L. S. Paulson of Lewiston. Under option to John E. Bennett and associates of San Jose.

Claims: Venicia, Hopeful, Blakemore, Providence, (½ claim) Rattler, Deerhorn, Venicia No. 2, and 4 new locations. Holdings comprise 230

acres. A series of parallel quartz veins occur in the granite-porphyry; strike N.E. and S.W., dip 80° E. The lower tunnel, cut a north and south vein, dipping 80° east. Ore occurs in lenticular lenses. Quartz carries heavy sulphide, showing free gold, pyrite, galena, and arsenopyrite. Width of veins varies from 12 inches to 3 feet.

Developments consist of five tunnels, the four upper tunnels being on the Venicia vein which strikes northeast and southwest and dips 80° east. Width 2 to 3 feet. Present development confined to driving No. 5 tunnel to intersect Venicia vein, 150 feet below old workings. In driving this tunnel, it cut a north and south vein 202 feet from portal of tunnel. This vein is being drifted on to the north. The vein has a width of 6 inches to 3 feet, and carries high values in gold. Average width of high grade ore is 12 inches, and reported to assay from $100 to $600 per ton. In this north drift, a winze has been sunk to a depth of 20 feet. The vein in the winze averages 12 inches in width. The quartz shows a high percentage of pyrite and galena, also some free gold. Also driving N. 85° E., in this tunnel to cut the Venicia vein. No. 3 tunnel is 150 feet above No. 5 tunnel and driven N. 70° E., parallel to the Venicia vein. At 156 feet from the portal it crosscuts to the vein and then follows it for 750 feet. In workings on tunnel No. 3 level, there is reported to be a large tonnage of milling ore, as only the high grade streak was mined, and shipped. Samples taken at intervals in these workings are reported to assay from $10 to $20 per ton.

No. 4 tunnel is driven on the opposite slope of the ridge to the south, 1200 feet. It is connected with No. 3 tunnel by a raise of 50 feet in height. Reported production from upper workings, $500,000.

Equipment consists of cars, blacksmith shop, tools, track, and bunk houses. Four men are employed on development work. W. A. Henderson, superintendent.

Trinity Mohawk Mine. The property is situated 15 miles northwest of French Gulch, on the south slope of the Trinity Range of mountains, between Mooney Gulch and Little Papoose Creek. It is in T. 34 W., R. 8 W. Owner: J. H. King of Redding.

The Trinity Mohawk group consists of 11 claims, and the Golden Oaks group, comprising three claims; total 280 acres. A series of parallel quartz veins occur on the contact of slate and diorite-porphyry. These veins have a general strike of N. 80° W., with dips varying from 25 to 45 degrees north. Widths 3 to 10 feet. Vein filling is white quartz carrying a small percentage of pyrite. At an elevation of 3880 feet, the Trinity Mohawk group is developed by two crosscut tunnels. These workings are 122 feet apart and one is 200 feet in length, the other 194 feet. Samples taken from an open cut on the vein above these tunnels are reported to assay from $8 to $18 per ton. Above tunnel No. 1, an incline shaft has been sunk to a depth of 42 feet. The vein near the surface in these workings has a dip of 40° N., but near the bottom of the incline flattens out to 15°. The vein has an average width of 4 feet. Over No. 2 tunnel, which lies west of No. 1, an incline shaft has been sunk to a depth of 20 feet. Here the vein has a width of 10 feet. An open cut has been made along the vein for a distance of 100 feet west of No. 1 incline shaft.

This vein has not been cut in either crosscut tunnel. Near the top of the ridge, at an elevation of 4300 feet, there are a series of parallel veins in the slate, and shallow open cuts expose 4 to 8 feet of quartz. On the Golden Oaks claims, there are 12 parallel quartz veins in diorite-porphyry, which have a general N. 80° W. trend and dip 40° N. A number of shallow open cuts have been made along the outcrops.

AUBURN FIELD DIVISION.

C. A. Logan, Mining Engineer.

Sierra County.

Quartz Mining in the Alleghany District.

Mining in this district has recovered from the setbacks of the past few years and the region is daily gaining more attention due to recent successes in the operation of a few properties. Several small outfits are prospecting and promotion and exploration plans are announced from time to time as one after another of the old mines and prospects are taken up.

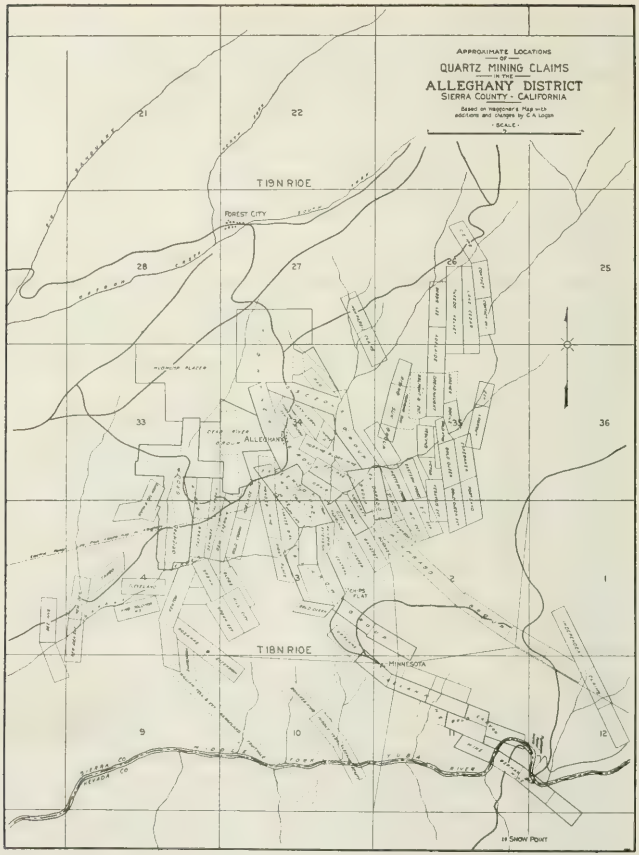
Geography. The town of Alleghany is near the center of an area of about fourteen square miles extending from Oregon Creek on the north to the Middle Fork of Yuba River, in which there are many old gravel mines and more than 150 quartz locations. Kanaka Creek and its branches flow southwest past the town, carving a deep canyon which has offered sites for numerous adits. Alleghany has an elevation of 4700 feet, with considerable snow in winter. The new Foote road is 32 miles long from Nevada City and the shortest way to the railroad. It was built at a reported cost of $87,000 through the efforts of A. D. Foote. Freight costs a cent a pound from Nevada City. The accompanying map shows the location of most of the mines mentioned in this report. It is not accurate in all details, but will help the reader to locate the different properties.

Power. Electric power for the mines is supplied by the Middle Yuba Hydro-electric Co. which has a line from the Alaska Mine at Pike City to Alleghany, with a local substation on the Happy Jack claim one-half mile south of town. A few mines have water rights that permit the direct use of water for power, or the generation of electricity.

Geology. The areal geology of the district was covered in the Colfax folio of the U. S. G. S., but this map is on a scale that does not permit enough detail for use in a study of the mines. H. G. Ferguson[1] wrote a short report upon the geology of the district, with a discussion of the mineralogy and ore deposits as far as revealed at the time of his visit, nine years ago. His paper is the only one extant dealing with these points in any detail. This Bureau's last county report also contains some additional details but there have been many changes and a great deal of development work since it was published.

In the following pages the individual mines are discussed, particularly as regards development underground, production and present condition. The statements made regarding conditions underground are based in nearly every instance upon the writer's observations, when the mines

[1]Ferguson, H. G., U. S. Geol. Survey Bulletin 580.



were accessible. Where inaccessible, the data was gathered from mine maps, and where these were not to be had, from owners or operators.

The principal rocks of the district are amphibolite schist, serpentine, and the metamorphosed rocks of the Carboniferous, once sedimentary but now slates, schists and quartzite. These strata have been compressed and folded by forces acting along a northeast-southwest direction. The amphibolite shows the same dip of schistosity in general to the east-northeast. The amphibolite schist has been considered as derived from gabbro by pressure, and the serpentine is probably derived from

peridotite or pyroxenite. The inference is that the serpentine is derived from rock that was originally injected into the older gabbro or amphibolite as sills and dikes. The 'bluejay' of the wall rock near the vein is an aggregate of quartz, dolomitic marble and calcite, of varying composition, containing more or less quartz but sometimes essentially a dolomite, and nearly always colored by green mariposite, derived from the serpentine. This mineral is a characteristic of the California gold belt wherever serpentine is prominent.

Most of the veins of the district have strikes between north and west, and dip northeast. The dip is generally less than that of the schistosity of the amphibolite schist, in which most of them have their principal development. There have been recurrent periods during which the fissures in the amphibolite have stood open for the formation of quartz veins, but there seems to be plenty of evidence to support the contention that the veins do not live in the serpentine for any great distance, although it may be reasonable to look to the parent rock of the serpentine as an agent for some of the phenomena of the ore formation. The mines have not yet been worked deep enough to prove that the very rich specimen ore will persist below the ground water level. There are some indications to show that as this level is approached, there is more of the pay in sulphide ore of lower tenor and in larger shoots. Rich specimen ore has been found under such a variety of conditions that experienced operators are adverse to naming any particular indications as necessary accompaniments of 'high grade.' The writer has concluded that it would be of interest and value to set down as many of these observations as were brought to his attention by mine foremen and superintendents who have been working in the mines for years, who have found pay where it was least expected, and have failed to find it where all past signs pointed to it.

A broken footwall or hangingwall seems to be most often alluded to as being near or with 'high grade.' Such breaks may mark the points of entry for mineralizing solutions. On the other hand, a thick layer of talc on the footwall has been found more than once in particularly poor places. Many of the veins show a marked tendency to branch into the footwall; the hangingwall is as a rule more distinct and firm. The broadening of a vein and marked disturbances in the nearby walls, incident to the approach of another vein, may be favorable for ore, which may be found outside of the main vein itself. The occurrence of water courses is thought favorable. 'Bluejay' of a particularly bright tint is held to be especially favorable. Ribbon structure in the veins is prominent, but not a mark for high grade ore, though often occurring with bodies of milling grade. The typical pocket rock, as pointed out underground, is a dead snowy white quartz. Arsenopyrite is always regarded expectantly, but is not always rich enough to be classed as high grade ore. Ribbon structure may show either arsenopyrite or the finely ground black schist in the ribbons.

Samples of the wall rocks from a number of the mines were taken by the writer and it is hoped that thin sections can be prepared from these and that the results of studying them under the microscope can be published later. The great amount of secondary carbonate rocks and the persistence of the lenses of black slaty schists are interesting and worth studying because of their probable influence on the ore deposits.

Belmont Group comprises two locations, Belmont and Belmont Annex, in the N.W. ¼ Section 35, T. 19 N., R. 10 E.; and is reached by the Mariposa Mine road and a trail from Alleghany. Owners, Mrs. L. C. Harden and Peter Flowers. Flowers is at present working alone, following a vein showing ore about six inches wide. During the summer just past, he had a mill test of about 1500 pounds of ore that yielded $15 gold and he occasionally mortars specimen rock showing a few dollars. There are several short adits, up to 150 feet in length.

Brush Creek Mine is outside the area of the Alleghany district as here described. It is at Mountain House and the vein is on the contact of the slates and the western area of serpentine that passes about three miles west of Alleghany. There is an old shaft said to be 800 feet deep, and adits. Work began during the month of September. A power line is to be built a mile and a quarter from the Kate Hardy Mine, and an old adit will probably be advanced toward the shaft.

The vein is supposed to be the same as that in the Kate Hardy Mine, under which it is more fully described. The Brush Creek Mine was an early producer, with a record for good ore. In 1869 there was a 20-stamp mill on the property and during that year the mine produced for the first eight months ore that averaged $31.31 a ton and in December of the same year averaged $42.50 a ton, according to an old report. It was then being worked to a depth of 300 feet.

Contact Mines. F. J. Hulaniski, president, Drawer K, Richmond, Cal. C. H. Weldon, superintendent, Alleghany. The group contains five unpatented claims covering 3000 feet along the contact of slate and serpentine, four miles by road and trail west of Alleghany and just north of the Foote road. It is believed by the operators to be on the southward extension of the Kate Hardy contact.

The adit portal is on Contact No. 1 claim, 150 feet from the south end-line and when visited September 20 had a total length of 206 feet, of which a few feet are crosscut and the balance on the vein or in the fissure filling. This adit was then about 75 feet below the surface at the face and will give increasing depth northward. The vein strikes N. 20° W. and dips 70° to 80° west. In the face when visited it showed stringers of quartz, crushed slate and the characteristic 'bluejay' or mariposite-dolomite rock of the district. A few feet back from the face, the roof of the drift was quartz for its entire width. A crosscut of eleven feet into the footwall showed 'bluejay' entirely. The hangingwall is slaty schist, usually dark and in places resembling serpentine. The serpentine of the footwall is only a short distance from the tunnel, which is being turned to reach it.

The vein so far has pinched and swelled abruptly and many high assays have been reported from it, but most of these were picked and therefore of little value in forming an estimate of the average value. The presence of 'bluejay' in such quantity on the east is the best sign so far encountered.

There is a small air compressor run by a 40-h.p. tractor engine, furnishing air for drilling. There are some dwellings on the claims.

Dead River Group adjoins the town of Alleghany on the west, and comprises the Dead River and Lackawanna Placer claims and the Wyoming and Wyoming Extension lode claims. The Dead River was

prospected for gravel without much resulting. A crosscut was driven from the Happy Jack claim across the Wonder claim, for a distance of 1700 feet, striking a vein reported by the owner to be 3 feet to 5 feet wide, with serpentine on the east and slate on the west. This vein was found about on the end line common to the Wyoming and Wyoming Extension claims and was drifted on for about 200 feet and a winze was sunk 100 feet, according to Weiland. The adit is at an elevation of 4600 feet.

The property has been recently under consideration by an engineer for the Tonopah Mining Company interests. A plan for working the two above claims through the Oriental main adit has been entertained. This latter adit enters the ridge at an elevation of 4050 feet, is supposed to be in good shape, and could be continued eastward across the Lackawanna claim to prospect the Wyoming claims 600 feet deeper than yet reached. Stanley Weiland, Scranton, Pa., owner.

Docile Mine comprising Docile and Loosner claims, has been idle since the last report. Reported production about $100,000. The old 10-stamp mill has been exposed to the weather for years.

Bibliography: State Mineralogist Report XII, page 264; and Register of Mines, 1903, page 4.

Dreadnaught Mine comprises the Dreadnaught and Seneca Fraction claims, west of the Docile in Section 35, T. 19 N., R. 10 E. It has been idle for a number of years. There is a 1-stamp mill, now in ruins.

Bibliography: State Mineralogist Report XII; also Mines and Mineral Resources of Sierra County, California, State Mining Bureau, 1918.

Edwards Group of claims lies between the Plumbago and Rainbow Mines near Chips Flat. There are four quartz locations, called Bonanza, Banquet, Red Jasper and Central, and these are partly covered by a placer claim called the Chips Flat Placer, containing 40 acres. E. Edwards of Alleghany is the locator. On the Red Jasper claim, which is a south extension of the Queen Radigunde, there is a tunnel 700 feet long which taps a gravel deposit and cuts one vein which the owner reports is 4 feet wide. On the Banquet claim, formerly called the Bonanza, there is a cut and adit 40 feet long entering but not bottoming the gravel.

El Dorado Mine, Fessler Estate, Alleghany, owners. Under lease and option to El Dorado Wisconsin G. M. & M. Co., 816 Tribune Bldg., Chicago. Eugene Yahr, president. Comprises three claims, El Dorado, El Dorado Extension and Gold Bullion or Terrible, the latter on a second vein.

The El Dorado vein has been developed by a series of adits driven on the vein from the south bank of Little Kanaka Creek, and higher on the same side. The vein has a strike varying from S. 33° E. to S. 45° W. and dips about 45° east or northeast. No. 1 adit is about 475 feet long and 130 feet below the outcrop on the dip of vein. An area 120 feet long by 60 feet high, beginning 60 feet from the portal, has been stoped above this level. No. 2 adit is about 110 feet below No. 1

on the dip and is 475 feet long. A small area was mined between these two adits. No. 3 adit is near the level of No. 4 and 250 feet west of it. It is 440 feet long and 340 feet below No. 2 on the dip. It is caved at the portal.

No. 4 is the present working entry and the place where best observation is possible. It runs as a crosscut 60 feet to the vein from a few feet above the level of the creek on the south side, thence for 410 feet on the vein in a general course S. 33° E. to raise No. 2. There it turns S. 56° E. for 600 feet to an abrupt bend in the vein, where the tunnel takes a course southwest and south to the face. Raises and winzes were driven from this adit as follows: Raise No. 1, 170 feet from the portal is up about 30 feet. Raise No. 2 is 470 feet in and up 60 feet above the adit with an upper level driven south 120 feet and north 30 feet. Raise No. 3 is 790 feet in, and Raise No. 4 is 860 feet in. Between these, specimen rock has been mined. One hundred fifty feet beyond, or 1010 feet from the portal, a winze has been sunk on the vein 200 feet, with levels at 100 and 150 feet. From the 100-level, the vein has been drifted north 300 feet and south 50 feet; on the 150-level south 400 feet and north 75 feet. These lower workings are at present full of water. The vein is said to be 4 feet wide in the bottom of the shaft and 7 feet wide in the south on the 150-level, but in a pinch on the north. Twenty feet beyond the winze is Raise No. 5 connecting with the face of No. 2 adit, with a sub-level two-thirds the way up, that runs northwest 300 feet. Some high grade ore was stoped here in a length of 70 feet nearly up to No. 2 adit and in a winze 35 feet below the level. From the shaft to the face is about 430 feet. The face is 800 feet on the dip of the vein from the surface. About 125 feet back from the face ore said to have averaged $10 a ton was stoped for a length of 75 feet and a height of 225 feet and was followed 80 feet below the level in a winze. The formation of this ore is attributed to the intersection of a stringer 6 inches wide, striking east and dipping north, which comes up to the main vein from the footwall but does not pass through into the hangingwall. The ore was along and near the intersection.

The vein at the face of No. 4 adit and for 110 feet back, strikes nearly due south and dips 45° east. It has a width up to 7 feet with a hangingwall of black slaty schist, and a lens of hangingwall rock a foot thick next the vein has been ground to gouge. The vein is similar to others in the district, of white quartz and ribbon rock. The footwall is of broken black slaty layers with 'bluejay' very prominent. The rock of both walls seems to have been a dark fine grained igneous rock originally. The tendency of the vein to branch into the footwall and the altered and shattered character of the latter, raises the doubt as to whether the real footwall has been reached. Coming from the face toward the portal, the vein enters a pinch 150 feet from the face, and is pinched for 300 feet. Here the serpentine hangingwall bends out, bending the vein. Three hundred fifty feet from the face, a stope 40 feet by 40 feet on high grade ore was thought by Superintendent Fessler to have been formed from stringers coming in from the hangingwall. Stringers also enter here from the footwall, however, in which 'bluejay' is prominent. An interesting but so far unproductive split occurs in the vein 550 feet from the portal. The quartz pinches here and the fissure is filled by a horse. The

well marked footwall was followed by a drift 80 feet long, S. 23° E. and at the face of this drift the two walls are about 40 feet apart. The hangingwall at the split is firm and well defined and holds a course of S. 38° E. Entering from the footwall, a well marked, nearly horizontal floor cuts through the horse in the roof of the drift but does not enter the hangingwall. From here out in the main drift the vein is big for 180 feet, then pinches for 90 feet, again swelling for 140 feet and so on.

G. S. Fessler states the mine has produced $225,000 from No. 4 adit to the surface. The present company began work March 24, 1919, and began milling in March, 1920. They report 4591 tons crushed, for gross returns of $52,652. Of this amount, 1408 tons of ore from the 150 ft. winze and its drifts yielded $9,448 and 336 tons from the winz farther in yielded $3,573. Concentrate is reported to form 2 per cen of ore and to be worth $129 to $169 a ton. This company did all th work below No. 4 adit and also drove the adit ahead 360 feet.

The mine has an air compressor run by 75-h.p. motor, electricity having been brought in to supplement water power. The old mill of ten 850-pound stamps will crush about 20 tons a day. A secondhand mill of twenty 1250-pound stamps has been bought and excavation for it is going on. At present it is planned to run the old mill with a 40-h.p. tractor engine. Sufficient water can be had from the creek to run the old 10-stamp about half the year.

Gold Canyon Mine adjoins the Irelan on the east, in the east half of Section 11, T. 18 N., R. 10 E. adjacent to Middle Fork of Yuba River. Our last report describes the workings. Little new underground work has been done since it was written. The last operators unwatered the workings and did some diamond drilling from the lowest level, which is about 360 feet deep, to an added depth of 400 feet, but report the vein was not found. This failure to find the vein has been attributed to the fissure passing into the serpentine, where it is presumed to pinch.

The main production, stated to have been $740,000 came from an ore shoot 285 feet long, 360 feet deep and with an average width of three feet. This was in the amphibolite near the serpentine; when the vein struck the serpentine a former operator reports that it broke into stringers and died. The last pay came from a winze sunk a few feet below the lowest level, 125 feet from the serpentine contact. Present lessees are prospecting for pockets in the upper levels. The mill has been burnt down since the last report.

Gold King Prospect is in Sec. 5, T. 18 N., R. 10 E. four miles southwest of Alleghany and adjoining the Contact No. 1 claim of the Contact Mines, on the south. An adit has been driven some 200 feet but there is no work being done now and the writer did not examine the showing underground. C. H. Weldon is in charge.

Golden King Mine has been idle since the last report. It is in Section 35 adjoining the Dreadnaught on the south, and is equipped with a 10-stamp mill, built about 1895 and buildings that are falling to ruin.

Bibliography: State Mineralogist Report XIII, p. 377; and Mines and Mineral Resources of Sierra County, 1918, p. 90.

Granger Prospect (*De Luxe Prospect*). This is on Kanaka Creek about three miles southwest of Alleghany, and near the west contact of

the same area of serpentine that passes the contact claims. The last adit driven is 25 feet above the creek on the east bank. It runs south 75 feet on a stringer lead. Both walls are chloritic schist and the adit is just west of the serpentine contact. This adit shows a little quartz all the way in, but nowhere over a foot wide and less than that at the face. The quartz stringers are encased in a layer of black slate which persists even when the stringer pinches down to 2 inches. The prospect was idle when visited. There is a good dwelling on it but no mining equipment. S. Granger, Alleghany, owner.

Irelan Mine comprises 4 claims with a length of 4500 feet along the strike, in the northwest part of Section 11, T. 18 N., R. 10 E, at the old camp of Minnesota. It is 36 miles to Nevada City by road and three miles by trail from Alleghany. W. T. Waldron is manager.

The vein, which strikes N. 53° W. and dips 50° east, has been developed by a series of adits. The old Irelan adit is 800 feet long on the vein, on the same level as the present entry, but southeast of it. In the canyon 800 feet lower on the dip of the vein, is the lower adit, 1100 feet long and all on the vein, but without any raises above it and no production to its credit yet. It has to be driven 400 feet further north to be under the crosscut where the latter intersects the vein in the upper adit. The new upper adit is a crosscut west 200 feet, striking the Irelan vein about the middle of the center claim, where the old adit ends, and is drifted thence 1200 feet northwest on the vein. At a point 1170 feet from the portal a winze is sunk 100 feet on the vein and a level at 80 feet is drifted each way about 100 feet on the vein (Sept. 20). From its intersection with the Irelan vein, the crosscut is continued 200 feet to the footwall vein, on which a drift was run 100 feet southeast and 150 feet northwest, with some production. Work at present is on the Irelan vein in the lower level, which is 300 feet on the dip of vein from the surface. The vein is thought to be worked out as far as drifted above the present adit.

Bunches of specimen ore and rich arsenopyrite have been mined in stopes and raises, the highest going up 200 feet above the drift. This work has been done for a distance of 200 feet each way along the adit from the shaft. Good ore has also been stoped between the bottom level and the adit. The vein in the south face of the drift on the bottom level strikes S. 53° E. and dips 50° N. E. Next to the hangingwall are two distinct ribbons of quartz, 1 inch and 4 inches wide, underlain by a layer of hard dead-white quartz 2 feet thick, having the characteristic appearance of pocket rock. This is underlain by a pronounced slippage plane and a foot of crushed quartz with arsenopyrite in stringers. The bounding planes of these separate layers in the vein are all inclined at a sharp angle to the hangingwall, indicating considerable post-mineral movement at this angle, which is flatter than the original fissure. Next the footwall lies a horse of fine grained light colored altered dike. The footwall for a foot or more next the vein is crushed black slaty schist, filled with quartz stringers. In the north face of this drift and in the level above, a very interesting feature is the occurrence of a distinct breccia of quartz fragments up to an inch in diameter in the hangingwall portion of the vein. These fragments have been recemented by brown chalcedony. In the north face, the cementing material of the

breccia has the appearance of a greasy, dark colored quartz and is thickly filled with crystals of arsenopyrite, from microscopic size to nests of crystals which fill seams ¼ inch wide. No specimens were seen where the arsenopyrite entered the white quartz fragments, and this would indicate that the arsenopyrite was brought in after the original vein was formed and crushed by the movements alluded to above. This mineralized breccia is said to be good ore. The arsenopyrite may assay very high at times, but does not as a rule show the massive pockets of gold found at a few of the mines. The kaolinized and intensely altered hangingwall is shot full of stringers of the later blue quartz. Pyrite is prominent in the wall rock. The country rock near the mine is amphibolite, with serpentine near on the hangingwall.

W. T. Waldron states the mine produced $250,000 previous to 1880. His company started work in 1913, since which time about $100,000 is said to have been taken out. Three mills have been installed, but the present one of ten stamps is the only one that gave satisfaction. A coarse screen is used for low grade ore and a fine one for high grade. The concentrate is said to be low grade as a rule. Electric power is supplied by the company's line, 2½ miles long, from Alleghany.

Kanaka Prospect is a mile southwest of the Kenton Mine on Kanaka Creek. There are three claims called Kanaka, Kanaka Extension and the Panama. They are on the east contact of the large area of serpentine that extends from Mountain House. Ambrose Madden of Alleghany is the owner.

This property was not visited. Madden reports that a tunnel has been run on the Kanaka claim between the creek and the Foote road, and is in 420 feet, including two drifts, 100 feet and 75 feet long, respectively. He reports taking a few small bunches from this tunnel, in all amounting to $467. One report from Selbys is said to show that ten pounds of quartz yielded $99.85. An upper adit at the roadside and 130 feet above the lower, is a crosscut 40 feet and for ten feet is on a stringer lead said to assay well, and to be of good width.

Madden has a dam across the creek and a pipe line 400 feet long. He plans to install a water wheel next spring to supply power.

Kate Hardy Mine is three miles southwest of Forest on Oregon Creek in Sections 29 and 32, T. 19 N., R. 10 E. Kate Hardy Mining Company, Frank A. Sullivan, Secretary, Santa Rosa, Calif., has been operating under a lease and option but the mine was temporarily idle when visited and the information below was furnished by W. W. Casserly, Superintendent.

The vein has a wide outcrop and in the lower workings is said to have a width of 80 feet in the widest place. It strikes N. 24° W. and dips 80° W. The principal pay shoot pitches N. 30° in the plane of the vein, coincident apparently with flat cracks having the same pitch.

Since our last report the lowest adit has been run 850 feet on the vein, with a winze 160 feet deep on the vein below the adit and 350 feet from the portal of the adit. Drifting has been going on from the bottom of this winze northerly, and Casserly estimated that 350 feet must still be run to reach the ore shoot, which crosses the lower tunnel 200 feet north of the shaft. From a point 500 feet in the adit there is a raise up 90 feet said to be in pay ore. From No. 3 upper adit,

which is about 400 feet long, they claim to have cut the shoot and raised 50 feet on it. Casserly estimates that a pitch length of 260 feet of ore is shown by the present developments on this shoot. Ore thought to indicate another shoot is reported from a raise 30 feet high about 50 feet from the face of the lower adit.

A width of six feet next the footwall is said to carry most of the gold found. The gold occurs mostly in lumps of arsenopyrite, showing oxidation on the outside. Little gold has been found in the white quartz outside the arsenopyrite. Stringers making into the vein from the footwall are thought by Casserly to bring in the pay. The footwall is amphibolite, with talc at times 4 feet thick on this wall. The hanging-wall is curved and broken black slate with gouge up to 18 inches thick. Casserly has observed that the best ore seems to occur where the talc layer is narrowest, inferring that where it is thick it has formed an impervious barrier. Outside the six foot layer mentioned, the vein contains principally pyrite with little gold. The present company has milled 1500 tons of ore averaging $10 a ton, from the portion of the vein within six feet of the footwall.

The property is equipped with a good 10-stamp mill, compressor, electric power and a good set of buildings, with a large reserve of timber and mine supplies.

Kenton Mine comprises Kenton, King Solomon, King Solomon Mill-site and a fraction, on the south side of Kanaka Creek, a mile and a half southwest of Alleghany. It was bonded in September, 1922, to Charles Burlock of San Diego and W. H. Rowe of Los Angeles. The buildings are being repaired preparatory to underground work.

The Kenton was developed by a series of crosscut adits to a depth of about 250 feet. It is reported that a new adit will be started 50 feet above Kanaka Creek. This would have to be run 900 feet, it is estimated, to strike the vein, and will be 300 feet below the old lower tunnel. The old workings and geology of the mine have been described in publications cited (1) and (2) in the bibliography.

There is an old mill containing 18 stamps, an air compressor, and an electric power line on the property. The past production from drifts and stopes in the two upper adits, is not definitely known, but has been considerable.

Mahady Prospect comprises two claims between the Rainbow and Irelan Mines near the old camp of Minnesota. D. C. Mahady is prospecting alone and has several hundred feet of drifts run.

Mariposa Mine. S. A. Grant and Mrs. Selinda Appel of Palo Alto, owners. The Mariposa joins the Ophir on the south side of Little Kanaka Creek near its mouth, in the northeast corner of Section 3, T. 18 N., R. 10 E. and is reached by road or trail from Alleghany.

The Mariposa was leased to Covenay and Hilmsley in 1915 and 1916 and they are locally reported to have taken out good pay. Later the Mariposa Mines Association prospected the claim at the same time they were working on the Ophir, but gave it up in favor of the latter.

The Mariposa main adit, elevation 3922 feet, runs southeast 758 feet from near the creek. At the face it is 400 feet vertically below the surface. The vein is stated to average 1½ to 2 feet wide, but swelling in places to 4 feet. Its strike varies from N. 30° W. to N. 60° W. and it

has an average dip of 50° E. to the lowest level opened. It is said to pinch at the face. The mine was closed when visited in September, 1922, and the lower levels were full of water. The following development has been done according to the mine map.

About 200 feet from the mouth of the main adit a shaft has been sunk on the vein with levels called 50, 100, 140, 180 and 300 levels, the last named being 197 feet vertically below the adit. These levels have been drifted as follows:

50 level, NW. 70 feet and SE. 40 feet;
100 level, NW. 40 feet and SE. 110 feet;
140 level, NW. 210 feet on footwall split;
Appel drift, near 140 level on hangingwall vein, is drifted 155 feet SE.;
180 level, drift 110 feet SE. on hangingwall vein;
300 level, drift 300 feet SE. and 300 feet NW.

The vein split about the 100-level. On the 300-level S. E. the vein turned into the footwall 110 feet from the shaft, striking S. 30° E. and and for the next 120 feet the drift was not on the vein, but it then reentered the vein. In the intervening distance one crosscut into the footwall produced pay. In the northwest drift which is crooked on the 300-level, there is a 65-foot crosscut north at the face.

The principal ore shoot pitched southeast. It was stoped on the main adit level for 140 feet northward from the shaft, and upward to the surface; on the 50-foot level, 70 feet long northward from the shaft, and on the 180-foot level, 100 feet southward from the shaft. The total production to and including 1918, when the last work was done, was estimated at $150,000. There is a building housing a compressor and motor, shop, etc. on the property, and electric power at hand.

Morning Glory Mine comprises the Morning Glory and Minnie D. Extension unpatented claims in section 34, ½ mile by trail from Alleghany on both banks of Big Kanaka Creek. Estates of Martin and Christina Rohrig, owners. A. A. Codd, Reno, Nev., lessee. It was idle in September, 1922, and the lower workings full of water, but the details below were furnished by M. Rohrig.

The claims cover two veins. On the Morning Glory claim adits have been driven westward from the east end of claim. The main adit is 600 feet long, all on the vein, which strikes nearly west and dips north and northeast, varying from 3 inches to six feet wide. About 75 feet on the dip below the upper adit, a drain tunnel has been run west 800 feet on the vein. From the mouth of the upper adit, a shaft was sunk passing through the drain tunnel 120 feet from the portal and reaches 180 feet on the dip below the drain tunnel. One hundred feet below the drain tunnel, drifts were run 50 feet each way, and the same distances were drifted on the 180-level. Rohrig states the vein shows well in the faces of the west drifts but pinches on the east. There still remains about 500 feet west and 200 feet east on the Morning Glory claim unexplored. An area 30 feet long by 25 feet high has been stoped between the two tunnels, and a similar sized block from the 180-level. The Rohrig family produced about $45,000 from the claim above the drain tunnel 25 years ago, and Codd has produced about $5,000.

There are three adits, each about 400 feet long, driven eastward from near the center of the Minnie D. Extension claim. These have partly prospected a block of ground 215 feet deep on the dip. The vein is said to have a maximum width of four feet, usually less, and dips south toward the Morning Glory vein. There is a winze 40 feet deep from the middle adit 300 feet from the portal. A block 40 feet by 40 feet has been stoped and milled but little production has been made, though good prospects are claimed.

On the Morning Glory claim there is a mill containing five 1250-pound stamps and one concentrator. There are also two air compressors capable of running 7 drills. Electric power is used and water for milling is taken from Cumberland Ravine.

Morning Sun claim is a location between the Rising Sun and Dreadnaught Mines covering ground not embraced in the Belmont, which is a senior location. F. W. Nicholls of Alleghany is the owner and has done only a little assessment work.

Moonshine claim is a location adjoining the King Solomon claim on the east. A vein 6 inches wide, striking north and dipping 45° east, is said to be traceable on the serpentine contact for 600 feet. The owner, Geo. W. Hallock of Alleghany, has driven an adit 35 feet in the course of assessment work.

Ophir Mine. This includes the Ophir claim and the portion of Eclipse claim east of Big Kanaka Creek. Under lease and option to Mariposa Mines Association, of which Nathan Haessly is president and Henry Sellenz secretary, address Theresa, Wis. H. I. Murphy, superintendent at the mine. The mine was idle in September, 1922.

The Ophir claim is developed by adits and winzes. The upper adit runs west 610 feet. The lower one, driven later and 140 lower, runs west and northwest 950 feet. Two winzes have been sunk from the lower level—an old shaft to the 200-level, 395 feet from the portal, and a new shaft 386 feet deep on the dip of the vein, with levels called 200, 300 and 400. The collar of the new shaft is at 3944 feet elevation and the 400 level at 3643 feet. The following drifts were run from this shaft:

On 200 level, 600 feet NW. and 260 feet SE.;
On 300 level, 70 feet west and 130 feet east;
On 400 level, 80 feet west and 95 feet east.

There is also a level at 100 feet in the old shaft and this was drilled 45 feet east and 95 feet west.

The vein strikes northwest and dips 52° northeast in the new shaft to a depth of 300 feet where it steepens to 64 degrees northeast. The average thickness stoped was 1½ to 2 feet. On the 200-level, 105 feet west of the shaft, the vein split and a branch went into the hangingwall; the footwall portion is presumably the main vein. The footwall is serpentine and the hangingwall schist.

The principal stopes were one 70 feet long, beginning 290 feet from the portal of the upper adit; one 220 feet long on ore 1½ to 2 feet thick between the two adits beginning 550 feet from the lower portal; one 110 feet long from the 100-level, and stopes and raises for a length of 130

feet on the 200-level. The total production of the Ophir claim is reputed to be $150,000, of which one-third was from the 70 feet in length stoped from the upper adit.

The portion of Eclipse claim held by these owners has been prospected by two adits, an old one running southeast 120 feet, and a new one 400 feet long. In the old adit, which is partly caved, 20 feet in length is said to pan. In the new adit the vein is said to be 6 inches to 2 feet wide. It dips 40 to 67 degrees east and strikes northwest.

The Ophir is equipped with a mill of five 1250-pound stamps, rock breaker, air compressor, and electric motors totalling 163 h. p.

Litigation is in prospect between the 16 to 1 and the Ophir. The former claims that the apex of the vein mined in the Ophir crosses the Ophir side line into the Twenty One claim, and that the Ophir is thereby deprived of extralateral rights. The operators of the Ophir contend that this is not the case and that the vein does not pass through the serpentine contact on that side.

Oriental Mine. Oriental Gold Mining Co. owners. Comprises nine claims as shown on the map, a mile southwest of Alleghany. The mine has been closed several years and little can be definitely learned about it. An adit was driven from Wet Ravine on the southern part of Bluejay claim at an elevation of 4050 feet nearly due north over 3000 feet and then eastward, having a total length of about 5000 feet and prospecting to a small extent six claims of the group. No timber was required for most of this tunnel. The first vein in this adit was struck 150 feet back from the face and was drifted on 200 feet each way without finding pay. At the face a vein five to seven feet thick is said to have been found on which a raise was put up 1000 feet, connecting with the old Oriental shaft. Above the adit several stations were opened and considerable drifting is reported to have been done. The last work was done under lease and bond by the Croesus Gold Mining Co. between 1915 and 1917. A 10-stamp mill with 2 concentrators, an air compressor and good buildings were put up and electric power brought in. As nearly as can be learned, this company produced $28,000. The geology of the property is covered by Ferguson in Bulletin 580, U. S. Geol. Survey.

Oriflame Prospect adjoins the Yuba Extension claim of the Irelan Group ½ mile south of Chips Flat. L. D. Nihell and Jack Langman of Alleghany are the owners. An unknown but considerable amount of work has been done in years past upon the claim but much of this is now caved. The vein runs nearly east and west. Beginning within 100 feet of the east end line, a crosscut runs 400 feet to the vein and a drift westward on the vein is open 100 feet; total length of drifts each way unknown because of caves. The crosscut was extended 200 feet beyond the vein but is also caved. The vein fissure is said to show a width of 1 to 4 feet but does not carry pay where open at present, according to Nihell.

Osceola Group comprises Osceola, Osceola Fraction, Colorado and Yellow Jacket claims ½ to ¼ mile northeast of Alleghany by road and trail. R. G. Gillespie, Pittsburg, Pa., is the owner.

Nearly all the work has been done upon the Osceola claim. The lowest adit begins near the creek and is 1650 feet long, running through the Osceola claim into the Osceola Fraction. It follows the vein, the strike

of which varies from N. 25° to N. 60° W. and the dip from 45° to 70° N. E. The vein varies here from 6 inches of gouge to 10 or 12 feet of quartz, and on the surface is even wider. At a point 125 feet from the portal, a winze has been sunk 75 feet; 75 feet farther and again 200 feet beyond that, other winzes of unknown depth were sunk. A dozen or more raises have been put up above that adit and one or two of these go through to the next level. Considerable ore was taken from these raises and a few adjoining stopes by Garnier, who also drove the next adit above. The three winzes probably mark the locations of three bunches of pay ore on which they raised and sank. There is an electric hoist and a skip at the first raise.

The second adit is about 200 feet vertically above the lowest and is about 300 feet long. The vein is up to 10 feet wide here. The highest tunnel is a crosscut 150 feet to the vein with a drift south 200 feet and north 75 feet. There is a winze 60 feet deep at the face of the south drift and a raise 90 feet to the surface.

The hangingwall of this vein shows a great deal of 'bluejay' and on the surface is altered to a rusty, oxidized mass full of quartz veinlets.

The total production of the property is stated to have been over $100,000, but the mine has been idle several years and no authentic details could be had locally about it. The two lower adits are accessible but the lowest one is in need of retimbering. There is a 9″ by 8″ compressor and 35-h.p. motor in a good building at the lower adit portal and a light 2-stamp mill stands exposed to the weather on the creek nearby.

Plumbago Mine comprises 8 quartz claims and a mill site extending diagonally southeast across Section 2 and into Sections 1 and 12, T. 18 N., R. 10 E., 31 miles by road from Nevada City and three miles by trail from Alleghany. Croesus Gold Mining and Milling Co. owner, 665 Fifth Avenue, New York. Leased with option to F. M. Ray, San Francisco. Hugh McCormick is the superintendent at the mine. This mine has been the biggest producer of the district. Its exact output is unknown and has no doubt been overestimated, but it has probably yielded about $7,000,000.

The Plumbago vein strikes west-northwest and dips 45° east as deep as followed. It lies in amphibolite and varies from inches to 18 feet in width, being pinched and without quartz on the west in most of the levels but is reported to be 18 feet wide on the east in No. 8 level. The outcrop was prominent and was worked extensively in early days.

Operations in later years have been through No. 4 tunnel, which is a crosscut 200 feet, then drifted west on the vein for nearly a mile. This tunnel is at an elevation of 3819 feet or about 700 feet below the outcrop. Nearly midway in it a winze has been sunk 650 feet on the dip of the vein, 45 degrees, and levels called 5, 5½, 6, 6½, 7, 8 and 9 have been drifted as follows:

No. 5 , east 600 feet and west 550 feet;
No. 5½, east 75 feet;
No. 6 , east 460 feet and west 760 feet;
No. 6½, east ___ feet and west 225 feet;
No. 7 , east 260 feet and west 600 feet;
No. 8 about 600 feet each way;
No. 9 about 300 feet each way.

Above No. 4, 'A' drift, elevation 3939 feet, and 'B' drift, elevation 4076 feet are expected to yield more ore.

The ore shoots pitch southeast, the largest at about 45 degrees. Beginning 200 feet east of the winze on No. 4 level, a stope was worked for a length of 350 feet on this level and was carried through to 'A' drift, where it was 450 feet long. From No. 9 level beginning near the shaft, another large shoot has been stoped through to 'A' drift. This is 250 feet long from the shaft west on No. 8 level; on No. 7 level it is partly stoped for 200 feet east and nearly all stoped for 300 feet west of the shaft, and on No. 5 it is stoped for 75 feet east and 275 feet west of shaft. The vein in this stope on No. 7 level was 4 feet to 7 feet wide. On No. 7 level beginning 400 feet west of shaft, a third shoot in which the vein was 3 feet to 6 feet wide, has been stoped partly for 150 feet up to No. 6.

As in the other mines nearby, the principal yield has been from bunches of free gold but the low grade ore often pays to mill. It carries pyrite with a little galena, zincblende and chalcopyrite.

The mine has a 20-stamp mill and its own electric power plant, run by water from the river and generating at full capacity 240 horsepower. Mine water has been used for milling. When visited September 20 the water had been pumped out as far as the No. 8 level and it was hoped that the mill could be started in a short time.

Rainbow Mine includes the Farnham Groves and Hanley patented claims and Belmont, Noble and Denver locations, extending about a mile southeast from Kanaka Creek across section 3 just south of Chips Flat. The vein was found in the fifties in an adit driven to prospect for gravel and was later found in two other adits 40 and 100 feet lower. The first mill of 8 stamps was built in 1858. From the lowest or Groves adit a winze was sunk 307 feet and stoping was done from this. A tunnel still lower, near the creek, was run later a total distance of 2300 feet including branches and a raise 481 feet connected with the Groves adit workings above, but pay was not developed in this lower tunnel.

The mine has been leased with option to the North Star Mines Co. They have been doing considerable work but report no particularly good results as yet. A winze has been sunk 330 feet on the vein from the lowest (Rainbow) tunnel and a level called No. 3 has been run 225 feet west and 250 feet east on the main vein. The vein is reported to be only a few inches wide here. There is also 400 feet of drift on a smaller vein which intersects the main vein 800 feet from the portal. Ferguson and MacBoyle describe the geology of the mine. The mill has been burned down.

Rainbow Extension adjoins the Twenty One claim on the south. A drift is reported to have been run 650 feet on what is supposed to be the '16 to 1' vein; in the footwall 150 feet distant, a vein called the Twenty One has been followed 250 feet, of which 130 feet is on the Twenty One claim and 120 feet on the Rainbow Extension. The prospect was not visited. The former vein is said to run from a few inches to 4 feet wide and to be pinched in the face of the drift.

Rising Sun Group comprises Monro, Rising Sun, Cedar and Baltimore claims on the west side of section 35, T. 19 N., R. 10 E., a mile by trail

from Alleghany on the ridge between Big and Little Kanaka Creeks. Under lease to F. W. Nicholls, Alleghany.

The vein outcrops prominently on the ridge north of the workings. It is opened by a crosscut 185 feet long running N. 25° to N. 29° W. Near where this enters the vein the latter makes a turn and what is perhaps a branch has been followed for about 500 feet, S. 18° E. The vein does not outcrop on this side and is said to pinch near the face of the south drift, but this could not be verified as the drift is open only part way. There are 5 raises in this drift, two of them to the surface. In the north drift, the vein strikes nearly due north and dips 70° W. Where the crosscut enters the vein the hangingwall is broken and altered, showing 'bluejay.' The footwall is hard schist, well defined. A winze was sunk 24 feet and a raise put up 30 feet on the vein here, and the small area worked is said to have produced $12,000. There are indications here, confirmed by observations on the surface, that the main vein going south has not been opened, but lies nearly parallel to the crosscut. In the north drift the vein varies from 6 feet to 2 feet in width as far as the drift is accessible. This drift is said to be 300 feet long and could be cleaned out at small expense. There is a raise from it to the surface about 200 feet vertically above.

The property has been idle many years, and original records are not available. Assays taken from 100 feet of the south drift and 300 feet of the north drift at regular intervals are reported to have ranged from $4 to $30 a ton. Small bunches from the south drift yielded from $75 to $400 each. In the middle nineties a 10-stamp mill was built and a large sum was spent on a tramway to deliver ore from the mine to mill. This tramway is said to have been unsuccessful and the company failed. Only a little ore, which is said by a former millman to have yielded $6 to $8 a ton was crushed. The mill is still on the property.

Sixteen to One Mine. Original Sixteen to One Mining Co. owner, main office 607 Monadnock Building, San Francisco, H. U. Maxfield, president. M. C. Sullivan, manager at the mine. The property is just south of Alleghany and includes the Sixteen to One, Twenty-One, Happy Jack, Eagle, Belmont and other small fractions. The Twenty-One Mine was acquired after the lawsuit of 1919 which was won by the Sixteen to One Company. The latter has been in steady operation since 1912.

The Sixteen to One was originally opened by an upper adit from which a winze was sunk. During this work litigation arose with the Twenty-One Mine. A dispute also came up with the Tightner Mine about extralateral rights and to settle this latter a compromise line was agreed upon. This line is 850 feet from the Sixteen to One main winze at No. 8 level, but is not vertical its entire distance.

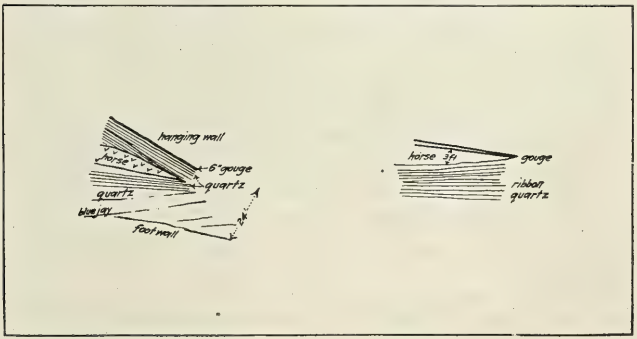
The working entry is called No. 2 tunnel; it is 1690 feet long and at an elevation of 4278 feet. The main winze to the lower levels is 600 feet from the portal of this tunnel and is equipped with a hoist capable of operating to a depth of 1500 feet. No. 2 tunnel is 107 feet below the apex. The winze gives an additional depth of 408 feet on the dip of the

vein to No. 8, now the bottom level. Below No. 2 tunnel, the following drifts have been run:

100 level, 115 feet each way;
150 level, 60 feet north and 90 feet south;
200 level, 115 feet north and 50 feet south;
250 level, 650 feet north and 60 feet south;
No. 3 level, 960 feet north and 130 feet south;
No. 4 level, 740 feet north and 150 feet south;
No. 5 level, 950 feet north and 230 feet south;
No. 6 level, 1000 feet north and 90 feet south.

On the Twenty-One tunnel level, which is the same as No. 8, the Twenty-One tunnel is 1870 feet long to the main Sixteen to One winze, from which the vein has been drifted 850 feet north to the line, with 200 feet of parallel drift on the footwall.

In the '54' stope from the hangingwall drift on No. 8 level there is a vein 24 feet wide in the amphibolite schist, with 6 inches of gouge on the hangingwall and at times gouge on the footwall. The vein swells here and the country is badly broken up as occurs on the entry of another vein. The vein is quartz, well ribboned on the hangingwall side, with 'bluejay' prominent on the footwall and the aspect of the stope face when visited in September is shown by the sketches:



The vein strikes northwest and the dip varies from 30 to 70 degrees northeast. Besides the rich pockets and the milling ore, gold is found at times plastered on the mariposite but usually it does not go in. Many theories put forth to explain the reasons for the formation of the pockets and to prognosticate their location in advance, have come to grief. When the Twenty-One tunnel was being advanced by the Twenty-One Mining Co. and had reached a point 330 feet north of the present Sixteen to One main winze, it is said the company was watching for pay on the hangingwall side of the vein, as recommended by their engineer, but the miners, watching the footwall, made the discovery first. In a space 10 feet long by 40 feet high there on the footwall side,

a pocket variously reported as containing $100,000 to $150,000 was extracted. Yields of proportional richness have been made in the mine during the past year. One report that received widespread notice stated that 50 feet of drifting with raises and stopes near the north line opened ore yielding $250,000 and the mine's output for the year is estimated locally at $750,000. The manager refuses to verify these reports and deplores their publication as being misleading. When rich spots are encountered he says they may or may not contain enough to pay for long periods of operations in low grade areas where the quartz is apt to carry $1 to $3 a ton, and the capricious occurrence of pay ore demands that this dead work be carried on.

In No. 1 stope at No. 6 level the vein is four feet wide, of well ribboned quartz with layers of 'bluejay' and considerable sericite mica, and with gouge on both walls. The immediate hangingwall here is black slaty schist.

The footwall of the vein in this part of the mine is everywhere intensely altered and broken up. It varies from greenish grey to nearly black, the latter color giving it the appearance of slate and being due probably to small amounts of graphite. The cross fractures and the cracks between the schist layers are filled with quartz and calcite and dolomite, the calcite being so common that every piece tested gave a pronounced carbonate reaction. This rock is undoubtedly the same as the 'bluejay,' except for the lack of the green mariposite. The hangingwall is similar to the footwall except for possibly less alteration. Horses of grey and black schist are prominent in the vein. The one shown in the sketch of the vein in the '54' stope is a black graphite schist, in places containing enough graphite to give a black streak on paper. Another slab from the hangingwall is an impure talc schist.

The quartz described as typical pocket rock is pure white, opaque, and without much visible ribbon structure. The average rock in the vein will not pay to mine and mill, according to Sullivan. The sulphide concentrate forms a small and unimportant part of the ore. From 1000 tons of ore milled 3 tons of concentrate worth up to $70 a ton may be obtained, and the concentrate product in three years is said to have been only 100 tons. In the No. 1 stope at No. 6 level the concentrate is said to be worth only $30 a ton and the average ore outside of pockets, $6 to $7 a ton.

The principal work now is near the compromise line in the stopes above mentioned. The vein is being stoped partly about 140 feet in length on the footwall side between No. 8 and No. 6 and the '54' stope is being worked in the same vicinity from the hangingwall drift. Between No. 6 and No. 5 three small stopes were worked. Between No. 6 and No. 4 for a distance of 170 feet north of the shaft the ground has been well stoped, with large pillars left. From No. 3 to within 100 feet of the surface has also been extensively stoped.

The policy of the management is to run to the line of the property and from there work back toward the shaft, cutting up the ground and retreating as it is worked. This is no doubt the best plan to follow. With all his experience, Superintendent Sullivan does not offer any hard and fast rule for finding rich ore, and states his belief that the best method is to carefully and systematically cut up the vein.

The property is well equipped and in good condition. Extensive additions are being made to the surface plant. A 10-stamp mill, crushing 30 to 35 tons a day is in operation. Machinery is on the ground for a new milling plant which will contain a Hendy ball mill and a Rexman balanced rod mill, which are expected to give a capacity of 100 tons a day. The ball mill will deliver a ¼-inch product to the rod mill which is designed to crush to 40-mesh. Outside amalgamation will be used. The ore is sorted and the high grade is crushed in Berdan pans. When the new mill is in operation the 10-stamp mill will probably be used for sampling. Power is obtained from the substation of the Middle Yuba Hydro-electric Co. located on the property. Seventy men are employed at present, but over half of these are working on surface construction, the average mine crew being 32 men.

Tightner Mine. Alleghany Mining Co. lessee with option to purchase. Main office 48 Mills Building, San Francisco, F. M. Searles, president. W. A. Simkins, secretary. The property includes the Contact, Contact Extension, Eclipse Extension, portion of Eclipse west of Kanaka Creek, Red Star Placer, Tightner Placer, Alene and Bartlett claims. Previous operations and the geology of the upper workings have been partly covered by H. G. Ferguson in U. S. Geol. Survey Bulletin 580, and in this Bureau's last county report. The lower section of the vein was opened by a crosscut adit 1265 feet long to the vein at an elevation of 4097 feet, thence continuing northwest over a mile as a prospect adit under the Red Star claim. Winzes, called North and South shafts, have been sunk on the vein below this adit. The South shaft is about 300 feet north of the compromise line between this mine and the Sixteen to One, and the North shaft is 700 feet from the South shaft. South shaft has reached a depth of about 1400 feet below the outcrop, or over 1000 feet below the tunnel and the North shaft is about 500 feet below the tunnel. No. 6 level in the South shaft is at the elevation corresponding with the bottom of the North shaft. In the South shaft, which is the present working shaft, the present company has sunk 330 feet and has driven the following new levels:

No. 4, 140 feet south and 90 feet north;
No. 5, 400 feet south;
No. 6, 300 feet south;
No. 8, 250 feet south;
No. 9, 60 feet south;
No. 10, 200 feet north;
No. 11, 70 feet north and 220 feet south.

Outside of mining that is going on above No. 6 level about midway between the shafts for a length of 75 feet and some possibilities of finding ore on 4 and 5 south of shaft, the mine is pretty well explored above No. 6 level, a length of 2400 feet out of 2720 feet of vein having been prospected. There is a barren streak in the vein between the shafts for a length of 500 to 550 feet, where the vein is small, usually only gouge. The north ore shoot was about 450 feet long, of which 100 to 150 feet on the north side was very rich. The ore shoots pitch south with the specimen ore in bunches.

On No. 11 level south near the line the vein is nearly five feet wide, strikes south to S. 20° E. and dips 22° N. E. The vein is formed of coarse ribbons of white quartz with bright green 'bluejay' on the footwall and a casing of a foot of soft slate on the hangingwall, with little gouge on the hangingwall and none on the footwall. The vein looks promising for pockets here, but so far is said to have yielded only a little coarse gold the size of wheat for a length of ten feet, where the vein pinched a little and the only other change noted was the coming in of small water courses. In the north face, horses in the form of small intermittent lenses of black slaty schist, heavily charged with pyrite, lay on the hangingwall.

Near No. 10 level is a small fault with three feet throw, above which there was some gold in the shaft, but none below. The vein steepens a little here. On this level the vein ranges from 6 to 14 feet wide. Some specimen rock was found near a small horse in the drift. In the face the vein is six feet wide, of coarsely ribbon-quartz, the black slate lenses of the hangingwall evidently furnishing the black layers in the vein.

On No. 9 south, the vein is six to seven feet wide, showing only a few zinc blende crystals in the dead white quartz, and a little 'bluejay.'

On No. 8 level south the vein was smaller most of the way than above or below but began to bulge near the face. The vein becomes disturbed here and swells to a width of 30 feet for 40 feet or more above the level. No pay is reported from this level, but a high grade shoot comes down under this enlarged portion on the sublevel above. In this upper level a stope 20 feet long by 20 feet on the dip by 2 to 5 feet thick is said to have yielded $50,000. This narrow part shows a bad hangingwall with gouge. There was gold in a layer 3 inches thick next the gouge; from there it jumped down to follow another streak a little way, and so on. Its location near the swell in the vein led to the idea that its formation was caused by the approach of another vein. Such remnants of this pocket as were seen by the writer showed free gold without arsenopyrite. It should be remembered that this shoot is only a few feet from the area on the same level of the Sixteen to One Mine where the vein is 20 to 25 feet wide and heavy production has been made. When the Twenty-One Mining Co. came north in their tunnel they found a large pocket about 550 feet south of this place, and also on the footwall side. In their suit with the Sixteen to One Company the Twenty-One Company contended that they had been following their vein all the way, but lost the decision. The area intervening between these two rich pockets has since yielded rich returns to the Sixteen to One Company. No. 8 level in the Tightner has not been crosscut yet to determine the possibilities back of the main vein.

On and above No. 6 level north, ore said to mill $9 to $10 a ton is being stoped for 75 feet in length. The vein is being broken six feet wide, as it is said to carry pay for 4 to 6 feet next the hangingwall, which rolls and carries a six-inch gouge. The footwall shows the characteristic lenses of dark slaty schist. The quartz is well ribboned both parallel to and perpendicular to the vein walls, and there is a good deal of 'bluejay,' which is said to carry a little free gold, but most of the gold is in the mixed sulphides.

On the north above No. 6 the vein pinches. On the footwall there is a layer of talc, evidently derived from serpentine. There was no pay here. On No. 4 south the hangingwall is altered to dolomitic marble and 'bluejay' and the vein is 12 feet or more wide. The south stope from No. 8 to No. 4 was in high grade. The vein has never been crosscut here to determine its possibilities. Just north of the shaft and a few feet below the drain tunnel, the present company report taking out $50,000 in an area 25 feet by 30 feet, in a body of quartz lying on top of the main vein. The production by the present company has been about $600,000.

Besides the work in the Tightner proper, they have done over 1000 feet of new work in search of the Red Star vein, that is said to have been rich in the old shallow workings. The Tightner drain tunnel was extended over a mile by former operators in search of pay ore in this vein. The present company has put up a raise 400 feet and has done a good deal of drifting, but have not reported finding pay. The 20-stamp mill at the Tightner is in steady operation.

Wonder Mine consists of two claims, Wonder and Wonder No. 1. Owners, Flynn Bros. of Alleghany, H. T. Bradbury and Estate of J. Walsh. Leased with option in September, 1922, to Contact Mining Co. of Richmond, Cal.

The development work, done years ago, consists of a crosscut 200 feet west to the vein and drifts north 100 feet and south 75 feet. Sixty feet in the south drift a winze was sunk on the vein 60 feet deep and Wm. Walsh states this shows a 4 ft. ledge, but this was not verified on account of the winze being inaccessible. Work is to begin soon under the terms of the lease.

Bibliography: U. S. G. S. Bulletin 580 I, H. G. Ferguson. Colfax Folio, No. 66. State Mining Bureau, Mines and Mineral Resources of Sierra Co., 1918; State Mineralogist Reports, XIII and previous; Register of Mines of Sierra Co., 1903.

SAN FRANCISCO FIELD DIVISION.

C. McK. Laizure, Mining Engineer.

Tulare County.

The last full report on the mines and mineral resources of Tulare County was that resulting from field work carried on in June, 1916, and published as Chapter II, Part VI, of Report XV of the State Mineralogist, 1915–1916.

The county has since been visited by representatives of the Bureau in gathering data for Bulletin No. 76, Manganese and Chromium in California, 1918; and Bulletin No. 89, Petroleum Resources of California, 1921. It was also visited for the purpose of making a report on the magnesite industry of the State (unpublished), but no general revision of Report XV had been made.

For the purpose of bringing that report up to date and recording new activities in all branches of the industry, the writer spent about two weeks in September and October investigating present conditions.

Where inquiry developed the fact that properties were idle or remained in the same hands as previously reported, they were not investigated further. The following notes give such changes in ownerships as were found, new development, new deposits reported and the present activities of operating and producing properties.

Acknowledgments.

The uniform courtesy and assistance extended by owners and operators of mineral deposits throughout the county and by local Chambers of Commerce in assisting the writer to get in touch with owners is deeply appreciated. It is particularly gratifying to note that many of the latter bodies are giving attention to the mineral resources of their neighborhood, as well as to the agricultural opportunities to be found in this county.

Mineral Resources.

Tulare County is one of the largest counties of the San Joaquin Valley, having an area of 4856 square miles. The population (U. S. Census 1920) was 59,031.

The eastern boundary of the county follows the crest of the Sierra Nevadas and extends north and south for about 75 miles, embracing a series of the highest peaks in the United States, including Mt. Whitney (14,501 feet).

General Grant Park and Sequoia National Park are situated in the north-central part.

The eastern or mountainous area is composed essentially of the deep-seated granitic rocks, including granites, diorites, granodiorites and gabbros.

In the vicinity of Mineral King there is an exposure of heavy thick-bedded limestones and masses of dark silicious slates containing important orebodies. In the first foothills east of Exeter, Lindsay, and Porterville bodies of serpentinized peridotite occur associated with the granitic rocks and thin belts of limestone. In this area the principal magnesite deposits of the county are found. The western boundary of the county passes just east of Tulare Lake and the western portion is composed of nearly level sands, gravels and clays, of quarternary age. A small area near Ducor is composed of heavily bedded marine sandstones and diatomaceous shales, clay shales and gravels, of Tertiary age.

Tulare County has a larger area of watershed than any other valley county. It is drained in the main by the Kaweah, St. Johns, Tule, White, and Kern rivers.

Electric power is an important factor in the industrial life of the county. The Southern California Edison Company and the San Joaquin Light and Power Company carry a connected load of 85,000 horse power, with an unlimited supply available.

There are three hundred and four miles of concrete-base highway within the county, said to be the greatest mileage of concrete roadway of any county in the United States, and except for the remote mountain districts, transportation facilities are excellent, by both road and rail. Mineral King and Camp Nelson are the most easterly points that can be reached by automobile.

Tulare County's known mineral resources consist of antimony, asbestos, brick and tile, clay, chromite, coal, copper, feldspar, gold, graphite, gems, infusorial earth, lead, limestone, magnesite, manganese, marble, molybdenum, natural gas, quartz, glass sand, silver, soapstone, talc, miscellaneous stone, and zinc. The occurrence of tin ore has been reported, but not confirmed. Many of these deposits are little more than prospects at the present time whose commercial importance remains undetermined.

A number of wells are being drilled within the county in an endeavor to develop a commercial oil field.

Tulare County led the state in the production of magnesite for several years.

MINERAL PRODUCTION TABLE.

Year	Gold, value	Silver value	Brick		Gems, value	Granite		Magnesite		Stone industry, value	Miscellaneous minerals	
			M.	Value		Cubic feet	Value	Tons	Value		Amount and kind	Value
Total, including 1915	$402,569 00	$4,800 00	72,948	$517,171 00	$493,096 00	52,958	$92,460 00	76,315	$622,177 00	$43,051 00	[1]Various	$88,360 00
1916			6,330	$48,500 00				87,606	$737,130 00	$82,225 00	Chromite, 3,435 tons Copper, 1,422 lbs. Feldspar, granite, limestone, marble, silver	$42,555 00 350 00 36,410 00
1917				$112,938 00				136,562	$1,238,853 00	$75,594 00	Chromite, 450 tons Feldspar, 240 tons Tile, copper, granite, limestone and talc	$11,000 00 1,580 00 60,023 00
1918								28,826	$269,748 00	$125,407 00	Chromite, 600 tons Feldspar, 444 tons Limestone, 8,400 tons Silica, 204 tons Brick, tile, gems, granite, soapstone and talc	$24,000 00 2,928 00 32,400 00 1,143 00 71,782 00
1919				$34,978 00				18,765	$186,601 00	$10,811 00	Limestone, 10,347 tons Natural gas, 700 M. cubic feet Chromite, feldspar and granite	$46,388 00 295 00 51,928 00
1920								35,305	$394,169 00	$8,465 00	Natural gas, 400 M cubic feet Brick, feldspar, granite, and limestone	$195 00 190,467 00
1921								11,454	$125,594 00	$284,122 00	Limestone, 10,030 tons Natural gas, 380 M. cubic feet Brick and granite	$40,090 00 190 00 102,238 00
Totals	$402,569 00	$4,800 00	79,278	$713,587 00	$493,096 00	52,958	$92,460 00	394,833	$3,574,272 00	$629,675 00		$804,322 00

Grand total, $6,714,781 00.

[1]For details in previous years, see State Mineralogist Report XV., page 904.

MINES.

ANTIMONY.

No changes were noted in the status of the *Lady Alice Mine* at Mineral King, described in Report XV. Antimony occurs also on Redwood Mountain twenty miles east of Badger. It is undeveloped.

ASBESTOS.

There has been no development of the asbestos deposits mentioned in Report XV. Undeveloped deposits are also known on the Gill properties; Frederick Gill, Exeter, owner.

CLAYS.

The Pioneer Brick Company is no longer in business, and operations at Visalia have been discontinued.

S. P. Brick Company. W. D. Trewhitt, president, H. W. Shield, secretary and treasurer. Office 435 Rowell Building, Fresno, California. Plant located $\frac{3}{4}$ of a mile northwest of Exeter in Sec. 14, T. 19 S., R. 20 E. The deposit covers an area of twenty acres of which eight to ten acres have been worked. Since the last report, additional machinery has been installed and hollow building tile added to the output. Yearly capacity of plant 7,000,000 brick and 250,000 tile. Twenty-five men are employed. Operated one shift per day, with two shifts on the kilns, when burning. Tests have been made at the plant on clays from Hanford and other sources, a clay from Coalinga yielding an especially light weight brick of great strength. There is an increasing demand for hollow tile in the building trade, and the future outlook is reported as excellent.

CHROME.

All chrome deposits are idle, there having been no production since 1919. Most of the properties were formerly operated under leases that have since expired.

COPPER.

The properties mentioned under this heading in Report XV remain practically in the same state of development as then noted. All are at present idle.

A. P. Kirkland, Auckland, (Orosi P. O.) has one claim of twenty acres covering a copper and iron deposit located in Redwood Canyon. There is a road to the claim, good timber nearby, and water can be obtained from Redwood Creek. Very little development.

Copper showings have also been found in the vicinity of Three Rivers.

GEMS.

There is no activity in the production of gem materials.

FELDSPAR.

The production of feldspar in Tulare County has declined the last few years. None was mined during 1921, and the properties mentioned in Report XV are idle.

The following deposits have not heretofore been of record:

Jacobs Estate Deposit. Orthoclase feldspar occurs on the property of the I. H. Jacobs Estate. Henry A. Jacobs, attorney, First National Bank Building, San Francisco. The deposit is in T. 15 S., R. 25 E., Orange Cove being the nearest town and railroad shipping point.

Henley Feldspar Deposit. Owner S. E. Henley, 706 N. Bridge Street, Visalia, California. Property consists of eighty acres of deeded land situated in the Globe Mining District. Springville, three miles southwest is the nearest town. Porterville is twelve miles northwest, connected by paved highway. Property adjoins Globe siding on the S. P. branch line from Porterville to Springfield.

It is situated in the foothills at an elevation of 580 feet. There is no timber. Water is obtained from Tule River. The present owner has had the property since 1905. The deposit consists of a vein or ledge of high grade feldspar, which can be traced for a considerable distance, coursing NW.-SE., with smaller stringer veins. There is also an 8-foot quartz vein on the property. Development consists of an 80-foot tunnel. Two carloads of feldspar were shipped to Colorado four years ago. No equipment.

Harmon Deposit. W. P. Harmon, Stage Route No. 2, Porterville, California, has an undeveloped deposit of feldspar on his ranch near Springville. Judging from prospect holes put down, there appears to be a large quantity available. There is an overburden of a few feet of soil.

GOLD.

The White River Mining District, fifteen miles southeast of Porterville, is the only productive area where gold mining has been carried on to any extent in Tulare County.

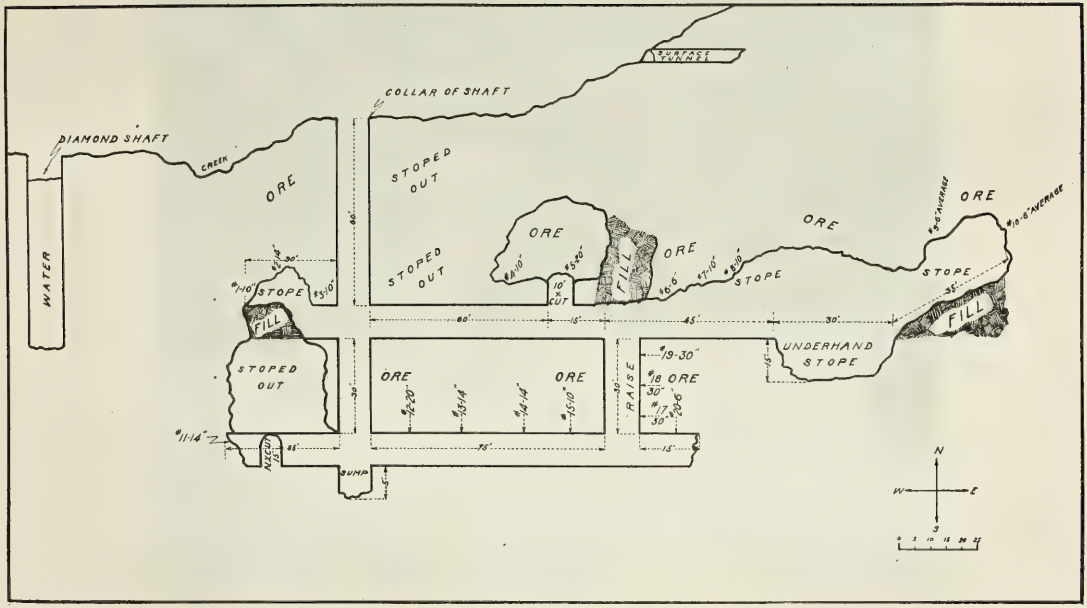
There has been a renewal of activities in the camp, the most important of which is the reopening of the *Bald Mountain Mine* by Warner Barnes & Co., (a limited co-partnership) home office, 1907 Chester avenue, Bakersfield, California. Copartners are Robt. Kendall, Porterville; M. Mitchell, Ducor; Edward Zalud and R. H. Barnes, White River; H. R. Warner and Roy Newberry, Bakersfield. Roy Newberry, secretary and treasurer, R. H. Barnes, general manager.

This company now controls the *Bald Mountain* and *Eclipse No. 2* mines.

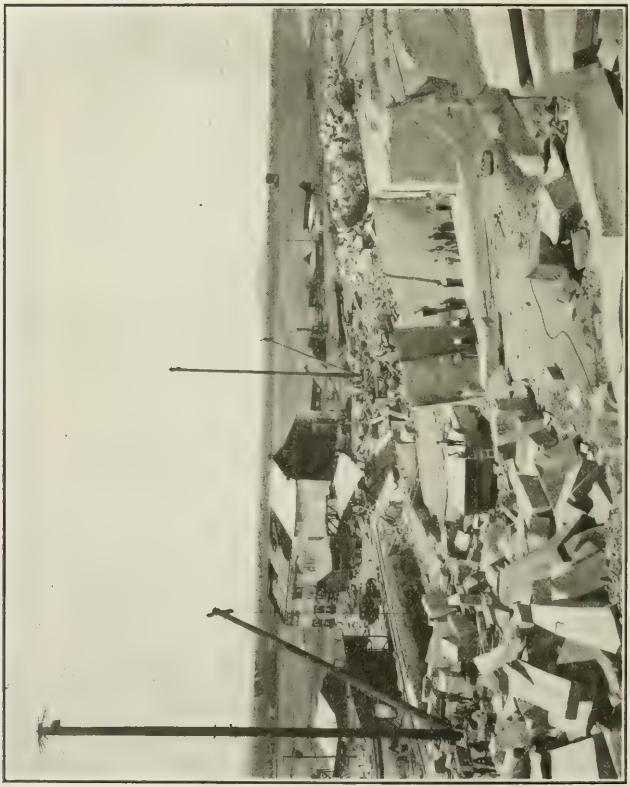
At present operations are confined to the Keys claim of the Bald Mountain property and to overhauling the mill and placing it in shape to run.

Old workings on the Keys Claim have been unwatered, the shaft cleaned out and retimbered and both drifts on the 60-foot and 90-foot levels cleared. A thorough sampling of the orebody indicated that a good grade of ore could be mined. On the 60-foot level a drift extends easterly along the vein for 185 feet. Considerable ore was stoped here, it being underhand stoped to a depth of fifteen feet toward the east end.

On the 90-foot level the drift has been run easterly on the vein for ninety feet. Seventy-five feet from the shaft there is a raise in ore to the level above. Both upper and lower drifts are being extended by the present company. West of the shaft the ore has been stoped out



Workings on Keys Claim, Bald Mountain Mine, Tulare County.



California Granite Company's Quarry, Porterville, California.

from the lower to the upper level for a distance of thirty-five feet, the length of the lower drift west. There is a considerable tonnage of ore blocked out by the present workings, and a complete sampling of the vein indicates good milling values.

The mine is equipped with a 15-h. p. Union gas hoist, good for 500 feet; a Rix 200-cubic-foot capacity compressor run by gas engine, complete blacksmith shop, ore bins, cars, etc. Nine thousand gallons of water is pumped daily.

Reduction equipment consists of 5-stamp mill (850-pound stamps) with plate amalgamation and No. 6 Wilfley table, all operated by 25-h. p. Fairbanks Morse gas engine. The ore is free milling. Seven men are employed.

The *Barton, Cherokee* and *Creeks* mines are idle.

At the *Florence G. Mine,* now owned by W. T. Young, E. S. Rowland, and P. McCluskey, preparations are being made to start operations. The ore will be handled by a 3-stamp mill and arrastra.

The *Homesake* and *Josephine* properties are idle.

At the *Last Chance* (*Redfield*) Mine there has been no development, other than assessment work.

The *Minnie Ellen, Stencil,* and *Sunset* Mines remain idle.

GRANITE.

California Granite Co., A. Pernu, president; A. M. Grindell, secretary, office 302 Builders' Exchange Building, 185 Stevenson street, San Francisco. This company operates quarries near Porterville and at Rocklin, Placer County.

Active operations have continued at the Tulare County quarry, described in detail in Report XV. The company has purchased fifteen acres including the ten acres formerly leased from C. A. Witt on the Success and Porterville road. Development of this tract has shown an excellent deposit of so-called 'black granite.'

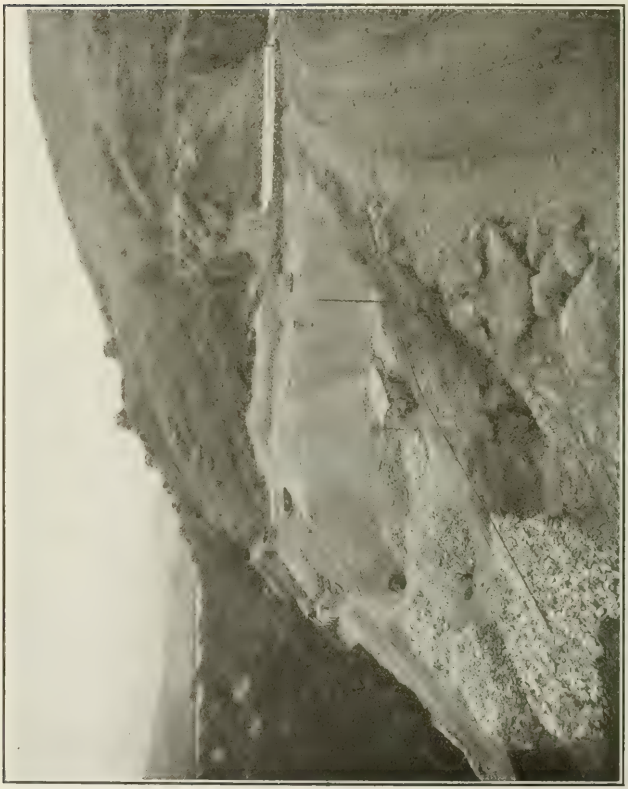
This rock is of exceptional beauty, and is especially desirable for monumental and decorative purposes, selling for $3.50 per cubic foot, compared to $1.80 for the light colored or gray granite.

The quarry is operated on the 'American Plan.' Twenty-five men are employed at present, but the number is being increased as fast as additional help can be secured. The company recently supplied the granite for the new Bank of Italy Building in San Francisco, and the management reports the future outlook to be excellent.

There has been no change of conditions at the *Rocky Point Granite Quarry* and it remains idle.

Dickey Property. There is a deposit of dark gray granite on the A. L. Dickey property in Sec. 11, T. 16 S., R. 25 E., about two miles east of East Orosi, at an elevation of 350 feet. It is practically undeveloped, but the U. S. National Bank Building in Dinuba is built of stone (largely float) from this deposit. There is no equipment. Total area 30 acres. A. L. Dickey, owner, Dinuba, California.

Conditions at the *graphite, gypsum* and *iron* properties described in Report XV remain unchanged.



Ore Dumps, A-South Opening, Sierra Magnesite Company.

LIMESTONE.

Kaweah Lime Products Co. This company controlled by A. C. Root of Fresno and C. A. Schafer took over in 1917 the property described in Report XV under the name *Lemon Cove Lime Quarry.* Home office, Lemon Cove; quarry and plant at Terminus, the end of the Visalia Electric Railroad. Operations have continued since 1917 with a production of from 90 to 175 tons of limestone per day. Considerable new equipment has been added and a new quarry face opened up. Air drills are used. Grinding equipment consists of a substantial mill building, housing two gyratory crushers, four Griffin machines grinding to two hundred mesh, and accessory machinery. The output consists of agricultural lime, paving dust and cement pipe stock. None of the limestone is burned.

Oat Canyon Limestone Deposit. Surface prospecting indicates the presence of high grade limestone lenses on the property of E. A. Orton, east of Lindsay. There is a siding on the Visalia Electric Railroad within four miles. The holding consists of 320 acres of deeded land lying in the foothills, at moderate elevation. Water can be developed. No production to date. Owner E. A. Orton, Box 41, Lindsay, California.

None of the other limestone deposits described in Report XV are being developed. It is reported that there has been some transfers of ownership of limestone-bearing lands in the vicinity of Three Rivers, and that the *Riverside Portland Cement Company* has acquired large limestone holdings on Cow Mountain near Springville.

The various deposits in this section have considerable potential value, although undeveloped at present.

MINERAL COMPOST.

Pennewell and Company, home office, Lemon Cove, are erecting a plant at Terminus adjoining that of the Kaweah Lime Products Company for the manufacture of a mineral compost composed essentially of lime, raw phosphate in the form of tri-calcium phosphate, and sulphur. The ground raw limestone will be supplied by the Kaweah Lime Products Company, and the other ingredients of the compost will be shipped in and combined into an indirect mineral fertilizer or soil corrective. The use of these minerals in farming operations is increasing in this state, and this product will no doubt find a ready market.

MAGNESITE.

Twenty-four magnesite properties in Tulare County are described in detail in Report XV, 1916. The production for that year was 87,606 tons of crude magnesite. In 1917 the production nearly doubled, amounting to 136,562 tons.

The magnesite industry declined rapidly in 1918, the production from Tulare County for that year being only 28,826 tons. There was a further decline in 1919, followed by an increased production in 1920, and then by a decrease in 1921 that brought the output of the Tulare County mines to the low figure of 11,454 tons.

The main hope for the future of this industry in Tulare County appears to be in the development of the plastic magnesite business.

The Tariff Act of 1922 places a duty on crude magnesite of $\frac{5}{16}$ of 1 cent per pound; caustic calcined magnesite, $\frac{5}{8}$ of 1 cent per pound; dead,



No. 22 Vein, Porterville Hill Property, Sierra Magnesite Company.

burned, and grain magnesite, not suitable for manufacture into oxychloride cements, $2\frac{3}{40}$ of 1 cent per pound. On magnesite brick the duty is $\frac{3}{4}$ of 1 cent per pound and 10 per centum ad valorem. With the tariff question settled, the situation faced by California producers has cleared.

Since Report XV appeared there has been a number of changes of ownership of existing plants, properties, leases, etc., and a concentration of the former rather scattered mining activities into the hands of a few.

Blue Crystal Magnesite Mine. This property, which produced about 2500 tons of magnesite during the war, is now owned by S. A. Boggs and Fred Coolidge of Lindsay. Another claim has been acquired, making five in all, the Blue Crystal No. 1 and No. 2, Yellow Metal, Kaolin King, and Western Fraction.

Negotiations for the sale of the Blue Crystal to a Chicago company are under way. Included in the deal are two other deposits, one close to Strathmore, owned by Ed. Schrie, and another called the Apapha Mine, owned by J. W. Marshall. All are idle.

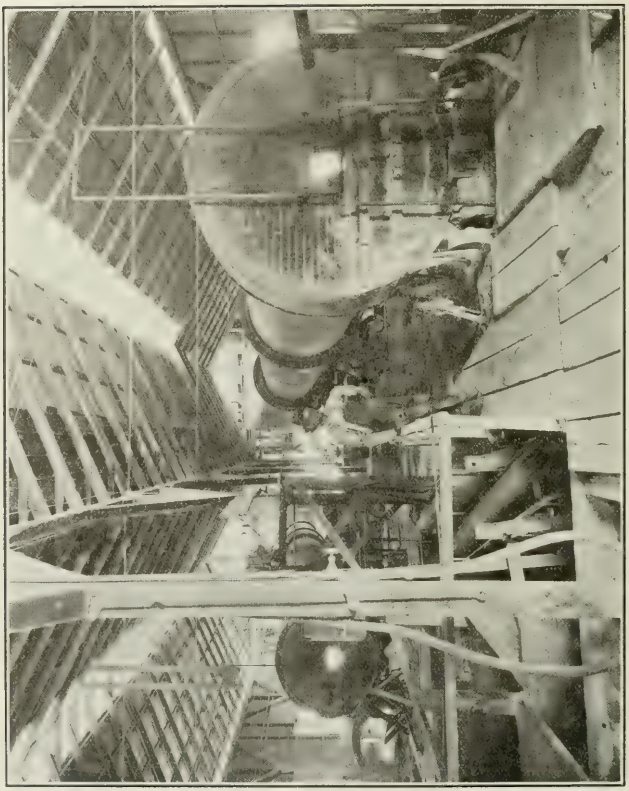
Sierra Magnesite Company (subsidiary *National Kellastone Company,* Chicago, Illinois), S. H. Barrows, president; J. A. Bernhard, vice president; C. H. Howse, treasurer; E. C. Tourje, secretary; offices, 404 Balfour Building, San Francisco; 155 E. Superior Street, Chicago, Illinois; 302 Park Row Building, New York and at Porterville. Arthur Deleray, manager, Porterville. The present company was organized in 1920 and has taken over the Tulare Mining Company property, leases formerly held by the Porterville Magnesite Company, and the Oakland Magnesite Company holdings. The calcining plant on the old Porterville Company property and that of the Tulare Mining Company are not in use, the Sierra Magnesite Company plant at the corner of E and Orange streets, Porterville, being the only calcining plant operating in the Tulare field.

The National Kellastone Company's plant is combined with this and a standardized magnesite produced. This is accomplished by the use of a Hoskins recording pyrometer for the exact control of furnace heat, and by the chemical and physical testing of all materials and finished products.

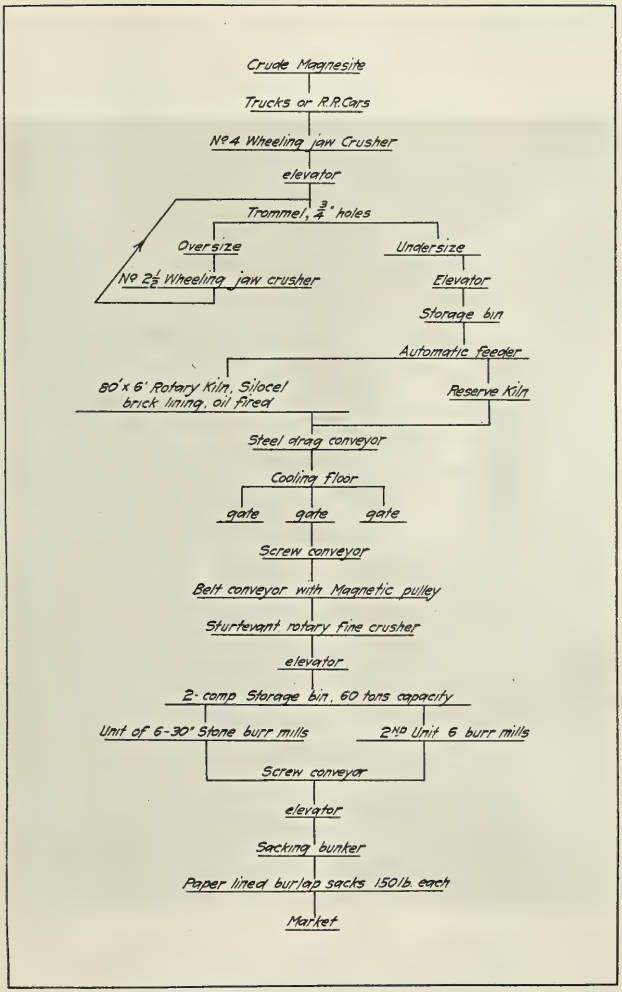
The company has its own magnesium chloride plant adjoining, for the manufacture of the solution used in mixing the 'Kellastone' stucco, composition flooring, drain-board material, interior plaster, wall board and other products.

Various colored rock 'dash' is used to give a variety of finish for exterior work. Difficulty has been found in locating a satisfactory yellow 'dash,' but reds, brown, pink, green, gray, and other colors are generally obtainable in the nearby foothills.

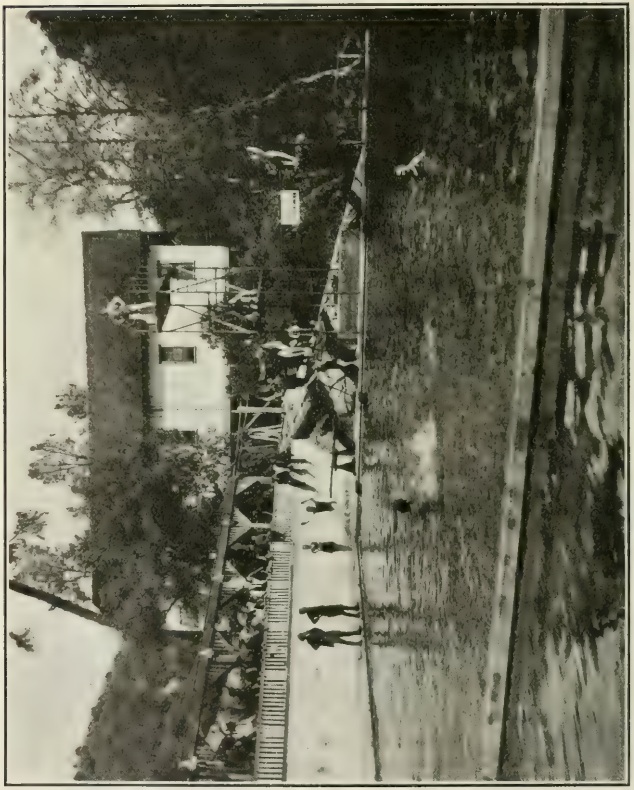
At the present time about one hundred men are employed. The Porterville Hill property is worked by contract. There are usually about twenty contracts going. All other properties are mined on company account. Sixty men are employed on the average in mining and thirty-five at the plant. A flow sheet of the mill is shown herewith. The entire plant is enclosed in a concrete and corrugated iron building with steel cooling floor. The chemical and physical laboratory and office building are finished on both the inside and the outside with Kellastone products.



Kilns Nos. 3 and 4—Rotary Calcining Ovens, Sierra Magnesite Company.



Flow Sheet, Sierra Magnesite Company's Calcining Plant.



Plunge, California Hot Springs.

One of the principal objections of architects and engineers against the use of magnesite plastic products in the past has been the lack of uniformity in the product marketed. This cause for complaint has been overcome by strict technical control of operations and the management reports the future outlook as especially good.

MANGANESE.

There is no activity in manganese mining. In addition to the localities mentioned in Report XV, manganese is reported to occur at points on Dry Creek about T. 15 S., R. 27 E. Undeveloped.

MINERAL SPRINGS.

Thirteen mineral springs are described in Report XV. No water is bottled at any of them. Probably the best known and one of the most accessible is *California Hot Springs*. Situated about 30 miles southeast of Porterville by good road. The property is owned by the California Hot Springs Company. Mrs. J. H. Williams, president; Joseph Mitchell, vice-president and general manager; Leo Mitchell, treasurer.

There is a large hotel and seventy cottages capable of accommodating 750 guests. Open the year round.

NATURAL GAS.

Natural gas has been known in the Tulare Lake district[1] for many years, but it has not been utilized commerically except for local domestic use on the several ranches. The gas occurs in water wells rising with the water, when pumped, or when they overflow, as a few do at certain seasons.

Southwest of Alpaugh the surface is higher than the general level of the land and a contour line here closes upon itself in the form of an ellipse whose major axis extends northeast and southwest. Locally this area is known as the island. Parallel with the contour line along the northwest side of the so-called island tract are the most numerous gas producing wells, but the gas is not limited to this area as it has been found and utilized at many other points in that part of southwestern Tulare lying west of the Santa Fe Railroad, and in Kings County.

These gas wells have not heretofore been mentioned in reports on the mines and mineral resources of the county, and for the purpose of placing them on record, this otherwise strictly agricultural and dairying section was visited.

Domestic Well, Alpaugh. This well supplies water for the Alpaugh Irrigation District and for domestic use in the town of Alpaugh. It is situated about half a mile south of the town. The well is 1200 feet in depth and is pumped continuously by a Layne-Bowler pump operated by electric motor. Pump discharge is through an 8-inch casing into an open concrete tank. The discharge pipe is raised at an angle so that although the pipe is full to within about one foot of the end, it does not carry a full 8-inch stream. At the lip there is a wedge-shaped open space extending back about one foot, the water at the lip occupying about three-quarters of the pipe end area. A lighted match applied to this open space above the water will immediately ignite the gas accom-

[1]See Summary of Operations, California Oil Fields, December, 1919, and July, 1922, for analyses of gas, etc.

panying the water. It burns so clearly that the flame can scarcely be discerned when looking against the sky as a background. The quantity is not sufficient to make a very persistent flame of such large size, and a quick gust of air will blow it out. The gas is allowed to escape into the atmosphere and is not utilized. H. C. Rogers, manager, Alpaugh, California.

Crowell Ranch Well. F. E. Crowell, Alpaugh, owner. The well on the Crowell Ranch about three miles southwest of Alpaugh is 1100 feet in depth. The discharge from the pump passes through a covered tank in which a portion of the gas collects. Enough is obtained for domestic use for cooking, lighting and heating. Most of the collecting tanks seen were small and as soon as filled to capacity the gas can no longer escape from the water but passes out into the irrigating ditches and hence into the atmosphere. There is a second well on the Crowell property, not now in use, at which the gas was formerly utilized for running the pump. Most owners prefer the convenience of electric power for pumping even when the wells supply sufficient gas to furnish the motive power for a gas engine.

Bent Ranch Well. On the Bent Ranch, J. W. McClarren, superintendent, Alpaugh. This property lies south of the Crowell Ranch. There are three gas producing wells on the Bent Ranch, but only one is utilized. It is 1100 feet in depth. A part of the gas that comes with the water is collected and utilized for cooking. A 1-inch pipe line supplies a 6-burner stove, but the owner says there is enough gas coming from the well to supply four such stoves. The gas burns with a clear blue flame said to be much hotter than one from manufactured gas.

Akes Ranch Well. Jess Akes, Alpaugh, owner. Property about ten miles southwest of Alpaugh. Gas from a well on this ranch is utilized to run the pump.

Golden State Property (Rising Ranch) Well. Owner, N. G. Rising, Los Angeles; Lessee, E. V. Elick, Alpaugh. One well 1100 feet in depth. Gas of the same character as that at the Bent Ranch is collected in a tank above the well and used for cooking and heating. When first put down there was a very strong flow of gas and the Rising Ranch Well was known, from its geyser-like blowouts of water and gas as the 'crazy' well.

Holland Dairy Ranch Well. Henry Lovin, Kingman, Arizona, owner; Jacob Sonke, Lessee, Alpaugh, California. There is one well on this property about 1200 feet in depth, with so much gas in the water that a turbine-type pump has to be used in place of a centrifugal. Gas allowed to go to waste.

Blaney Ranch Well. Mrs. N. J. Blaney, owner, 920 O Street, Fresno; T. C. Roller, Lessee, Angiola, California. There is one well about 1500 feet deep on this property. A tank over the discharge pipe collects a portion of the gas which is used for cooking, but most of it is allowed to escape. At certain seasons this well is artesian, and the gas comes with the water when it is overflowing as well as when being pumped.

Williams Ranch (Fulton) Well. Owner, R. Y. Williams, Santa Ana; Lessee D. H. Fulton, Angiola, California. Two wells are being pumped on the property, one 1800 feet and the other 2200 feet in depth. Gas is

obtained from both and used for cooking. More is obtained than is used, and the owner states that he believes enough could be collected from the 2200-foot well to supply a small town.

California Natural Gas and Development Co., First National Bank Building, San Francisco, California. F. P. Kendall, president; Amos W. Elliott, secretary; R. N. Ferguson, superintendent, Angiola. This company is drilling a well for gas and oil about five miles southwest of Angiola just west of the Tulare-Kings County line, present depth 2200 feet. There are several other old wells on the property of the company and enough gas is being obtained to supply their needs in drilling.

Gas wells are also reported on the *E. L. Fox Ranch* four miles south of Angiola, on the *Tulare Farms property* and *Dan Gregg lands* south of Alpaugh, W. W. Galbreath, Alpaugh, manager of two latter properties; and on the *Canfield Ranch*, E. C. Percival & Son, Angiola, managers, but no details were obtained in regard to these.

In the same general vicinity, but farther north near Corcoran, in Kings County, there are a number of producing gas wells.

Sixteen or seventeen years ago there was a large gas blowout which destroyed the derrick at a well in Sec. 12, T. 23 S., R. 22 E., Kings County, and left a deep crater. There have been a number of wells at ranches along Dairy Avenue between Angiola and Corcoran, but some of these have ceased to produce gas. As a rule the gas ceases in from two to six years owing to the corrosion of pipes. Galvanized pipe is said to last longer than iron.

Burt Bros. Ranch. Owners, Burt Bros., Corcoran. Gas from two wells on this ranch is being used for cooking, lighting and heating, but more gas is wasted there than is saved, and the owner states that he believes the two wells would supply the town of Corcoran. The wells near Corcoran are much shallower than those farther south.

Hunter Ranch Well. Hunter Ranch, Corcoran, California. The gas wells here are shallow and usually not over two inches in diameter, being put down for the gas rather than as a source of water. At present one well 420 feet in depth is used, supplying gas for the cook-house. A good deal is wasted.

Hall Ranch Well. Hall Ranch, Corcoran, California. There are four 2-inch wells about 500 feet deep supplying gas for the cook-house. The quantity is diminishing as the pipes are getting corroded. These wells produce only a little water.

One mile south of the Hall Ranch there is a 4-inch well on unoccupied land that is a heavy gasser. No one is using it.

There is another gas well reported at the Clark and Becket Creamery, Corcoran. Not visited.

SILVER.

Deer Creek Silver Mine. This is an old property worked in the 60's or 70's, the ore at that time being hauled by wagon to Tipton for shipment to smelter. It was acquired in August, 1922, by the Deer Creek Silver Mining Company (unorganized), 1330 L Street, Bakersfield, California, and is being reopened. J. R. Hughes, superintendent. Terra Bella is the nearest town, and Magnolia Siding, 6 miles distant, the nearest rail shipping point. The mine is situated 11 miles southeast of Porterville at an elevation of 500-600 feet and is easily reached by

good road. It is in an unorganized district but adjoins the White River Mining district. The company owns two patented claims and forty acres additional, making a total area of 80 acres. There is no timber. At present the mine makes about 250 gallons of water per minute.

The deposit occurs in a sheer zone about 150 feet wide, containing several parallel igneous dikes, and consists of a quartz vein system with talc gouge and cross veins. The principal vein so far developed is from six inches to 3½ feet in width. The lode can be traced on the surface for over a mile. Granite, the country rock, forms both foot and hanging wall. The vein strikes N.–S. and dips about 50° W.

The deepest working is an 80-foot vertical shaft which cuts the vein at that level. At a depth of 60 feet there is a 25-foot drift and 22-foot crosscut. From this level ore was stoped to the surface. On the 80-foot level there is a 75-foot drift run south from which some ore has been stoped. The ore carries silver sulphides, some gold, and about 6 per cent copper in the form of azurite. In places it is heavily mineralized and high grade. Present operations are of an explanatory character. Equipment consists of pumping plant, new head frames, and light hoisting equipment. A new incline shaft has been started on the vein. This is down 40 feet. From this shaft a crosscut is being driven into the footwall where it is expected to cut a parallel orebody. Four men are employed, two on top and two in the mine. Hand work only is used at present, but the company expects to install electric power.

This deposit is typical of many of the gold and silver properties in the granitic area of Kern, Tulare, Fresno and Madera counties. Many have good production records, but values are spotted as a rule, and the veins irregular and relatively narrow. Successful exploitation depends to a very great extent on a proper realization of these factors with the consequent reduction of 'overhead' costs to a minimum, and the elimination of expenditures for unnecessarily large reduction equipment.

ZINC-LEAD.

The old Mineral King district at the headwaters of the Middle Fork Kaweah River is the principal locality in which zinc-lead deposits are found. The ores usually carry gold, silver and copper as well, and are of complex character. Local attempts at treatment have been unsuccessful, and the inaccessibility of the district makes transportation very expensive.

Except for changes in ownership and annual assessment work, the mines remain in practically the same condition as stated in Report XV. To a company with ample capital and a thorough technical knowledge of the metallurgical problems, the district presents interesting possibilities.

Dolly Varden Mine. Idle. Owned by J. J. Davis, Mineral King, or Woodlake, California.

Empire Mine. Former owner, W. O. Clough, long interested in the district, deceased. Present owner, Arthur Crowley, Mineral King. Idle.

Monarch Mine. Owner, J. J. Davis, Mineral King. Formerly known as the Black Wolf.

White Horse Mine. Owned by Crowley and Davis, Mineral King.

LOS ANGELES FIELD DIVISION.

M. A. Newman, Mining Engineer.

Inyo County.

California Talc Co. This company has an option on a group of seven claims, as follows: Eclipse No. 1 and No. 2, Comet No. 1 and No. 2, Grant, Climax and Chieftain.

It has received a permit from the Corporation Commission to sell 75,000 shares at $1 per share par value, in order to purchase the above claims and erect a mill for the manufacture of talc and talc by-products. It is estimated a milling plant will cost, when erected, $25,000.

Kern County.

North Sumner. This property, described in the April number, is reported to have cut 4 feet of ore, assaying $41 per ton, in its lower workings. This is supposed to be an entirely new vein, and, should such be the case, it will mean much to the future of this mine.

Percy V. Long of San Francisco is president of the company.

Randsburg District.

Yellow Aster Mining Co. The leasers, which the company has on its property, are taking out ore of an exceptional grade. From the Gunderson and Otterman lease $6,500 were the mint returns from 108 tons treated at the Yellow Aster mill.

While the company has had applications from many persons, but very few leases have been granted, and those only to first-class miners. By pursuing this policy the company will develop its holdings most advantageously and leave the mine in good condition for large scale operations in the near future.

Mojave District.

Yellow Dog Mining Co. This company (to which reference was made in the July number of 'Mining in California') has just installed a 12″x10″ compressor and proposes to sink a double compartment shaft on its property near Mojave.

The Mojave district has to its credit production of several million dollars from such mines as the Exposed Treasure, Queen Esther and others, and it is to be hoped another mine of real importance may be developed by the Yellow Dog Mining Company.

San Bernardino County.

Randsburg District.

Ben Hur. Developments have proven so satisfactory that larger equipment has been found necessary. The company has therefore installed one 10″x10″ Chicago Pneumatic Compressor, capacity 250 cubic feet. A. B. Hall is superintendent.

Black Hawk. Some months ago, this company put down a diamond drill hole, located several hundred feet to the east of the Bisbee shaft. Evidently the results obtained were encouraging, as it is now sinking a double compartment shaft in this region, which is down 100 feet. It has recently moved its compressor to this shaft from another part of

its holdings, in order to speed up sinking. J. R. Greenan, manager; Dan McCormick, superintendent.

California Rand Silver, Inc. The following has been abstracted from the company's report for September:

"Dividend No. 33 for $25,600 was paid, being at the rate of 2 cents per share, and making a total of 70 cents per share since January 1, or a total of $896,000. Since organization $1.53½ per share, or $1,964,800 has been paid."

Ore Extraction and Advancement.

During September, tonnage extracted was as follows:

Shipping ore	962 tons
Milling ore	4,312 tons
Waste	2,351 tons
Total extraction	7,625 tons

Advancements were as follows:

Drifts	1,163 feet
Raises	140 feet
Crosscuts	102 feet
Shafts	140 feet
Total advancement	1,505 feet

During the month, sinking of No. 2 shaft was resumed and it had reached a depth of 821 feet on the thirtieth of September.

Milling Operations.

Except for a shutdown of virtually two days occasioned by an interruption in the Yellow Aster water supply, the operation of the mill was substantially as heretofore reported.

Total ore milled	4,391 tons
Daily average, 30 days	146.37 tons
Daily average running time	168.24 tons
Running time	26 days, 2½ hours
Lost time	3 days, 21½ hours
Average gold heads	$1 66
Average silver heads	14 02
Total average value	$15 68
Average gold tails	$0 41
Average silver tails	93
Total tails	$1 34
Average gold extraction	75.30 per cent
Average silver extraction	93.36 per cent
Total average extraction	91.45 per cent

Recovery, per ton	$14 34
Total recovery on 4,391 tons	62,966 94
Average concentrate value	367 00
Tons of concentrates produced at $367	171.57
Tons of concentrates shipped, net	240

During the last days of September the new machinery designed to increase capacity to 200 tons daily was put in operation.

Water Situation.

Late in the month the mine commenced pumping from the new Teagle Springs well, and is now being supplied with nearly 25,000 gallons daily from this source. The water is of high quality and materially improves the domestic water service of the mine.

In connection with the water situation, it should be noted that the water for some months present in the No. 2 shaft is increasing in volume, 114,000 gallons having been hoisted from this shaft in September. It is likely that the management will soon have to install pumps to handle the increasing flow. As all this water is used in milling operations, thereby lessening the amount purchased from the Yellow Aster Company, the increase of volume offers some compensation for the expense involved.

Patent Proceedings.

During the month word was received from Washington that the Commissioner of the Land Office has denied the application of the Randsburg Silver Mining Company, owning the Coyote claim, for a hearing to investigate the mineral character and discoveries of this company's Uranium No. 7 and 10 claims. In other words, unless the Secretary of the Interior reverses this ruling, the only method of attacking this company's title to said claims will be through the courts.

During September 945 tons of ore (23 cars) and 240 tons of concentrates (6 cars) were shipped. We call attention to the fact that the mine since discovery has now shipped over 1000 cars of ore and concentrates.

Receipts from the smelter for September were $174,244.56.

After the payment of this dividend of $25,600, the company has on hand: $383,127.85.

Golden King United. This company controls ground in the region between the Sunshine and the Gimlet Mines. It is sinking an incline shaft on the vein and its present depth is about 100 feet. Its equipment consists of one 10″x10″ compressor capacity 250 cubic feet per minute, and one West Coast hoist driven by a 50–h. p. West Coast gas engine.

Housing accommodations for its employees are most modern in every respect. A few extra dollars spent in this respect will insure a contented crew and will be repaid many times by the increased efficiency resulting.

J. C. Topping is superintendent.

Grady shaft No. 1. This shaft, which is now down 1000 feet, is to be sunk 200 feet deeper. At a depth of 975 feet, a crosscut is being run, and it is reported that assays running as high as 25 ounces silver have

been obtained. While no large or well defined ore body has as yet been encountered, it is nevertheless encouraging that some mineralized ground has been cut.

Silver Bell Mining Co. The Silver Bell claim of this company lies to the northwest of Uranium No. 3 owned by the California Rand Silver, Inc. The company has mapped out a very ambitious program, by proposing to sink a shaft to a depth of 1000 feet. Its equipment consists of one 12″x10″ Chicago pneumatic compressor having a capacity of 360 cubic feet per minute; one 50-h. p. Denver Engineering Company single drum electric geared hoist, having a hoisting speed of 600 feet per minute. The gallows frame is 40 feet high with self dumping apparatus. The shaft is 5′x7½′ in the clear and is now down about 150 feet.

The following are the officers of the company:

President: E. D. Burge; secretary-treasurer, Nat. Solomon; general manager, A. T. Johnson; consulting engineer, T. T. Lane.

Treasure Hill Mine: It is reported that the company operating this property will sink its present shaft to a depth of 525 feet. The property lies betwen the Ben Hur and the K. C. N. groups and has already developed ore of a commercial grade on its holdings.

Other Districts.

The old *Waterman Mine*, near Barstow, which was formerly worked by ex-Governor Waterman, is to be reopened.

Mr. George B. Parks has obtained a lease and bond on the property and is getting the workings in shape for active operation.

The property has a record of nearly 1,000,000 ounces of silver during the period that it was operated by Governor Waterman.

San Diego County.

Kerst & Regnier. A prospect carrying pockets of high grade ore is being developed by Kerst & Regnier at the Chase Ranch in the El Cajon Valley. Two shafts, one 48 feet, and the other 36 feet in depth, have been sunk on two stringers and assays from $75 to $300 have been reported on this ore. A small prospect mill is now at the property. If the present development proves the veins to be of a permanent nature, it is the intention of the present lessees to install a larger milling plant.

OIL FIELD DEVELOPMENT OPERATIONS.

R. E. COLLOM, State Oil and Gas Supervisor.

From September 16, 1922, to and including October 7, 1922, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well	Field
KERN COUNTY:					
Pacific Oil Co	35	30	24	109	Elk Hills
Midway-McKittrick Oil Co	30	30	22	2	McKittrick
Balboa Oil Co	24	31	23	6	Midway
C. O. M. O. Co	22	31	22	23	Midway
C. C. M. O. Co	22	31	22	24	Midway
C. C. M. O. Co	9	32	23	9	Midway
Caliposo Petroleum Co	36	32	23	1	Midway
Honolulu Consolidated Oil Co	6	32	24	59	Midway
Honolulu Consolidated Oil Co	2	32	24	89	Midway
North American Oil Cons	32	31	24	1	Midway
Pacific Oil Co	27	31	23	29	Midway
Pacific Oil Co	29	32	24	31	Midway
Pyramid Oil Co	28	32	24	2	Midway
Standard Oil Co	7	32	25	6	Midway
B. B. & O. Oil Co	28	12	24	31	Sunset
C. J. Berry	34	12	24	11	Sunset
El Dora Oil Co	32	12	23	5	Sunset
Lake View No. 2 Oil Co	4	11	23	6	Sunset
Tannehill Oil Co	34	12	24	24	Sunset
LOS ANGELES COUNTY:					
Black Star Oil Co	30	4	12	Black Star 1	Long Beach
Bush-Voorhis Oil Co	19	4	12	7	Long Beach
Calmont Oil Co	19	4	12	3	Long Beach
Casa Blanca Oil Co	28	4	12	Casa Blanca 1	Long Beach
Conductor's Oil Co	29	4	12	Keyes 1	Long Beach
F. M. Couden	20	4	12	1	Long Beach
Dabney Oil Syn	30	4	12	19	Long Beach
Dabney Oil Syn	30	4	12	20	Long Beach
Duplex Petroleum Corp	30	4	12	Weisz 1	Long Beach
Duplex Petroleum Corp	30	4	12	Dahlia 1	Long Beach
E. & W. Oil Co	19	4	12	1	Long Beach
Hugh B. Evans	30	4	12	1	Long Beach
Walter H. Fisher	30	4	12	2	Long Beach
Fred B. Foster Co	20	4	12	Wallace 1	Long Beach
Graham & Loftus	19	4	12	1	Long Beach
Harmony Oil Co	19	4	12	1	Long Beach
Hawthorne Oil Co	19	4	12	1	Long Beach
Henderson Petroleum Co	30	4	12	Nancy 1	Long Beach
A. T. Jergins Trust	19	4	12	4	Long Beach
Wm. P. Loftus	19	4	12	1	Long Beach
Lone Star Oil Syn	30	4	12	1	Long Beach
Marine Oil Corp	29	4	12	7	Long Beach
E. J. Miley	19	4	12	2	Long Beach
National Oil Co	19	4	12	1	Long Beach
Petroleum Midway Co., Ltd	19	4	12	Davidson 2	Long Beach
Petroleum Midway Co., Ltd	19	4	12	Harlow 2	Long Beach
Petroleum Midway Co., Ltd	19	4	12	Harlow 3	Long Beach
Petroleum Midway Co., Ltd	19	4	12	Harlow 4	Long Beach
Regina Petroleum Corp	27	4	13	1	Long Beach
Shell Co	19	4	12	Marcellus 5	Long Beach
Shell Co	29	4	12	Alamitos 5	Long Beach
Shell Co	20	4	12	2	Long Beach
Shell Co	19	4	12	Cresson 3	Long Beach
Shell Co	29	4	12	Pickler 4	Long Beach
Shell Co	29	4	12	Cherry Hill Com. 3	Long Beach
Shell Co	29	4	12	Martin Com. 2	Long Beach
Shell Co	29	4	12	Nicholson 2	Long Beach
Shell Co	29	4	12	Wells 1	Long Beach
Simplex Petroleum Corp	19	4	12	Garrison 1	Long Beach
Simplex Petroleum Corp	19	4	12	Johnson, Dugan & Clark 1	Long Beach
Superior Oil Co	19	4	12	Britton 1	Long Beach
Ticker & Johnston	30	4	12	1	Long Beach
United Oil Co	19	4	12	Hass 2	Long Beach
Western Star Oil Co	19	4	12	Campbell 1	Long Beach
Western Star Oil Co	19	4	12	Neece 2	Long Beach
M. H. Whittier Co	19	4	12	1	Long Beach
General Petroleum Corp	8	4	14	Van Lew 1	Redondo

Company	Sec.	Twp.	Range	Well	Field
Standard Oil Co	10	4	14	Torrance Com. 2	Redondo
Standard Oil Co	8	4	14	Kirk Com. 1	Redondo
General Petroleum Corp	5	3	11	Santa Fe 46	Santa Fe Springs
General Petroleum Corp	6	3	11	Hill Midway 1	Santa Fe Springs
General Petroleum Corp	6	3	11	Springs 4	Santa Fe Springs
Luneta Oil Co	9	3	11	1	Santa Fe Springs
McKeon & Doyle	6	3	11	1	Santa Fe Springs
Pacific Petroleum Corp	6	3	11	K-1	Santa Fe Springs
P. M. Pike	6	3	11	1	Santa Fe Springs
Standard Oil Co	6	3	11	Walker Com. 3	Santa Fe Springs
Standard Oil Co	5	3	11	S. Whittier Com. 5	Santa Fe Springs
Standard Oil Co	6	3	11	Walker Com. 4	Santa Fe Springs
Stewart-Anderson Syn	7	3	11	1	Santa Fe Springs
Superior Oil Co	6	3	11	Wardman 2	Santa Fe Springs
Union Oil Co	6	3	11	Bell 14	Santa Fe Springs
Union Oil Co	5	3	11	Farwell 2	Santa Fe Springs
Union Oil Co	31	2	11	Howard 4	Santa Fe Springs
Union Oil Co	5	3	11	Meyer S	Santa Fe Springs
Universal Cons. Oil Co	6	3	11	3	Santa Fe Springs
Western Star Oil Co	6	3	11	Weaver 2	Santa Fe Springs
Whiston & Cox Oil Co	6	3	11	1	Santa Fe Springs
Wilshire Oil Co	6	3	11	Gill 1	Santa Fe Springs
Mark L. Hawley	19	3	11	1-A	----------
Reider-Hoag Co	34	1	17	1	----------
Frank P. Sproul	24	2	17	1	----------
NAPA COUNTY:					
Griffiths Oil Co	29	8	3	6	----------
ORANGE COUNTY:					
George E. Cathcart	7	3	10	Toler 1	Coyote Hills
Standard Oil Co	18	3	10	M. C. 94	Coyote Hills
Amalgamated Oil Co	2	6	11	Hunt. Beach 4	Huntington Beach
Huntington-Downey Oil Co	35	5	11	1	Huntington Beach
Miley Keck Oil Co	2	6	11	20	Huntington Beach
Selby, Root & Hogue	34	5	11	Curtis 2	Huntington Beach
Selby, Root & Hogue	34	5	11	Clark 3	Huntington Beach
Shell Co. (U. D.)	14	6	11	Newland-Borchard 1-C	Huntington Beach
Standard Oil Co	34	5	11	Bolsa 10	Huntington Beach
Standard Oil Co	12	6	11	Gisler 1	Huntington Beach
Standard Oil Co	12	6	11	Mills Land-Water Co. 1	Huntington Beach
Standard Oil Co	12	6	11	Farnsworth 2	Huntington Beach
Union Oil Co	35	5	11	Copeland 14	Huntington Beach
Union Oil Co	34	5	11	Copeland 15	Huntington Beach
Union Oil Co	34	5	11	Brooks 4	Huntington Beach
RIVERSIDE COUNTY:					
Arl Oil Co	31	2	5	1	----------
SAN BERNARDINO COUNTY:					
Italian Vineyard Co	26	1	17	1	----------
Western Pacific Oil Co	4	10	4	1	----------
SAN MATEO COUNTY:					
Poso-Moon Oil Co	10	6	5	1	Half Moon Bay
SANTA BARBARA COUNTY:					
Wm. F. Tobin	Lookout Park			4	Summerland
TULARE COUNTY:					
Josephine E. Neame Oil Co	24	17	24	1	----------
VENTURA COUNTY:					
Montebello Oil Co	4	3	19	Shiells 126	Bardsdale
B. & L. Oil Co	4	4	18	1	Piru
Schell & Jennings	32	4	18	3	Piru
Ventura Petroleum, Inc	25	4	22	14	Santa Paula
Progressive Oil & Ref. Co	5	2	17	1	Simi
S-S Syndicate	6	2	17	2	Simi
South Santa Paula Pet. Co	26	3	21		South Mountain

SPECIAL ARTICLES.

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the Bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff containing much information that will add to the permanent value of the Monthly Chapter are included in each number of 'Mining in California.'

It is anticipated that these special articles will cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations, as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the text of new laws and official regulations and notices affecting the mineral industry.

RADIOACTIVITY IN THERMAL GASES AT THE GEYSERS, SONOMA COUNTY, CALIFORNIA.

By Walter W. Bradley.

The presence of radioactivity at The Geysers hot springs in Sonoma County was first noted by the writer[1] in the annual statistical report of mineral production two years ago. The statement referred to was based on the fact that one or two positive reactions had been obtained on February 22, 1920, with a rather crude arrangement of apparatus but the only equipment available on short notice at the time. Those tests were made on gases issuing from crevices in the side wall of the canyon of Sulphur Creek near the creek bed, at a point where the bank had been excavated and then covered by two rooms, with concrete walls, to be utilized for steam baths.

The main difficulty encountered in attempting to make the tests at that time was in getting rid of the considerable amount of steam accompanying the gas, as we had not suitable condensing apparatus at hand. The electroscope used was a homemade, single-chamber affair, provided with inlet and outlet tubes for the passage of the gas. The gold leaf was supported on an aluminum rod set in a sulphur plug. The principal objection to the single-chamber electroscope is the fluttering of the gold leaf and its possible damage thereby, in case the current of gas passing should be too strong.

Recently (Aug. 20, 1922) the writer made a second series of qualitative tests, assisted by Mr. Frank Sanborn, determinative mineralogist of the State Mining Bureau staff. The present owner of the property, Mr. J. D. Grant, has drilled two wells in the fumarole area on the north side of the canyon, opposite the hotel, at an elevation of approximately

[1]Bradley, W. W., California mineral production for 1919: Cal. State Min. Bur. Bulletin 88, p. 124, 1920.

1450 feet (barometric reading) above sea-level. The first well was not completed, as the casing collapsed on account of being too light. The second well (see photos A, B, and C) was put down with 12-inch casing to 106′, then an 8-inch inside of that down to 118′ 5″, from which point the hole was drilled in rock without casing. At the time of our visit the bottom was at 181′ 6″, but Mr. Grant informs the writer that it has since been drilled to 203′, at which point on breaking into another crevice (27 such crevices were broken into between 124′ depth and the bottom) the gas pressure became great enough to force the tools up the casing 12′ to 15′ and balance them there. They have decided to 'let well enough alone' so far as that one hole is concerned and will not try to go deeper, at least at present. These wells, and others to be drilled, are part of a prospective plan to develop steam power for an electric-generating plant, along similar lines to plants now in commercial operation in Italy.

With the top valve closed and the valve in the 8-inch horizontal pipe wide open, as shown in photo C, the steam gauge at the well showed 60 pounds pressure. With both valves closed, the gauge registered 70 pounds. A Brown expansion pyrometer indicated a temperature of 530° F. within the chamber of the top gate-valve while discharging wide open.

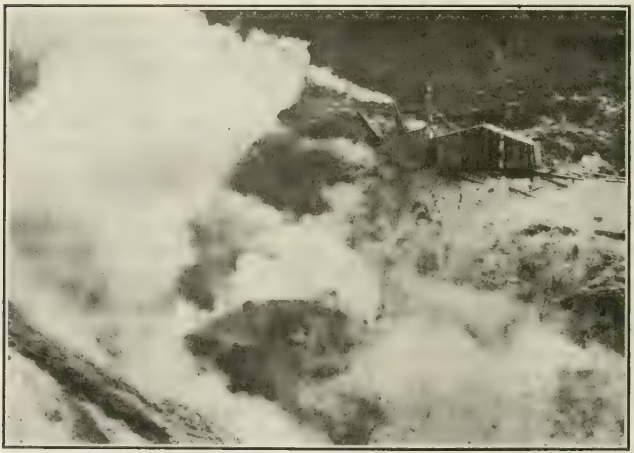


Photo A. Natural fumaroles, and well being drilled, at The Geysers, Sonoma County, California. Photograph taken early in the cool of the morning, when the steam shows more effectively. Photo by J. D. Grant.



Photo B. Superheated steam issuing from well, with valve open. The thermometer registered temperature of 530° F. within the chamber of this valve. Photo by J. D. Grant.

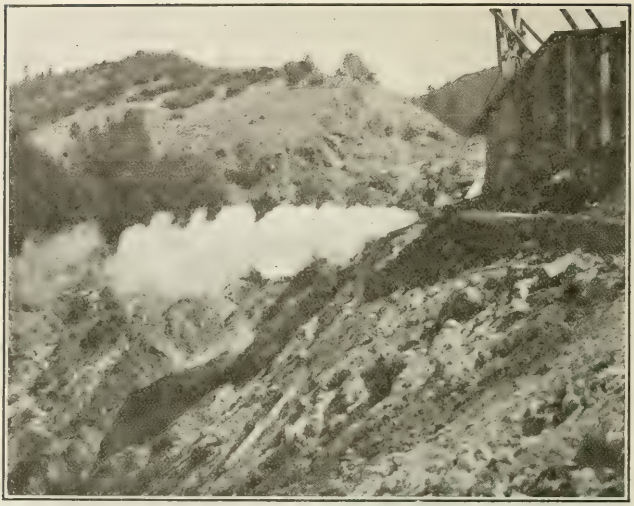


Photo C. Full head of steam issuing from 8-inch exit pipe at side of well. The Geysers, Sonoma County, California, August 20, 1922.

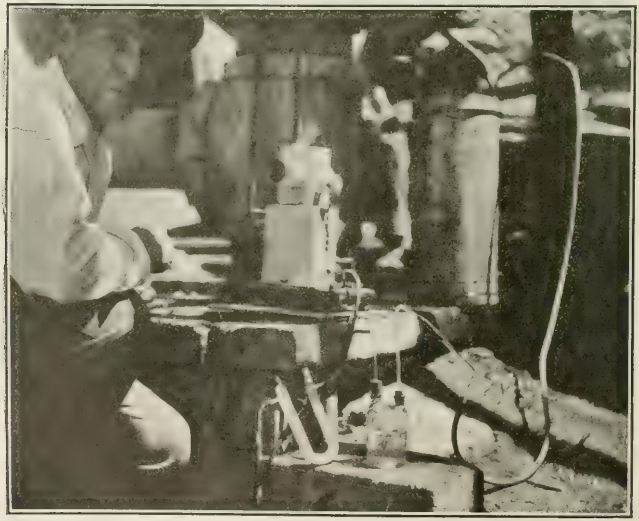


Photo D. Apparatus arranged to test radioactivity of gases at The Geysers, Sonoma County, California.

The electroscope used in testing the gas from this well for radioactivity is a two-chamber unit, constructed in the laboratory of the State Mining Bureau after consulting a number of text-books, drawings and authorities on the subject (see photo D). It is made of sheet copper, soldered, and the separable joints made air-tight with wax. The gold leaf in the upper compartment is attached to an aluminum rod which passes through a sulphur insulating-plug into the lower compartment.

Gas for testing was led off through a $\frac{3}{4}$-inch pipe tapped into the side of the well pipe and the valve in this smaller pipe barely 'cracked' open. The gas was cooled by passing through a tin coil condenser in a vertical cylinder (see photo D) with circulating cold water, and then into a Wolff bottle which collected such of the condensed steam as had not stopped in the tin coil. The gas was then passed through a U-tube filled with calcium chloride ($CaCl_2$) to completely dry the gas before it reached the electroscope.

Before introducing the gas, the gold leaf in the electroscope was first charged until it stood out at an angle of approximately 30° from the vertical. It remained in that position for 15 minutes without showing any appreciable air leak. (In the laboratory of the State Mining Bureau the leaf has repeatedly stood charged for as much as two hours without showing an appreciable air leak.) The dried gas was then allowed to pass through the lower compartment of the electroscope and the static electric charge on the gold leaf was completely discharged in 15 minutes. With the gas current still on, the leaf was then recharged; this time to an angle of 40°, and became completely discharged in 7 minutes.

The electroscope was then taken out of the circuit and removed to a point about 50 feet away from the well. The gas in the lower compartment was expelled by blowing air through, the stop-cocks closed, and the gold leaf charged to 40°. After 35 minutes the leaf had become discharged to 20°, indicating that the radioactive emanations had not been completely expelled from the chamber. The electroscope was again connected to the flow, and in three successive readings the gold leaf was completely discharged in 13 minutes, 12 minutes, and 9 minutes, respectively. A lighted match, held at the gas outlet to test the current flow, caused part of the gas to burn. This was due to methane and hydrogen, as shown by the following analysis, made for Mr. Grant on a sample of gas from this well by Smith, Emery and Company, San Francisco.

Analysis of gas from The Geysers:

	Per cent
Methane (CH_4)	2.9
Hydrogen (H)	11.2
Oxygen (O)	0.0
Carbon monoxide (CO)	0.0
Carbon dioxide (CO_2)	36.8
Nitrogen (N), and similar inert gases that may be present	49.1
Total	100.0

While making the above tests we suggested to Mr. Grant that he collect a gallon or two of the water condensed from the escaping steam, evaporate it to dryness and send us the residue for analysis. A few days later he reported to the writer that after evaporating three gallons of the water there was only a slight film of white powder on the side of the bucket, too thin to scrape off. One surprising feature of the above analysis is that it shows no sulphur, sulphur dioxide, or sulphuretted hydrogen, particularly as sulphur crystals are being deposited at many of the fumarole crevices in the vicinity of the well.

Although only a limited number of tests were made, the reactions were so positive and striking that there is no doubt as to the presence of radioactive emanations in the gas from this well. The results were qualitative only, but, with a proper standardization of the electroscope and volumetric measurement of gas samples, quantitative results can be obtained. For this we hope to find time available at some future date.

TERTIARY SLUICE ROBBERS.

By Chas. S. Haley.

From both the historical and the economic standpoint, the buried channels of what may be termed the Cretaceous-Eocene South Fork of the ancient river system which drained the major portion of the present American and Yuba rivers territory, are among the most important in the state.

From Yankee Jim on northwesterly, through Iowa Hill and Dutch Flat to its junction with the North Fork at Columbia, the course of this channel is well defined, and admits of little argument. From Yankee Jim east, however, there is a vast difference of opinion with regard to the correlation of this stream and its tributaries.

This is largely due to the change in drainage of the system which occurred toward the close of the Eocene period and contemporaneously with the earlier rhyolite flows. It seems undoubtedly to be the case that a large block of the western slope of the Sierras was tilted and dropped at this time, and comparatively abruptly; because a drainage was established toward the southwest, and approximately down the course of the present Middle Fork of the American, along lines which it retains to this day; although a gradual subsequent uplift during Quaternary time has altered the course of present day streams, and heavy erosion has taken place. Coincident with, and immediately following upon, this shift, new channels were cut. The flows of lava pouring down the western slope at intervals, in part following the old stream beds and in part obliterating them and transporting their contents to other courses; the dams of volcanic ash temporarily created and later released like tremendous 'self-shooters,' with all the volume of pent-up torrents behind them to cut new courses; and the comparatively quiescent periods between lava flows when the new streams pursued, perhaps for thousands of years at a time, new and wandering courses, distributing both new and ancient wash according as they were cutting lava or ancient stream beds; all of these influences combine to produce perhaps a unique condition, and certainly one of the most puzzling and complex situations with which the gravel miner has ever had to contend.

In working out this system, it is absolutely necessary to make one sharp distinction primarily; that between the tributaries of the old Cretaceous-Eocene, northward flowing stream, and those of the post-Eocene, southwesterly course.

In doing this, it is impossible to correlate exactly. Drainage lines as followed out may not have been contemporaneous by a matter of a thousand years, or even several thousands; but along broad general lines, it seems perfectly clear that the system is well established.

To begin with the pre-volcanic system. Following upstream from Yankee Jim through Forest Hill, Mayflower and Bath to Michigan Bluff, we have an important tributary coming down from the north which we may follow up through Gas Hill, Turkey Hill, Hidden Treasure and Sunny South to Damascus and Humbug Bar, with a tributary coming in by way of Red Point which may be traced below Westville clear up to the head of Secret Canyon. This evidently had a divided course at a later period, crossing over through Black Canyon and being joined by a tributary from Whiskey Hill, and later resuming its course near Westville. Another tributary to the Hidden Treasure branch came in by way of Deadwood. This in turn may be traced through Last Chance, American Hill and north of Antone Canyon up to Canada Hill and Sailor Ravine.

Coming back to the junction at Bath, we have the old Breece and Wheeler channel. For some distance this has been eroded; but in general it followed the Middle Fork to the Rubicon and up Long Canyon nearly to Wallace, where it crossed to the south side and goes through what is now Nevada Point to Little Grizzly; thence up Pigeon Roost to the eastern slope of Devils Peak, where it is very deeply buried under subsequent lava; thence through and across the upper portion of Long and Wallace Canyons to the northeast side of Jerry's Canyon, where it went through the Ralston Divide and its entrance may be seen above the Little Crater. From Jerry's Canyon on down another run of this same channel may be traced around Blacksmith Flat by way of the old Clydesdale over to the Nevada Point side, where it joins the old course. Following up from Little Crater, it crosses the Middle Fork to Duncan Creek, where it is joined by two tributaries; the Blue Eyes, coming down from Deep Canyon; and the Glen, coming down from Flat Ravine. Continuing north through the Hard Climb to Chalk Bluffs, it goes up the Middle Fork toward Castle Peak.

Again coming back to a junction southwest of Bath, we have another major fork. Crossing in a southerly direction near Volcanoville, we follow it upstream southeasterly toward Twelve Mile House and along the Georgetown Divide through Fornis Ranch, across Pilot Creek to Eleven Pines, and on the south side of the Rubicon through Uncle Tom's and thence easterly and northerly by way of Mount Mildred to Tahoe. A tributary comes from the southwest near Robb's Peak and joins this near the eastern edge of the Placerville quadrangle.

South of this area, we have tributaries running into another great stream, which was at this time the equivalent of the present South Fork of the American, with regard to territory drained. Commencing near the head of Rock Creek and also the head of Silver Creek we have two channels which drained southerly, and are almost eroded except for

fragmentary patches until we get to White Rock Canyon and to Badger Hill, respectively. Their relation to the intervolcanic streams will be shown later.

Such was the general situation during Cretaceous and Eocene times. These channels had planed down the metamorphic rocks of the Sierras for probably a million years or more. In their beds was the source of most of the present day enrichment of the placers of this portion of the Sierras. Like gigantic sluice boxes they stretched their shining lengths over the rolling foothills of the Sierras, wending their way toward the northward flowing tributary of the Cretaceous Yuba, and contributing to the enormous masses of gravel already deposited in the glacier-hewn channels of what is now Quaker Hill and Blue Tent. Whenever these streams crossed a rich pocket and seam area, like that running northerly through Georgetown and Michigan Bluff, they were enormously enriched; but the heavy gold gained from these areas did not travel far, and hence these channels were, like those of the present day, extremely spotty. The fine gold was far more generally distributed.

The beginning of the era of intensive vulcanism is generally placed at the latter end of the Eocene period. The first manifestations of it were extensive showers of volcanic ash and pumice, which coated the flanks of the Sierras for many feet in depth. Probably the source of these eruptions can be traced to two or three vents; and from the present topography it is rather hard to estimate their positions. These vents covered the Cretaceous summit of the Sierras and its flanks for over a hundred miles in length with a mass of steaming mud and lava.

As the thick coating of ash was gathered up by the tributaries of the region, it collected in enormous masses along the main channels, causing them to dam up and change their courses. Then came the first flows of rhyolite, and a period of comparative quiescence for a few thousand years. New cement channels were formed, cutting the old ones and changing the drainage lines; but in general the course of the drainage was the same.

Next came the enormous eruptions of rhyolite and other acid lavas, together with the older basalts on the north. Pouring down the mountain sides in slow-moving masses, converting whole rivers into steam and causing tremendous explosions along their flanks and beneath the viscous masses, they cooled and solidified, raising the enormous rock masses that we now know as the Ralston Divide, the Nevada Point, and the Georgetown Divide, which were greatly increased in their relief by the later erosion of quaternary streams. Coincident with this came the dropping down of the area south and west of the present Middle Fork of the American. A new drainage to the ocean was established in a relatively short time; the then shore line being at the edge of the Sierras, and the diversion point being somewhere near the Dardanelles.

Intermittently, then, was created a whole new system of Tertiary streams, which may well be termed the sluice robbers of that and even of a later period.

The effects of this sudden change are well shown at Todds valley. Enormous masses of rhyolite lava, alternating with flows of steaming, viscid mud, tore down the old courses of the white quartz and metamorphic channels and picked up their contents bodily until, losing their

grade and their momentum, they deposited them in this flat space. Quaternary erosion did the rest, the gold concentrated, and the result was the enrichment of Todds Valley. The gold originally lay in the channels of the old Cretaceous river; but these sluice robbers picked it up and redeposited it. Another similar drainage was established by way of Peckham Hill. Passing east through Volcanoville, we can follow another stream of this system which is joined by a tributary coming down the Ralston Divide. This latter picked up its enrichment from the crossing of the old channel near and below the Goggin diggings. Gathering some legitimate enrichment in crossing the pocket belt, but for the most part containing what gold it had taken from the older channel, this meets the Volcanoville Tertiary, which heads somewhere east of Bacchis. Together they form a larger channel which crosses Otter Creek to Gravel Hill and Jones Hill, and on into the present Middle Fork, where they were in turn eroded. At Jones Hill, or near there, this main channel is joined by another Tertiary stream which comes down from Seven Mile House through Bottle Hill. This also has another course through Three Mile House and southwest of the Georgia Slide, where it doubtless picked up some legitimate, primary enrichment. The Ralston Divide branch also had another tributary which later buried Nevada Point under a tremendous lava flow.

To the southward, via Kentucky Flat, Tiedemann's, and Tipton Hill, still further flows of volcanic mud and ash, as well as rhyolitic lava, poured down the Rock Creek drainage toward Placerville. Later, this channel, both in its Cretaceous and Tertiary form, was eroded by Rock Creek between Tipton Hill and White Rock canyon. A few traces of the gravel remain on widely separated points. The same condition was duplicated both as to formation and erosion by Silver Creek in the channel which came down from Eleven Pines by way of Mundy's and McManus to Badger Hill.

While these Tertiary channels may have accumulated a little gold for themselves, in the main they secured what wealth they have from their crossing and intermingling with the older Cretaceous drainage already described. In the main, they do not pay to drift, except near the sources of their enrichment; and often they do not pay to hydraulic. They are marked by a heterogeneous collection of quartz and metamorphic gravels robbed from the older streams, and by rhyolite boulders and ash, as well as intermittent solid rhyolite flows.

The principal one of these channels was undoubtedly the Ralston Divide-Volcanoville; and up near the Goggin diggings, where it more or less conformed to the old drainage, there was a fair, if somewhat spotty, gold content. Again at the Ralston pit, where it may have caught a northerly swing of the old channel over toward Brushy Creek, before the piling up of the main lava flow, and stripped the same, there appears to have resulted some enrichment. Again, west of Volcanoville, this channel has been enriched by crossing another of the old channels. This enrichment continues all the way to Jones Hill, where there was good hydraulic ground.

Wherever the modern rivers crossed and reconcentrated the Tertiary channels, there was little relative enrichment; but wherever they crossed the channels of the old Cretaceous system, as at Horseshoe Bar, the enrichment appears to have been the greatest.

NON-METALLIC MINERALS OF SOUTHERN CALIFORNIA.

By M. A. Newman.

There is no industry in California, and particularly in southern California, that is making the strides of the china clay industry, and whose future is more promising, due to our ever increasing population on the Pacific Slope.

The average prospector knows very little about the non-metallics and is just as apt as not to walk over a large body of clay in complete ignorance of its potential value. Neither the University of California, nor Stanford University, give any course in 'Ceramics,' so that even the mining engineers graduated from these institutions know very little about our non-metallic resources.

The following article on the china clay industry is being presented in the hope of being of some service to the mining public. As it is written by a man of years of experience in the china clay industry, we have no doubt it will prove so.

CHINA CLAY IN CALIFORNIA.

By Thos. Normile.

Part I.

Historical.

California is a land of wonderful opportunity as to its clay resources, and, as new deposits are discovered and located and their possibilities and usefulness studied for development, it is safe to say that California (and particularly southern California) will be very much in the lead as a producer of high-grade clays, or china clay, and will rank in first place with such states as Georgia, Florida, Tennessee and North and South Carolina; these states being large producers of china clays for a number of years, to the ceramic industries of the country, and to the paint and paper industries.

In regard to china clay (or kaolin), England has set the standard wherever the high grade clays are used, for the past 250 years, or ever since their discovery by Cooksworthy at St. Austall, Cornwall, in 1768. If civilization had started in the West and progress had moved eastward, who knows but what the clays of California would be the standard today, and not the china clays of England, for it is a fact not generally known that the first whiteware manufactured, of which record is made, was manufactured in Burlington, New Jersey, U. S. A., in 1685, by Dr. Daniel Cope, one of the Colonial Governors of New Jersey, and this ware was manufactured out of clay found in America.

In 1688, the works were inventoried and offered for sale, and published as follows:

"I have erected a Pottery at Burlington for white chinaware, a great quantity, to the value of 1,200 pounds, has already been made and vended in the county and neighboring colonies and ye islands of Barbadoes and Jamaica, where they have been in great request. I have two houses and kilns with all necessary implements, diverse workmen, and servants. Have expended thereon about 2,000 pounds."

The above extract was taken from the 'Pottery Industry' also the following paragraph, which was taken from 'Pottery and Porcelain in the United States' by Edwin Atlee Barber:

"A patent was taken out in 1744 by Edward Hylyn of the parish of Bow, in the county of Middlesex, Merchant, and Thomas Frye, of the parish of West Ham, in the county of Essex, Painter, for the manufacture of chinaware and the following year they enrolled their specifications, in which they state that the material used in their invention is an earth, the produce of the Cherokee Nation in America, called by the nation 'unaker.'"

The information contained in the above two paragraphs quoted will no doubt be a surprise to many pottery and clay men, who are not already acquainted with this fact, and who are of the opinion that china clay and the whiteware pottery industry was started in England, before it was in America, but as previously stated it was twenty-four years later before china clay was first discovered by Cookworthy in 1768.

Josiah Wedgwood wrote of a pottery that was established in South Carolina, U. S. A., in 1765, that was operated by workmen from England, and "having one of our American master potters to conduct them."

The most important districts producing china clay today in America are the southern states already mentioned, Georgia, Florida, Tennessee, and North and South Carolina, and California, and the least known of these districts is California, for it is only the past few years that china clay was prospected for to any extent.

The writer has a personal knowledge of a china clay in California that was first discovered over thirty years ago. Samples of this clay were sent to various potteries in the East, and also to Germany and England, and, wherever it was tested and its finished samples exhibited, it was pronounced about the finest china clay ever found. A chemical analysis of this clay made by Dr. Frank K. Cameron of Washington, D. C., shows on analysis 66 per cent silica (SiO_2) and 22.8 per cent alumina (Al_2O_3), the difference from 100 per cent being mainly water, with only a very faint trace of iron, which positively does not show in the firing. This composition shows a somewhat higher ratio of alumina to silica than in the theoretical kaolin of 46.3 per cent silica, and 39.8 per cent alumina, balance 19.9 per cent water.

This clay is a very desirable clay for manufacturing all kinds of whiteware, such as general ware, sanitary and electrical porcelain. It is known today as the 'Lost Clay' and will be on the market in the not too distant future. I may also add that this 'Lost Clay' will be of exceptional value to the paint and paper trade, especially on the Pacific Coast, due to its plasticity, freeness of grit and whiteness under water.

This 'Lost Clay' deposit was first discovered in 1884 and has been very much sought after ever since. The original discoverer of this wonderful deposit of clay, after sending samples of it broadcast throughout the East, including Germany and England, very suddenly died. Two years ago, this long-lying dormant deposit was rediscovered by the writer, by accidentally finding a sample of the clay on which the original discoverer had carved his name, date and location, in 1884. The reading on this old sample of clay is still discernible, and is considered quite a curio by the owner. This old deposit would be working now, but the parties now interested are desirous of securing some adjacent property

that will facilitate the working of the clay property. This wonderful clay will be selling on the market within the coming year.

California has some very plastic china clays, some of them extremely so, which makes them adaptable in the manufacture of table ware, sanitary ware and electric porcelain.

The uses of clay are many and varied, and new ones are being found constantly.

Clay is one of the most widely distributed minerals, and a little more cooperation among interested parties would help materially.

The California State Mining Bureau has made vast strides in the past few years in clays, and all non-metallic minerals.

The State Mining Bureau, in January, 1920, issued Preliminary Report No. 7, entitled the 'Clay Industry in California,' that is a very good guide to the prospector and others interested in looking for clays, and, on page 13, under 'Field Examination,' they will find some valuable information that will be of great assistance in this interesting work.

A Department of Ceramics in our State University at Berkeley and Los Angeles would be a great asset in helping with the physical and chemical analysis needed in the testing of the various clays that are almost daily being sent in from the mountains and deserts of the Pacific Coast states.

In England, years ago, when the clay industry was somewhat more or less of a problem, the Government pooled its interests with the people interested, and the results are well known.

What is needed in California at this time is a plant for the washing of china clays. The writer knows of deposits of good white clays, suitable and adaptable for the paint, paper and pottery trades, but they need washing to eliminate the impurities they now contain, such as free silica, mica, pyrite and limonite. Hardly any one company is large enough at this time to make a sufficiently comprehensive research of this industry on this coast.

Present Operators and Products Manufactured.

The manufacturing concerns in California today that are users of high-grade white burning china clays in the ceramic industry are the following:

The Pacific Porcelain Ware Company is operating two plants. It has a six-kiln pottery at Richmond, California, and a five-kiln pottery at San Pablo, California.

The West Coast Porcelain Company, at Millbrae, California, has a six-kiln pottery.

These two very progressive concerns are manufacturing a complete line of sanitary ware, and are credited, today, with making the best line of sanitary ware made in the world, and they are both users of California clays.

The Homer Knowles Pottery Company, located at Santa Clara, California, is making a general line of hotel and dinner ware. They are using some local clays.

The Empire China Company, at Burbank, California, is operating a seven-kiln pottery, and is making a complete line of hotel and

dinner ware. This concern is using local clays, getting their china clay from their own large deposit in Lincoln County, Nevada.

The Mission Potteries Company, at 652 Griffin avenue, Los Angeles (formerly the Standard Pottery), is operating a three-kiln plant and is manufacturing a line of hotel ware and at present is using some foreign clays, but in the near future will operate with all local clays, exclusively.

The China Products Company, located at 2300 East Fifty-second street, Los Angeles, has a three-kiln pottery. This company manufactures a line of hotel and dinner ware, and is using all local clays.

The American Encaustic Tiling Company, located at 5200 Alameda street, Los Angeles, is operating a nine-kiln pottery, and is manufacturing a very high grade of floor, wall and mantel tile. This large concern is also using local clays.

The T. C. Prouty Pottery Company, located at Hermosa Beach, is manufacturing low potential electric porcelain spark plugs and white floor tile. This new concern, after a few years of experimenting with all kinds of clays, is using California clay almost exclusively.

There is at the present time under construction a large plant being erected by the Whiting-Mead Company of Los Angeles, on its 38-acre industrial tract, to manufacture a complete line of sanitary ware. This concern is going to use the Russell type of twin continuous kilns, three hundred and sixty feet long, built by the Russell Engineering Company of St. Louis, and is also going to use local clays.

(To be continued.)

SECRETARY'S OFFICE.

W. W. Thayer, Secretary.

The California State Mining Bureau was created April 16, 1880, by legislative act. In March, 1893, the original act was repealed and an amended act approved and passed by the legislative body. Again on June 16, 1913, a new Mining Bureau Act was approved which became effective August 10, 1913, repealing all former acts, and forming the basic law under which the Bureau now functions.

It is doubtless true that both the mining and lay public have not in the past always recognized the part played by the Bureau in the development of the state's mineral resources. Innumerable inquiries regarding them, originating within and without its borders and in foreign countries, have been answered with ultimate results reflected by a consistent growth in the value of the state's mineral output since the records of production were first compiled by the Bureau in 1887.

It is believed that a better understanding of the economic position occupied by the Bureau will be imparted to the public, whose funds support it, by embodying in the Monthly Chapter a review of the executive activities.

The responsibility for the coördination of effort of each department, to the end that the utmost efficiency may be maintained with the limited and variable appropriations accorded the Bureau by successive legislatures, rests upon the office of Secretary.

Activities referable to that office, such as reports of new maps and publications issued, amount of mail handled, changes and enlargements in offices, changes in personnel of the staff, property and equipment, financial statements, etc., are therefore included herein.

New Publications.

During the month the following Bureau Publications have been made available for distribution:

Summary of Operations, California Oil Fields, June, 1922, Vol. 7, No. 12.
Mining in California, August 1922 (Monthly), Vol. 18, No. 8.
Oil Field Map, No. 8, South Midway and Buena Vista Hills.
Oil Field Map, No. 9, North Midway and McKittrick.

Distribution of Publications.

The Bureau's publications are constantly in demand, requests for copies coming from all over the United States and foreign countries.

Publications were distributed during the month as follows:

Publications	Number distributed
Report XIV, State Mineralogist	6
Report XV, State Mineralogist	1
Report XVII, State Mineralogist	3
Mines and Mineral Resources of Colusa, etc.	1
Mines and Mineral Resources of Del Norte, etc.	4
Mines and Mineral Resources of Fresno, etc.	2
Mines and Mineral Resources of Imperial, etc.	3
Mines and Mineral Resources of Alpine, etc.	2
Mines and Mineral Resources of El Dorado, etc.	1

Publications	Number distributed
Mines and Mineral Resources of Los Angeles, etc.	1
Mines and Mineral Resources of San Bernardino, etc.	2
Mines and Mineral Resources of Nevada County	2
Mines and Mineral Resources of Plumas County	3
Mines and Mineral Resources of Sierra County	4
Bulletin No. 6, California Gold Mill Practices	3
Bulletin No. 37, Gems, Jewelers' Materials and Ornamental Stones of California	4
Bulletin No. 50, Copper Resources of California (Revised)	1
Bulletin No. 72, Geologic Formations of California	11
Bulletin No. 75, United States and California Mining Laws	35
Bulletin No. 76, Manganese and Chromium in California	1
Bulletin No. 78, Quicksilver Resources of California	10
Bulletin No. 85, Platinum Resources of California	6
Bulletin No. 89, Petroleum Resources of California, with special reference to unproved areas	36
Pulletin No. 90, California Mineral Production for 1920, with County Maps	1
Mining in California (Monthly), Vol. 18, No. 7, July, 1922	2650
Summary of Operations, California Oil Fields (Monthly) Vol. 7, No. 12, June, 1922	2750
County Maps and Registers of Mines	3
Copper Deposit Map	3
Inyo County Geological Map	4
Minaret Map	1
Tuolumne County Map	1
Geological Map of California, mounted	16
Map accompanying Bulletin No. 89	37
Lake County Map	1
Oil field maps	397

Mails and Files.

The Bureau maintains in addition to its correspondence file a mine report file which includes reports on some 7500 mines and mineral properties in California. Also there is available to the public a file of the permits granted to mining and oil corporations by the State Commissioner of Corporations.

During the month 793 letters were received and answered. They are practically all requests for information and the inquiries cover all phases of prospecting, mining and developing mineral deposits, reduction of crude minerals and marketing of refined products.

Drafting.

The Bureau maintains an up-to-date drafting department, where topographic and geological maps, tracings, oil well logs, and oil field maps are prepared.

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Statistician and Curator.

STATISTICS.

MINERAL PRODUCTION OF CALIFORNIA IN 1921.

SECTION SEVEN —— BY COUNTIES.

Introductory.

The State of California includes a total area of 158,360 square miles, of which 155,980 square miles are of land. The maximum width is 235 miles, the minimum, 148 miles; and the length from the northwest corner to the southeast corner is 775 miles. The state is divided into fifty-eight counties. The 1920 census figures show a total population for California of 3,437,709. Minerals of commercial value exist in every county, and during 1921 some active production was reported to the State Mining Bureau from all of the fifty-eight.

Of the first ten counties in point of total output for 1921, the first five (Kern, Orange, Los Angeles, Fresno, Santa Barbara) owe their position mainly to petroleum, as does also Ventura (seventh). Kern, due to its oil, leads all the others by over twice the total of Orange, its nearest competitor. San Bernardino owes its place chiefly to cement, silver and borax; Riverside to cement; Yuba to gold; Santa Cruz and Solano to cement. Twenty counties have each a total in excess of a million dollars, for 1921. Cement is an important item in six of these counties. In point of variety and diversity, San Bernardino County led all the others in 1921, with a total of 23 different mineral products on its commercial list, followed by Los Angeles and San Diego with 14 each; Inyo with 13; Kern and Shasta, 12 each; Riverside, 11; Fresno, 10; Santa Clara, 9. The counties with their mineral resources, production for 1921, etc., are considered in detail in the following paragraphs.

Value of California's Mineral Production by Counties, for 1921. Arranged in the Order of Their Importance.

County	Value	County	Value
1. Kern	$100,840,933	16. Contra Costa	$1,622,732
2. Orange	47,499,030	17. Calaveras	1,525,201
3. Los Angeles	31,704,941	18. Inyo	1,460,218
4. Fresno	19,498,503	19. San Benito	1,386,093
5. Santa Barbara	10,190,929	20. Alameda	1,353,690
6. San Bernardino	9,375,540	21. Shasta	841,062
7. Ventura	6,245,269	22. Santa Clara	750,708
8. Riverside	4,883,898	23. Butte	669,830
9. Yuba	4,852,266	24. Sierra	620,361
10. Santa Cruz	4,080,885	25. Tuolumne	554,483
11. Solano	3,030,198	26. Tulare	552,234
12. Nevada	2,641,081	27. San Diego	501,393
13. Sacramento	2,394,894	28. San Joaquin	474,378
14. Amador	2,368,464	29. Madera	467,667
15. Plumas	1,798,461	30. Trinity	456,882

County	Value	County	Value
31. Placer	$449,070	46. Lassen	$83,485
32. Mariposa	342,601	47. Colusa	80,438
33. Marin	318,776	48. Mono	56,876
34. San Mateo	257,092	49. Mendocino	44,722
35. Stanislaus	236,207	50. San Francisco	41,562
36. Napa	195,239	51. Modoc	36,650
37. Imperial	182,818	52. Merced	33,550
38. Sonoma	175,551	53. Tehama	30,820
39. Lake	174,389	54. Yolo	14,829
40. Monterey	170,155	55. Del Norte	6,029
41. Humboldt	138,597	56. Kings	5,722
42. San Luis Obispo	129,791	57. Alpine	925
43. El Dorado	112,756	58. Sutter	54
44. Glenn	103,197		
45. Siskiyou	93,347	Total	$268,157,472

ALAMEDA.

Area: 843 square miles.
Population: 344,177 (1920 census).

Alameda County, while in no sense one of the 'mining counties,' comes twentieth on the list with a value of mineral products for 1921 of $1,353,690, a decrease from the 1920 total, which was $1,947,880. The mineral resources of this county include asbestos, brick, chromite, clay, coal, limestone, magnesite, manganese, pyrite, salt, soapstone, and miscellaneous stone.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Clay and clay products		$373,258
Pyrites	13,449 tons	70,669
Salt	108,925 tons	370,296
Stone, miscellaneous		513,641
Other minerals*		25,826
Total value		$1,353,690

*Includes magnesium salts, manganese ore, mineral paint, potash.

ALPINE.

Area: 776 square miles.
Population: 243 (1920 census).

Alpine has in the past shown a small production of gold and silver, but dropped out of the list of producing counties in 1914–1918. For 1921, a total value of $925 was reported, as follows:

Substance	Value
Stone, miscellaneous	$925

This county lies just south of Lake Tahoe, in the high Sierra Nevada range of mountains. Transportation is by auto, wagon, or mule back, and facilities in general are lacking to promote development work of any kind.

The mineral resources of this section are varied and the country has not yet been thoroughly prospected. Occurrences of barium, copper, gold, gypsum, lead, limestone, pyrite, rose quartz, silver, tourmaline, and zinc have been noted here.

AMADOR.

Area: 601 square miles.
Population: 7,793 (1920 census).

The value of Amador County's mineral production increased from $2,010,200 in 1920, to $2,368,464, placing it number fourteen on the list of counties in the state as regards total value of mineral substances marketed. The advance was due to an increase in gold output.

Although having an output consisting of 7 different minerals, the leading product, gold, makes up approximately 92% of the entire total.

Amador at one time led the state in gold production, but was exceeded in 1920–1921 by Yuba and Nevada counties.

The mineral resources of this county include asbestos, brick, chromite, clay, coal, copper, gold, lime, quartz crystals, glass-sand, sandstone, silver, soapstone, and miscellaneous stone.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Clay (pottery)	22,124 tons	$46,664
Gold	----------	2,167,443
Silica	1,802 tons	20,646
Silver	----------	35,460
Stone, miscellaneous	----------	1,125
Other minerals*	----------	97,126
Total value		$2,368,464

*Includes brick and platinum.

BUTTE.

Area: 1,722 square miles.
Population: 30,030 (1920 census).
Location: North-central portion of state.

Butte, twenty-third county in California in regard to the value of its mineral output, reported a commercial production of seven mineral substances, having a total value of $669,830 as compared with $641,562 in 1920. As will be noted in the following tabulation, gold is by far the most important item. Butte stands seventh among the gold-producing counties of the state. Among the mineral resources of this section are asbestos, barytes, chromite, gems, gold, limestone, marble, mineral water, platinum group, silver, and miscellaneous stone.

Commercial value for 1921 was as follows:

Substance	Amount	Value
Gems	----------	$331
Gold	----------	456,760
Mineral water	2,900 gals.	4,100
Platinum	31 fine oz.	2,432
Silver	----------	1,759
Stone, miscellaneous	----------	203,900
Other minerals	----------	548
Total value		$669,830

CALAVERAS.

Area: 1,027 square miles.
Population: 6,183 (1920 census).
Location: East-central portion of state—Mother Lode district.

Calaveras County reported production of 7 different minerals, valued at $1,525,201 during the year 1921, as compared with the 1920 output at $1,880,050. Gold, copper, and silver are the chief mineral substances. In regard to total value of mineral output Calaveras stands seventeenth among the counties of the state, and fifth in gold. The decrease, as compared with 1920, is due to copper.

The principal mineral resources developed and undeveloped are: Asbestos, chromite, clay, copper, fuller's earth, gold, limestone, marble, mineral paint, mineral water, platinum group, pyrite, quartz crystals, silver, soapstone, and miscellaneous stone.

Commercial output for 1921 was as follows:

Substance	Amount	Value
Gold		$1,495,758
Mineral water	2,809 gals.	791
Platinum	12 fine oz.	876
Silver		10,232
Stone, miscellaneous		17,527
Other minerals*		17
Total value		$1,525,201

*Includes copper and lead.

COLUSA.

Area: 1,140 square miles.
Population: 9,920 (1920 census).
Location: Sacramento Valley.

Colusa County lies largely in the basin of the Sacramento Valley. Its western border, however, rises into the foothills of the Coast Range of mountains, and its mineral resources—largely undeveloped—include coal, chromite, copper, gypsum, manganese, mineral water, pyrite, quicksilver, sandstone, miscellaneous stone, sulphur, and in some places traces of gold and silver.

The value of the 1921 production was $80,438, an increase over the 1920 figures of $57,488, giving it forty-seventh place, and was distributed as follows:

Substance	Value
Stone, miscellaneous	$80,000
Other minerals	438
Total value	$80,438

CONTRA COSTA.

Area: 714 square miles.
Population: 53,889 (1920 census).

Contra Costa, like Alameda County, lies on the eastern shores of San Francisco Bay, and is not commonly considered among the mineral-producing counties of the state. It stands sixteenth on the list in this

respect, however, with an output valued at $1,622,732 for the calendar year 1921. Various structural materials make up the chief items, including brick, cement, limestone, and miscellaneous stone. Among the others are asbestos, clay, coal, gypsum, manganese, mineral water, and soapstone.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Clay and clay products		$198,248
Mineral water	600,300 gals.	6,099
Stone, miscellaneous		415,127
Other minerals		1,003,258
Total value		$1,622,732

DEL NORTE.

Area: 1,024 square miles.
Population: 2,759 (1920 census).
Location: Extreme northwest corner of state.
Transportation: Motor, wagon and mule back; steamer from Crescent City.

Del Norte rivals Alpine County in regard to inaccessibility. Like the latter county also, given transportation and kindred facilities, this portion of the state presents a wide field for development along mining lines especially. Its chief mineral resources, largely untouched, are chromite, copper, gems, gold, iron, platinum group, silver, and miscellaneous stone. The 1921 output was a decrease from the figure of $11,781 in 1920.

Commercial production for 1921, giving it fifty-fifth place, was as follows:

Substance	Value
Stone, miscellaneous	$5,580
Other minerals*	449
Total value	$6,029

*Includes gold, platinum, silver.

EL DORADO.

Area: 1,753 square miles.
Population: 6,426 (1920 census).
Location: East-central portion of the state, northernmost of the Mother Lode counties.

El Dorado County, which contains the locality where gold in California was first heralded to the world, comes forty-third on the list of counties ranked according to the value of their total mineral production during the year 1921. In addition to the segregated figures here given, a large tonnage of limestone is annually shipped from El Dorado for use in cement manufacture, and whose value is included in the state total for cement. The decrease from the 1920 figure of $186,432 was due mainly to limestone.

The mineral resources of this section, many of them undeveloped, include asbestos, barytes, chromite, clay, copper, gems, gold, iron,

molybdenum, limestone, quartz crystals, quicksilver, glass-sand, slate, soapstone, silver, and miscellaneous stone.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Gold		$34,109
Limestone	15,296 tons	66,143
Silver		301
Stone, miscellaneous		2,750
Talc	1,652 tons	9,453
Total value		$112,756

FRESNO.

Area: 5,950 square miles.
Population: 128,779 (1920 census).
Location: South-central portion of state.

Fresno County, fourth in importance as a mineral producer among the counties of California, reported an output for 1921 of ten mineral substances, with a total value of $19,498,503, a decrease from the reported 1920 production, which was worth $23,819,351. The bulk of the above is derived from the petroleum production of the Coalinga field.

The mineral resources of this county are many, and, aside from crude oil, are in the main not yet fully developed. They include asbestos, barytes, brick, chromite, copper, gems, gold, graphite, gypsum, magnesite, natural gas, petroleum, quicksilver, and miscellaneous stone.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Clay and clay products		$125,276
Gold		13,085
Granite		28,610
Magnesite	945 tons	9,540
Natural gas	1,886,081 M. cu. ft.	190,181
Petroleum	12,161,565 bbls.	18,643,679
Silver		75
Stone, miscellaneous		486,057
Other minerals		2,000
Total value		$19,498,503

GLENN.

Area: 1,259 square miles.
Population: 11,853 (1920 census).
Location: West side of Sacramento Valley.

Glenn County, standing forty-fourth, owes its position among the mineral-producing counties of the state mainly to the presence of large deposits of sand and gravel which are annually worked, the product being used for railroad ballast, etc. In 1917 and 1918, chromite was also an important item. In the foothills in the western portion of the county, deposits of chromite, copper, manganese, sandstone, and soapstone have been found.

Commercial production for 1921 was as follows:

Substance	Value
Stone, miscellaneous	$103,197

HUMBOLDT.

Area: 3,634 square miles.
Population: 37,857 (1920 census).
Location: Northwestern portion of state, bordering on Pacific Ocean.

Humboldt County is almost entirely mountainous, transportation within its limits being very largely by auto and wagon road, and trail, and until recent years was reached from the outside world by steamer only. The county is rich in mineral resources, among which are brick, chromite, coal, clay, copper, gold, iron, mineral water, natural gas, petroleum, platinum, silver, and miscellaneous stone.

Nine mineral substances, as shown by the table given below, having a total value of $138,597, were produced in 1921, as compared with the 1920 output, worth $159,796, the decrease being due to manganese. Humboldt ranks forty-first among the counties of the state for the year.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Clay (pottery)	75 tons	$190
Gold		2,054
Silver		37
Stone, miscellaneous		131,688
Other minerals*		4,628
Total value		$138,597

*Includes brick, mineral water, natural gas, platinum, pumice.

IMPERIAL.

Area: 4,089 square miles.
Population: 43,383 (1920 census).
Location: Extreme southeast corner of the state.

During 1921 Imperial County produced five mineral substances having a total value of $182,818, as compared with the 1920 output, worth $169,882. Its rank is thirty-seventh. This county contains deposits of gold, gypsum, lead, marble, pumice, salt, silver, and strontium, largely undeveloped.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Brick	654 M.	$6,363
Gold		537
Silver		920
Stone, miscellaneous		171,173
Other minerals		3,825
Total value		$182,818

INYO.

Area: 10,019 square miles.
Population: 7,031 (1920 census).
Location: Lies on eastern border of state, north of San Bernardino County.

Inyo, the second largest county in the state, and containing less than one inhabitant per square mile, is extremely interesting from a mineralogical point of view. It is noted because of the fact that within its

borders are located both the highest point, Mount Whitney (elevation 14,502 feet), and the lowest point, Death Valley (elevation 290 feet below sea level), in the United States. In the higher mountainous sections are found many vein-forming minerals, and in the lake beds of Death Valley saline deposits exist.

Inyo's mineral production during the year 1921 reached a value of $1,460,218, standing eighteenth among the counties of the state in this respect. The 1920 value was $3,889,400, the decrease being due mainly to borax, lead, soda, and silver. Its mineral resources include antimony, asbestos, barytes, borax, copper, gems, gold, gypsum, lead, marble, soda, sulphur, talc, tungsten, and zinc.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Copper	45,725 lbs.	$5,898
Dolomite	22,112 tons	49,073
Fuller's earth	1,185 tons	8,295
Gold		80,373
Lead	1,052,253 lbs.	47,351
Silver		86,020
Stone, miscellaneous		16,250
Talc	4,350 tons	77,250
Other minerals*		1,089,708
Total value		$1,460,218

*Includes borax, building stone, marble, pumice, soda.

KERN.

Area: 8,003 square miles.
Population: 54,843 (1920 census).
Location: South-central portion of state.

Kern County, because of its immensely productive oil fields, stands preeminent among all counties of California in the value of its mineral output, the exact figures for 1921 being $100,840,933. This is larger by more than fifty million dollars than the succeeding county on the list. This figure also is nearly six and one-half times the value of the total gold output of the entire state for 1921. The 1920 mineral output for Kern County was worth $89,121,581. The increase was due to larger production and the enhanced prices for crude oil of all grades.

Among the mineral resources, developed and undeveloped, of this section are: Antimony, asphalt, borax, brick, clay, copper, fuller's earth, gems, gold, gypsum, iron, lead, limestone, magnesite, marble, mineral paint, natural gas, petroleum, potash, salt, silver, soapstone, soda, sulphur, and tungsten.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Brick	5,840 M	$85,820
Gold		84,698
Lime	72,629 bbls.	141,491
Natural gas	40,136,930 M. cu. ft.	1,926,797
Petroleum	57,434,945 bbls.	97,639,407
Salt	18,500 tons	93,500
Silver		1,897
Stone, miscellaneous		38,208
Other minerals*		829,115
Total value		$100,840,933

*Includes cement, gypsum, limestone, silica.

KINGS.

Area: 1,159 square miles.
Population: 22,031 (1920 census).
Location: South-central portion of the state.

Little development has taken place in Kings County along mineral lines to date. Deposits of fuller's earth, gypsum, mineral paint, natural gas, and quicksilver, of undetermined extent, have been found in the county. Some drilling for oil has been under way, but there has, as yet, been no commercial output recorded. The decrease in 1921 was due mainly to quicksilver.

Tulare Lake is in Kings County.

In fifty-sixth place, commercial mineral production in this county for 1921 was as follows:

Substance	Amount	Value
Natural gas	2,090 M. cu. ft.	$980
Other minerals		4,742
Total value		$5,722

LAKE.

Area: 1,278 square miles.
Population: 5,542 (1920 census).
Location: About fifty miles north of San Francisco Bay and the same distance inland from the Pacific Ocean.

On account of its topography and natural beauties, Lake County is sometimes referred to as the Switzerland of America. The mineral resources which exist here are many and varied, actual production being comparatively small, as shown by the table below, and in the past composed mainly of quicksilver, and mineral water. Some of the leading minerals found in this section, in part as yet undeveloped, are borax, chromite, clay, copper, gems, gold, gypsum, mineral water, quicksilver, silver, and sulphur.

The increase in value from $63,553 in 1920, to $174,389 in 1921, was due to large amounts of crushed rock, sand and gravel used on highway work and in dam construction for hydroelectric power development.

In thirty-ninth place, commercial production for 1921 was as follows:

Substance	Amount	Value
Mineral water	54,715 gals.	$26,751
Quicksilver	22 flasks	880
Stone, miscellaneous		146,508
Other minerals		250
Total value		$174,389

LASSEN.

Area: 4,531 square miles.
Population: 8,507 (1920 census).
Location: Northeast portion of state.

Lassen County is one of the little explored sections of California. Since about 1912 a railroad traversing the county north and south has

been in operation, thus affording opportunity for development along mineral and other lines.

Among the mineral resources of this county are copper, gems, gypsum, gold, silver, and sulphur. In the past, some gold had been produced, but not for some years, until 1921, when the yield again became important.

In forty-sixth place, commercial production for 1921 was as follows:

Substance	Value
Gold	$39,943
Silver	1,234
Stone, miscellaneous	42,308
Total value	$83,485

LOS ANGELES.

Area: 4,067 square miles.
Population: 936,438 (1920 census).
Location: One of the southwestern coast counties.

Mineral production in Los Angeles County for the year 1921 amounted in value to $31,704,941 as compared with the 1920 output, worth $26,975,163. This county ranked third in the state as a mineral producer in 1920 and 1921, having passed Fresno in 1919 which was previously fourth. The advance was due mainly to the large increase in the petroleum valuation, and in part to an increase in the output of bricks and building tile.

Its output of brick and tile was over three milion dollars, and that of petroleum amounted to over twenty-five million dollars. Among the mineral resources may be noted asphalt, barytes, borax, brick, clay, fuller's earth, gems, gold, gypsum, infusorial earth, limestone, marble, mineral paint, mineral water, natural gas, petroleum, salt, glass-sand, sandstone, serpentine, silver, soapstone, and miscellaneous stone. Some potash has been obtained from kelp.

Commercial production for 1921, consisting of 14 substances, was as follows:

Substance	Amount	Value
Brick and tile		$3,208,448
Clay (pottery)	29,055 tons	62,866
Mineral water	264,468 gals.	13,314
Natural gas	6,944,277 M. cu. ft.	638,936
Petroleum	12,395,605 bbls.	25,795,254
Stone, miscellaneous		1,763,180
Other minerals*		222,943
Total value		$31,704,941

*Includes borax, gems, gold, graphite, limestone, magnesium chloride, salt, silver.

MADERA.

Area: 2,112 square miles.
Population: 12,203 (1920 census).
Location: East-central portion of state.

Madera County produced four mineral substances during the year 1921, having a total value of $467,667, as compared with the 1920 output worth $122,925. The increase is due mainly to granite. This

county contains deposits of copper, gold, iron, lead, molybdenum, pumice, silver, and building stone.

In twenty-ninth place, commercial production for 1921 was as follows:

Substance	Value
Gold	$1,053
Granite	461,822
Silver	27
Stone, miscellaneous	4,765
Total value	$467,667

MARIN.

Area: 529 square miles.
Population: 27,342 (1920 census).
Location: Adjoins San Francisco on the north.

Mineral production in Marin County during the year 1921 reached a value of $318,776, as compared to the 1920 output, worth $335,745, the decrease being due to crushed rock, and brick. This county is not especially prolific in minerals, although among its resources along these lines are brick, gems, manganese, mineral water, soapstone, and miscellaneous stone.

In thirty-third place, commercial production for 1921 was:

Substance	Value
Stone, miscellaneous	$202,333
Other minerals*	116,443
Total value	$318,776

*Includes brick and mineral water.

MARIPOSA.

Area: 1,463 square miles.
Population: 2,775 (1920 census).
Location: Most southerly of the Mother Lode counties. East-central portion of state.

Mariposa County is one of the distinctly 'mining' counties of the state, although it stands but thirty-second on the list of counties in regard to the value of its mineral output for 1921, with a total of $342,601 as compared with the 1920 figure of $271,031, the increase being due to gold.

Its mineral resources are varied; among the more important items being barytes, copper, gems, gold, lead, marble, silver, slate, soapstone, and miscellaneous stone.

The Yosemite Valley is in Mariposa County.

Commercial production in 1921 was as follows:

Substance	Value
Gold	$331,295
Silver	5,251
Stone, miscellaneous	400
Other minerals*	5,655
Total value	$342,601

*Includes barytes and pyrites.

MENDOCINO.

Area: 3,453 square miles.
Population: 24,116 (1920 census).
Location: Joins Humboldt County on the south and bounded by the Pacific Ocean on the west.

Mendocino's annual mineral production has usually been small, the 1921 output being valued at $44,722, ranking it forty-ninth among the counties. That of 1920 was worth $26,110.

Deposits of in part undetermined value of asbestos, chromite, coal, copper, graphite, magnesite, and mineral water have been found, as well as traces of gold and silver.

Commercial production for 1921 was as follows:

Substance	Value
Gold	$1,509
Silver	13
Stone, miscellaneous	40,000
Other minerals*	3,200
Total value	$44,722

*Includes brick, manganese ore, natural gas, platinum.

MERCED.

Area: 1,995 square miles.
Population: 24,579 (1920 census).
Location: About the geographical center of the state.

Merced County as a whole lies in the San Joaquin Valley, and it figures as one of the lesser mineral producing counties of the state. The 1921 mineral output was valued at $33,550. Gold, platinum, and silver were formerly obtained by dredging, which ceased in this county in 1918, though a small yield from other sources was reported in 1921. Undeveloped deposits of antimony, magnesite, quicksilver, and limestone have been noted in this county in addition to the foregoing.

In fifty-second place, commercial production during 1921 was as follows:

Substance	Value
Gold	$3,163
Silver	87
Stone, miscellaneous	30,300
Total value	$33,550

MODOC.

Area: 3,823 square miles.
Population: 5,425 (1920 census).
Location: The extreme northeast corner of the state.

Modoc County, like Lassen, has only in recent years had the benefit of communication with the outside world by rail. Among its known mineral resources are: Clay, coal, gold, iron, quicksilver, salt, and

silver. In fifty-first place, commercial production for 1921 was as follows:

Substance	Value
Stone, miscellaneous	$34,930
Other minerals*	1,720
Total value	$36,650

*Includes gem material and salt.

MONO.

Area: 3,030 square miles.
Population: 960 (1920 census).
Location: Is bordered by the State of Nevada on the east and is about in the central portion of the state measured on a north and south line.

Gold mining has been carried on in portions of Mono County for many years, although taken as a whole it lies in a rather inaccessible country and has been but superficially explored. It is in the continuation of the highly mineralized belt which was noted in Inyo County and contains among other mineral resources barytes, clay, copper, gold, limestone, molybdenum, pumice, salt, silver, and travertine.

In forty-eighth place, commercial production for 1921 was as follows:

Substance	Amount	Value
Copper	2,940 lbs	$379
Gold		37,754
Lead	42,962 lbs.	1,933
Silver		15,160
Other minerals*		1,650
Total value		$56,876

*Includes onyx and salt.

MONTEREY.

Area: 3,330 square miles.
Population: 27,980 (1920 census).
Location: West-central portion of state, bordering on Pacific Ocean.

Monterey County produced eight mineral substances during the year 1921, having a total value of $170,155, as compared with the 1920 output worth $126,449, the increase being due to coal. Its mineral resources include brick, clay, copper, coal, dolomite, feldspar, fuller's earth, gold, silver, gypsum, infusorial earth, limestone, mineral water, petroleum, quicksilver, glass-sand, sandstone, silver, and miscellaneous stone.

In fortieth place, commercial production for 1921 was as follows:

Substance	Amount	Value
Dolomite	2,500 tons	$8,750
Stone, miscellaneous†		63,316
Other minerals*		98,089
Total value		$170,155

†Includes molding, building, blast, filter, and roofing sand.
*Includes absestos, coal, diatomaceous earth, mineral water, salt, glass-sand.

NAPA.

Area: 783 square miles.
Population: 20,678 (1920 census).
Location: Directly north of San Francisco Bay—one of the 'bay counties'.

Napa, because of its production of structural and industrial materials and mineral water, stands thirty-sixth on the list of mineral-producing counties in California. Its mineral resources include chromite, copper, gypsum, magnesite, mineral water, quicksilver, sandstone, and miscellaneous stone. In the past this county has been one of the important producers of quicksilver.

In 1921, the value of the output decreased to $195,239 from the 1920 figure of $230,141, due mainly to quicksilver.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Mineral water	72,364 gals.	$55,760
Quicksilver	35 flasks	1,659
Stone, miscellaneous		111,100
Other minerals		26,720
Total value		$195,239

NEVADA.

Area: 974 square miles.
Population: 10,860 (1920 census).
Location: North of Lake Tahoe, on the eastern border of the state.

Nevada, one of the mountain counties of California, for some years alternated with Amador in the gold lead, but both were passed by Yuba in 1918–1921. Nevada County stands twelfth on the list in regard to value of its total mineral output, with a figure of $2,641,081, as compared with the 1920 production worth $2,955,006. The decrease is due mainly to gold.

While this county actually produces mainly gold and silver, its resources cover a wide scope, including antimony, asbestos, barytes, bismuth, chromite, clay, copper, gems, iron, lead, mineral paint, pyrite, soapstone, and tungsten.

Commercial production for 1921 was as follows:

Substance	Value
Gold	$2,570,162
Silver	33,906
Stone, miscellaneous	19,151
Other minerals*	17,862
Total value	$2,641,081

*Includes asbestos, barytes, granite.

ORANGE.

Area: 795 square miles.
Population: 61,375 (1920 census).
Location: Southwestern portion of state, bordering Pacific Ocean.

Orange County is one of the many in California which on casual inspection appears to be anything but a mineral-producing section. It

stands, however, as the second county in the state in regard to the total value of mineral output for 1921, its highly productive oil fields making such a condition possible.

This county, in company with most of the other oil counties, shows a gain in 1921, with a total value of mineral products of $47,499,030, compared to the 1920 output, worth $34,108,136. It passed Shasta County in 1917, which previously for a number of years had exceeded all other counties in California, except Kern.

Aside from the substances actually produced and noted in the table below, coal, gypsum, iron, infusorial earth, sandstone, and tourmaline have been found in Orange County.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Brick	2,994 M.	$47,720
Natural gas	14,097,639 M. cu. ft.	1,312,704
Petroleum	22,929,466 bbls.	45,996,509
Stone, miscellaneous		131,301
Other minerals*		10,796
Total value		$47,499,030

*Includes clay (pottery), copper, gold, lead, silver.

PLACER.

Area: 1,395 square miles.
Population: 18,584 (1920 census).
Location: Eastern border of state directly west of Lake Tahoe.

While standing only thirty-first on the list of mineral-producing counties, Placer contains a wide variety of mineral substances, some of which have not been commercially exploited. Its leading products include gold, chromite, granite, copper, and clay. Other mineral resources are: Asbestos, brick, coal, gems, iron, lead, limestone, magnesite, manganese, marble, quartz crystals, glass-sand, silver, and miscellaneous stone.

Commercial production for 1921 was as follows, compared to a total value of $612,813 for the preceding year:

Substance	Amount	Value
Brick and tile		$144,508
Clay (pottery)	76,665 tons	95,980
Gold		132,468
Granite		48,328
Silver		1,068
Stone, miscellaneous		21,490
Other minerals*		5,278
Total value		$449,070

*Includes chromite, mineral paint, silica.

PLUMAS.

Area: 2,594 square miles.
Population: 5,681 (1920 census).
Location: Northeastern border of state, south of Lassen County.

A considerable portion of the area of Plumas County lies in the high mountains, and deposits of the metals, especially gold and copper, are found there. Lack of transportation and other facilities has retarded

its growth, but its future is promising. Mineral production for 1921 was valued at $1,798,461, as compared with the 1920 output, worth $2,082,662, the decrease being due mainly to copper. This placed the county fifteenth in rank. In 1919–1921 Plumas passed Shasta in the copper lead, owing to the Shasta smelters being closed down.

Among its mineral resources are: Chromite, copper, gold, granite, iron, lead, limestone, manganese, molybdenum, platinum, silver, and zinc.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Copper	11,584,216 lbs.	$1,494,364
Gold		127,148
Lead	2,961 lbs.	133
Platinum	18 fine oz.	1,615
Silver		171,090
Other minerals*		4,111
Total value		$1,798,461

*Includes granite and miscellaneous stone.

RIVERSIDE.

Area: 7,240 square miles.
Population: 60,297 (1920 census).
Location: Southern portion of state.

Riverside is the fourth county in the state in size and the eighth in regard to the total value of mineral output for 1921. Within its borders are included mountain, desert, and agricultural land. Its mineral resources include metals, structural and industrial materials, and salines, some of the more important being brick, cement, clay, coal, copper, feldspar, gems, gold, gypsum, iron, lead, limestone, manganese, magnesite, marble, mineral paint, mineral water, salt, glass-sand, soapstone, silver, miscellaneous stone, and tin. In point of variety Riverside County showed eleven different minerals commercially produced in 1921.

The decrease in 1921 from the 1920 value of $5,128,208 is due mainly to clay products.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Brick and tile		$376,553
Clay (pottery)	84,224 tons	111,219
Feldspar	2,094 tons	14,808
Granite		12,852
Mineral water	56,400 gals.	2,945
Silica	1,625 tons	6,357
Stone, miscellaneous		431,671
Other minerals*		3,927,493
Total value		$4,883,898

*Includes cement, coal, gems, potash.

SACRAMENTO.

Area: 983 square miles.
Population: 90,978 (1920 census).
Location: North-central portion of state.

Sacramento stands thirteenth among the counties of the state as a mineral producer, the output, principally gold, for 1921 being valued at $2,394,894, as compared with the 1920 production, worth $2,066,154. In regard to gold output alone this county ranks fourth, being exceeded only by Yuba, Amador, and Nevada counties, the product coming from the dredges. Its mineral resources include: Brick, clay, gold, natural gas, platinum, silver, and miscellaneous stone.

Commercial production for 1921 was as follows:

Substance	Value
Brick and tile	$216,402
Gold	1,690,662
Granite	39,469
Silver	5,254
Stone, miscellaneous	386,911
Other minerals*	56,196
Total value	$2,394,894

*Includes natural gas and platinum.

SAN BENITO.

Area: 1,392 square miles.
Population: 8,995 (1920 census).
Location: West-central portion of state.

Although nineteenth among the counties of the state in regard to value of total mineral production, San Benito led for some years in one important branch of the mineral industry, namely, quicksilver. In spite of the shut-down of the quicksilver mines in 1921, San Benito County retained its position on account of cement, which showed an increased yield over the 1920 figures.

Its other mineral resources, many of them undeveloped, include: Antimony, asbestos, bituminous rock, chromite, coal, dolomite, gems, gypsum, limestone, magnesite, mineral water, and miscellaneous stone.

Commercial production for 1921 was as follows:

Substance	Value
Stone, miscellaneous	$269,334
Other minerals*	1,116,759
Total value	$1,386,093

*Includes asbestos, cement, dolomite, magnesite, mineral water, quicksilver.

SAN BERNARDINO.

Area: 20,157 square miles.
Population: 73,401 (1920 census).
Location: Southeastern portion of state.

San Bernardino, by far the largest county in the state, in area, ranks sixth as regards the value of its mineral output for 1921 with a total of $9,375,540, as compared with the 1920 total of $6,541,348. The increase is due to cement and silver.

San Bernardino for several years (except 1918) has led all other counties in the state in point of variety of minerals, producing commercially during 1921 a total of 23 different substances.

This county, consisting largely of mountain and desert country, is highly mineralized, the following being included among its resources: Asbestos, barytes, borax, brick, cement, clay, copper, gems, gold, granite, gypsum, iron, lead, limestone, manganese, marble, mineral paint, mineral water, nitre, potash, salt, glass-sand, soapstone, soda, miscellaneous stone, strontium, talc, tungsten, vanadium, and zinc.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Borax	3,718 tons	$338,905
Calcium chloride	683 tons	22,980
Cement	1,964,926 bbls.	4,633,437
Copper	17,054 lbs.	2,200
Gold		217,568
Lead	22,812 lbs.	1,027
Limestone	21,862 tons	106,195
Potash	7,202 tons	211,067
Salt	13,279 tons	67,782
Silver		3,210,706
Stone, miscellaneous		145,572
Talc	2,750 tons	43,375
Other minerals*		374,726
Total value		$9,375,540

*Includes clay (pottery), dolomite, feldspar, gems, granite, gypsum, iron ore, lime, mineral water, pumice, soda.

SAN DIEGO.

Area: 4,221 square miles.
Population: 112,248 (1920 census).
Location: Extreme southwest corner of state.

San Diego ranks twenty-seventh in the total value of its mineral output. This figure for 1921 equaled $501,393, as compared with the 1920 output worth $794,229. In 1918, for the only time in several years, there was no production of gems, in which San Diego County has led the state. Aside from minerals commercially produced, as shown below, San Diego County contains occurrences of bismuth, lithia, marble, nickel, soapstone, and tin. Potash has been produced from kelp.

A development of recent years is the shipping of pebbles for grinding mills.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Clay and clay products		$92,600
Feldspar	1,850 tons	11,100
Gems		1,405
Granite		22,444
Mineral water	70,924 gals.	9,161
Sand (glass)	370 tons	725
Stone, miscellaneous		187,922
Other minerals*		176,036
Total value		$501,393

*Includes gold, lithia, magnesium salts, marble, salt, silver.

SAN FRANCISCO.

Area: 43 square miles.
Population: 506,676 (1920 census).

Surprising as it may appear at first glance, San Francisco County is listed among the mineral producing sections of the state, actual production consisting of crushed rock, sand and gravel. Small quantities of various valuable mineral substances are found here, including cinnabar, gypsum, lignite, and magnesite, none, however, in paying quantities. Some pumice has been produced.

In fiftieth place, commercial production for 1921 was as follows:

Substance	Value
Stone, miscellaneous	$41,562

SAN JOAQUIN.

Area: 1,448 square miles.
Population: 79,905 (1920 census).
Location: Central portion of state.

San Joaquin County reported a mineral production for the year 1921 having a total value of $474,378, as compared with the 1920 output, worth $471,102.

Comparatively few mineral substances are found here, the chief ones being brick, clay, manganese, natural gas, glass-sand, and miscellaneous stone. Gold, platinum, and silver have been obtained by dredging in the Mokelumne River, which forms the boundary between this county and Amador on the northeast.

In twenty-eighth place, commercial production for 1921 was as follows:

Substance	Amount	Value
Clay and clay products		$318,242
Manganese ore	425 tons	3,750
Natural gas	204,057 M. cu. ft.	79,571
Stone, miscellaneous		72,815
Total value		$474,378

SAN LUIS OBISPO.

Area: 3,334 square miles.
Population: 21,893 (1920 census).
Location: Bordered by Kern County on the east and the Pacific Ocean on the west.

The total value of the mineral production of San Luis Obispo County in 1921 was $129,791, as compared with the 1920 output, worth $405,604, the decrease being due mainly to quicksilver and soda. Among its mineral resources, both developed and undeveloped, are: Asphalt, bituminous rock, brick, chromite, coal, copper, gypsum, infusorial earth, iron, limestone, marble, mineral water, onyx, petroleum, quicksilver, soda, and miscellaneous stone.

In thirty-first place, commercial production for 1921 was as follows:

Substance	Amount	Value
Petroleum	30,725 bbls.	$43,691
Stone, miscellaneous		80,000
Other minerals*		6,100
Total value		$129,791

*Includes chromite, diatomaceous earth, mineral water.

SAN MATEO.

Area: 447 square miles.
Population: 36,781 (1920 census).
Location: Peninsula, adjoined by San Francisco on the north.

San Mateo's most important mineral products are stone and salt, the last-named being derived by evaporation from the waters of San Francisco Bay. The total value of all mineral production during 1921 equaled $257,092, as compared with the 1920 figures of $293,103, the decrease being due to salt.

Small amounts of barytes, chromite, infusorial earth, and quicksilver have been noted in addition to the items of economic value given below.

Bricks have also been produced commercially.

In thirty-fourth place, commercial production for 1921 was as follows:

Substance	Amount	Value
Petroleum	322 bbls.	$966
Salt	32,587 tons	167,022
Stone, miscellaneous		61,697
Other minerals*		27,407
Total value		$257,092

*Includes brick, magnesium chloride, potash.

SANTA BARBARA.

Area: 2,740 square miles.
Population: 41,097 (1920 census).
Location: South-western portion of state, joining San Luis Obispo on the south.

Santa Barbara County owes its position of fifth in the state in regard to its mineral output to the presence of productive oil fields within its boundaries. The total value of its mineral production during the year 1921 was $10,190,929, as compared with the 1920 output of $10,538,611.

Aside from the mineral substances listed below, Santa Barbara County contains asphalt, diatomaceous earth, gilsonite, gypsum, magnesite, and quicksilver in more or less abundance.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Mineral water	97,847 gals.	$133,590
Natural gas	1,544,892 M. cu. ft.	145,179
Petroleum	5,465,942 bbls.	9,122,657
Potash	143 tons	5,720
Stone, miscellaneous		65,600
Other minerals*		718,183
Total value		$10,190,929

*Includes bituminous rock, diatomaceous earth, sandstone.

SANTA CLARA.

Area: 1,328 square miles.
Population: 100,588 (1920 census).
Location: West-central portion of state.

Santa Clara County reported a mineral output for 1921 of $750,708, as compared with the 1920 figures of $1,038,692, the decrease being due to potash and quicksilver.

This county, lying largely in the Coast Range Mountains, contains a wide variety of mineral substances, including brick, chromite, clay, limestone, magnesite, manganese, mineral water, petroleum, quicksilver, soapstone, and miscellaneous stone. It led in quicksilver yield for the year.

In twenty-second place, commercial production for 1921 was as follows:

Substance	Amount	Value
Brick	7,501 M.	$110,961
Clay (pottery)	1,126 tons	2,300
Magnesite	25,800 tons	280,000
Mineral water	2,500 gals.	275
Petroleum	13,964 bbls.	26,943
Stone, miscellaneous		138,584
Other minerals*		191,645
Total value		$750,708

*Includes limestone marl, potash, quicksilver.

SANTA CRUZ.

Area: 435 square miles.
Population: 26,269 (1920 census).
Location: Bordering Pacific Ocean, just south of San Mateo County.

The mineral output of Santa Cruz County, a portion of which is itemized below, amounted to a total value of $4,080,885, giving the county a standing of tenth among all others in the state in this regard.

The increase over the 1920 figure of $3,081,138, is due mainly to cement.

The commercial production for 1921 was as follows:

Substance	Amount	Value
Lime	122,907 bbls.	$242,869
Stone, miscellaneous		22,895
Other minerals*		3,815,121
Total value		$4,080,885

*Includes bituminous rock, cement, limestone, mineral paint, potash.

SHASTA.

Area: 3,858 square miles.
Population: 13,311 (1920 census).
Location: North-central portion of state.

Shasta County stood twenty-first in California among the mineral producing counties for 1921, with an output valued at $841,062, as compared with the 1920 production worth $1,108,538. The marked

decrease in 1918–1921 was due to the falling off in the output of copper, the large plants of the Mammoth and Mountain copper companies being shut down. Not taking petroleum into account, Shasta for a number of years led all of the counties by a wide margin; but in 1919–1921 was passed by San Bernardino, Inyo, Yuba, Plumas, Amador, Calaveras, Nevada, and Sacramento, among the 'metal' counties.

Shasta's mineral resources include: Asbestos, barytes, brick, chromite, coal, copper, gold, iron, lead, lime, limestone, mineral water, molybdenum, pyrite, silver, soapstone, miscellaneous stone, and zinc.

Lassen Peak is located in southeastern Shasta County.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Copper	437,593 lbs.	$56,449
Gold		267,681
Platinum	219 fine oz.	26,817
Silver		5,581
Stone, miscellaneous		31,945
Other minerals*		452,589
Total value		$841,062

*Includes asbestos, barytes, iron ore, lead, pyrites, zinc.

SIERRA.

Area: 923 square miles.
Population: 1,783 (1920 census).
Location: Eastern border of state, just north of Nevada County.

Sierra County reported a mineral production of $620,361, consisting mainly of gold and silver, during the year 1921, as compared with the 1920 output, worth $446,861. Considering gold output alone, this county stands sixth; and as to total mineral yield twenty-fourth.

Aside from the metals itemized below, Sierra County contains deposits of asbestos, chromite, copper, iron, lead, platinum, minerals, serpentine, and talc.

Commercial production for 1921 was as follows:

Substance	Value
Gold	$612,267
Silver	5,236
Stone, miscellaneous	2,858
Total value	$620,361

SISKIYOU.

Area: 6,256 square miles.
Population: 18,545 (1920 census).
Location: Extreme north-central portion of state, next to Oregon boundary.

Siskiyou, fifth county in California in regard to size, located in a highly mineralized and mountainous country, ranks forty-fifth in regard to the value of its mineral output for 1921. The decrease in 1921 was due mainly to gold, copper, and mineral water.

Although the county is traversed by a transcontinental railroad in a north and south line, the mineral-bearing sections are almost without

exception far from transportation and other facilities. A large part of the county is accessible by trail only. Future development and exploitation will increase the productiveness of this part of the state to a considerable degree.

Mount Shasta is located in Siskiyou County.

Among Siskiyou's mineral resources are: Chromite, clay, coal, copper, gems, gold, lead, limestone, manganese, marble, mineral water, pumice, quicksilver, sandstone, silver, and miscellaneous stone.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Gold		$42,635
Mineral water	250,150 gals.	5,015
Silver		294
Stone, miscellaneous		44,343
Other minerals*		1,060
Total value		$93,347

*Includes asbestos, chromite, brick, lime, platinum.

SOLANO.

Area: 822 square miles.
Population: 40,602 (1920 census).
Location: Touching San Francisco Bay on the northeast.

Solano, while mostly valley land, produced mineral substances during the year 1921 to the total value of $3,030,198, ranking eleventh among the counties of the state, the increase over the 1920 figures of $2,930,614 being due to cement. Among her mineral resources are: Brick, cement, clay, fuller's earth, limestone, mineral water, natural gas, onyx, quicksilver, salt, and miscellaneous stone.

Commercial production for 1921 was as follows:

Substance	Value
Stone, miscellaneous	$60,604
Other minerals*	2,969,594
Total value	$3,030,198

*Includes cement, mineral water, onyx.

SONOMA.

Area: 1,577 square miles.
Population: 51,990 (1920 census).
Location: South of Mendocino County, bordering on the Pacific Ocean.

Sonoma ranked thirty-eighth among the counties of California during the year 1921, with a mineral production of $175,551, as compared with its 1920 output worth $287,245. More paving blocks have been turned out here than in any other section of the state, but this industry has now practically ceased, owing to the construction of smooth-surface pavements both in the cities and on the highways.

Among Sonoma's mineral resources are: Brick, chromite, clay, copper, graphite, infusorial earth, magnesite, manganese, marble, mineral paint, mineral water, quicksilver, and miscellaneous stone.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Mineral water	37,641 gals.	$9,891
Stone, miscellaneous		151,300
Other minerals*		14,360
Total value		$175,551

*Includes gems, magnesite, quicksilver.

STANISLAUS.

Area: 1,450 square miles.
Population: 43,557 (1920 census).
Location: Center of state, bounded on south by Merced County.

Gold has usually been the chief mineral product of Stanislaus County, but it was exceeded in 1918–1919 by manganese, and in 1921 by miscellaneous stone. Brick, clay, gypsum, mineral paint, quicksilver, and silver are found here to some extent as well. This county for 1921 ranks thirty-fifth in the state in regard to value of minerals, with an output of $236,207, as compared with $385,017 in 1920, the decrease being due mainly to gold. Gold, platinum, and silver are obtained mainly by dredging.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Gold		$18,439
Magnesite	3,378 tons	33,158
Silver		136
Stone, miscellaneous		180,697
Other minerals*		3,777
Total value		$236,207

*Includes manganese ore, mineral paint, platinum, quicksilver.

SUTTER.

Area: 608 square miles.
Population: 10,115 (1920 census).
Location: Bounded by Butte County on the north and Sacramento on the south.

Sutter is one of only two counties in the state which for a number of years reported no commercial output of some kind of mineral substance. In 1917 some crushed rock was taken out, from the Marysville Buttes, but there was no production in 1918, nor 1919. There has been some utilization of natural gas. The 1921 mineral yield was valued at $54, being concealed under 'unapportioned.' Both coal and clay exist here, but deposits of neither mineral have been placed on a productive basis.

TEHAMA.

Area: 2,893 square miles.
Population: 12,882 (1920 census).
Location: North-central portion of the state, bounded on the north by Shasta.

Tehama stands fiftieth among the mineral producing counties of the state for 1921, when its output was valued at $30,820, as compared with the 1920 yield worth $26,400.

Among its mineral resources are listed: Brick, chromite, copper, gold, manganese, marble, mineral water, salt, and miscellaneous stone.

The 1921 yield was distributed as follows:

Substance	Value
Stone, miscellaneous	$30,520
Other minerals	300
Total value	$30,820

TRINITY.

Area: 3,166 square miles.
Population: 2,551 (1920 census).
Location: Northwestern portion of state.

Trinity, like its neighbor, Siskiyou County, requires transportation facilities to further the development of its many and varied mineral resources. Deposits of asbestos, barytes, chromite, copper, gold, mineral water, platinum, quicksilver, silver, and building stone are known here, but with the exception of gold, chromite, copper, quicksilver, and platinum, very little active production of these mineral substances has been made as yet. The 1921 output of $456,882 shows a decrease from the 1920 figure of $562,105.

In thirtieth place, commercial output for 1921 was:

Substance	Amount	Value
Gold		$437,993
Platinum	27 fine oz.	3,260
Silver		1,390
Other minerals*		14,239
Total value		$456,882

*Includes quicksilver and miscellaneous stone.

TULARE.

Area: 4,856 square miles.
Population: 59,031 (1920 census).
Location: Bounded by Inyo on the east, Kern on the south, Fresno on the north.

Tulare stands twenty-sixth on the list of mineral-producing counties, the decrease from the 1920 value being due mainly to magnesite. This county's mineral resources, among others, are: Brick, clay, copper, feldspar, graphite, gems, limestone, magnesite, marble, quartz, glass-sand, soapstone, miscellaneous stone, and zinc. Tulare for a number of years has led the state in magnesite output, except in 1918 when it was passed by Napa County, and in 1921 by Santa Clara.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Limestone	10,030 tons	$40,090
Magnesite	11,454 tons	125,594
Natural gas	380 M. cu. ft.	190
Stone, miscellaneous		284,122
Other minerals*		102,238
Total value		$552,234

*Includes brick and granite.

TUOLUMNE.

Area: 2,190 square miles.
Population: 7,768 (1920 census).
Location: East-central portion of state—Mother Lode District.

Tuolumne ranks twenty-fifth among counties of the state relative to its total value of mineral output for 1921. This county ranks first as a producer of marble in the state. The increase in the year's valuation to $554,483 for 1921, over the 1920 figure of $513,914 was due to the large amounts of crushed rock, sand and gravel being used on the Hetch Hetchy project of the City of San Francisco, although there was a considerable decrease in the county's gold yield.

Chromite, clay, copper, gold, lead, limestone, marble, mineral paint, platinum, soapstone, silver, and miscellaneous stone are among its mineral resources.

Commercial production for 1921 was as follows:

Substance	Amount	Value
Gold		$96,026
Limestone	3,650 tons	9,475
Silver		2,505
Stone, miscellaneous		229,185
Other minerals*		217,292
Total value		$554,483

*Includes dolomite, granite, lime, marble.

VENTURA.

Area: 1,878 square miles.
Population: 28,724 (1920 census).
Location: Southwestern portion of state, bordering on Pacific Ocean.

Ventura is the seventh county in the state in respect to the value of its mineral production for 1921, the exact figure being $6,245,269, as compared with the output for 1920, worth $5,229,175, the advance being due to petroleum.

The highest gravity petroleum produced in the state is found here.

Among its other mineral resources are: Asphalt, borax, brick, clay, mineral water, natural gas, sandstone, and miscellaneous stone.

The commercial production for 1921 was as follows:

Substance	Amount	Value
Clay and clay products		$3,985
Natural gas	2,127,476 M. cu. ft.	360,443
Petroleum	2,167,326 bbls.	5,869,119
Stone, miscellaneous		11,250
Other minerals*		472
Total value		$6,245,269

*Includes mineral paint and sandstone.

YOLO.

Area: 1,014 square miles.
Population: 17,105 (1920 census).
Location: Sacramento Valley, bounded by Sutter on the east and Colusa on the north.

The mineral production from Yolo County during the year 1921 consisted mainly of miscellaneous stone, valued at $14,829, ranking it in fifty-fourth place. Deposits of undetermined value of iron and sandstone have been discovered within the confines of this county. Quicksilver has also been produced.

YUBA.

Area: 639 square miles.
Population: 10,375 (1920 census).
Location: Lies west of Sierra and Nevada counties; south of Plumas.

Yuba is ninth of the mineral producing counties of the state, and leads in regard to gold output, surpassing both Nevada and Amador counties in 1918-1921 in that metal. Iron and clay deposits have been reported in this county aside from the following commercial production shown for the year 1921. The increase over the 1920 figure of $3,573,649 was due to gold obtained by the dredgers, which also yield silver and platinum.

The 1921 production of Yuba County was distributed as follows:

Substance	Amount	Value
Gold		$4,738,248
Platinum	179 fine oz.	14,396
Silver		26,135
Stone, miscellaneous		73,387
Other minerals		100
Total value		$4,852,266

MUSEUM.

The Museum of the State Mining Bureau possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the first five of such collections located in North America; and contains not only one or more samples of most of the known minerals found in California, but many specimens from other states and foreign countries as well.

Aside from its purely educational features, the Museum daily attracts throngs of tourists and travelers, and furnishes visual evidence of the immense mineral resources of California. The State Mining Bureau supplies a collection of forty typical minerals and ores, appropriately labeled, to any public school in the state upon request.

Mineral specimens suitable for exhibit purposes are solicited and their donation will be appreciated by the State Mining Bureau, as well as by those who utilize the facilities of the collection.

During the month a total of 450 visitors signed their names to the Museum register, and in addition there are many others daily who fail to take note of our request for their signatures.

LABORATORY.

FRANK SANBORN, Petrologist.

A total of 264 samples were received and determined during the thirty-day period covered by this report. There were few among the number of special scientific interest.

In a previous issue of this report the occurrence of a lime phosphate from Tulare County was mentioned. An analysis of the sample gave 36.80 per cent phosphoric anhydride (P_2O_5). A large deposit of this material would be valuable.

A list of samples of possible commercial value, judged from the sample submitted only, is appended.

The Bureau will supply the name and address of the party who sent in any sample listed, upon request, if the reference number is given.

05–283 Zinc-copper ore; some silver present.
05–284 Barite, fair quality.
05–285 Oxides of iron, possibly make paint pigment.
05–286 Massive garnet.
05–287 Arsenopyrite with quartz.
05–288 Barite; good grade.
05–289 Lead vanadate.
05–290 Copper ore; low grade.
05–291 Spinel.
05–292 Galena; some silver present.
05–293 Black sand; contains gold and platinum.
05–294 Quartz; good grade.
05–295 Limonite (yellow ocher).
05–296 Copper ore; contains a little gold.
05–297 Copper ore, some gold and silver present; also barite.
05–298 Asbestos (chrysotile), good grade.
05–299 Clay, burns white.
05–300 Sulphur.
05–301 Sand; contains platinum and gold.
05–302 Wollastonite; also limestone.
05–303 Gold-silver ore.
05–304 Complex material; contains scorodite (ferric arsenate).
05–305 Copper ore, some gold and silver present.
05–306 Asbestos (short fiber chrysotile).
05–307 Quartz and galena; also wulfenite.
05–308 Sodium sulphate with some sodium chlorite; also gypsum.
05–309 Massive garnet.
05–310 Quartz and iron oxide; contains gold.
05–311 Gold ore; contains some copper and lead.
05–312 Fluorite; also limestone.

LIBRARY.

E. Cooney, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received during the month, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the State are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geol. Survey:

Bulletin No. 722—Mineral Resources of Alaska. By A. H. Brooks and others.

Bulletin No. 724—Nitrate Deposits in the Amargosa Region, Southeastern California. By L. F. Noble, G. R. Mansfield and others.

Water Supply Paper No. 450-C—Ground Water in Pahrump, Mesquite and Ivanpah Valleys, Nevada and California. By Gerald A. Waring.

Water Supply Paper No. 463—Surface Water of the United States, 1917. By Nathan C. Grover, G. C. Baldwin, G. L. Parker and F. F. Henshaw.

Salt, Bromine and Calcium Chloride in 1921.

Clay in 1921.

Mineral Resources of the United States in 1921 (Preliminary Summary).

Professional Paper No. 131-B. A Section of the Paleozoic Formations of the Grand Canyon at the Bass Trail. By L. F. Noble.

U. S. Bureau of Mines:

Technical Paper 188—Corrosion Under Oil Films, With Special Reference to the Cause and Prevention of the After Corrosion of Firearms, by Wilbert J. Huff.

Technical Paper 290—Inclusions in Aluminum-Alloy Sand Castings. By R. J. Anderson.

Technical Paper 292—Tests of Gas Masks and Respirators for Protection from Locomotive Smoke in Railroad Tunnels, with Analyses of Tunnel Atmospheres. By A. C. Fieldner, S. H. Katz and S. P. Kinney.

Technical Paper 309—Recent Progress in the Thawing of Frozen Gravel in Placer Mining. By Charles Janin.

Bulletin No. 199—Experimental Production of Alloy Steels. By H. W. Gillett and E. L. Mack.

Reports of Investigations:
Serial No. 2380—Use of Geophone in Locating Compressed-air Leaks. By Byron O. Pickard (M. E.—U. S. B. M.)
Serial No. 2381—The Rate of Reduction of Hematite to Magnetite by Bethane. By C. M. Bouton (Physical Chemist, U. S. B. M.).
Serial No. 2382—The White Clay Industry in the Vicinity of Langley, South Carolina. By W. M. Weigel (Mineral Technologist, U. S. B. M.).
Serial No. 2383—Ignition of Gas by Electric Detonators. By L. C. Ilsley (Electrical Engineer) and A. B. Hooker (Asst. Electrical Engineer, B. M.).
Serial No. 2384—Failure of Center Shots in Blasting. By L. C. Ilsley (Electrical Engineer, B. M.) and A. B. Hooker (Asst. Electrical Engineer, B. M.).
Serial No. 2385—Tellurium. By H. A. Doerner (Chemist, B. M.).
Serial No. 2386—Comminuted Smokeless Powder as a Blasting Agent. By C. E. Munroe (Chief Explosives Chemist, B M.) and Spencer P. Howell (Explosive Engineer, B. M.).
Serial No. 2387—Explosives Used in June, 1922. By W. W. Adams (Statistician. B. M.).
Serial No. 2388—Sixth Semi-Annual Motor Gasoline Survey. By A. D. Bauer (Assist. Petroleum Chemist, B. M.) and N. F. LeJeune (Asst. Chemist, B. M.).
Serial No. 2389—Fatalities at Coal Mines in July, 1922. By W. W. Adams (Statistican, B. M.).
Serial No. 2390—The New Albany Shale of Indiana. By John R. Reeves (Dept. of Geology, Indiana University).
Serial No. 2391—Underground Hygiene and Sanitation. By R. R. Sayers (Chief Surgeon, U. S. B. M., P. A Surgeon, U. S. P. H. S.).
U. S. Dept. of Commerce:
Supplement to Commerce Reports Nos. 11, 12, 13, 14, 15 and 16.
Bulletin No. 48—Topographic and Geological Survey, Commonwealth of Pennsylvania—Pyrite from Bituminous Coal Mines in Pennsylvania. By Henry Leighton.
Bulletin No. 49—Coal Beds in Clarion County, Pennsylvania. By J. D. Sisler.
Bulletin No. 50—New Oil Pool at Tidioute and Gas Pools Near Corry and Meadville, Pennsylvania. By M. E. Johnson.
Bulletin No. 52—Coal Beds in Mercer, Crawford, Venango Forest, Warren, McKean, Potter, Tioga and Bradford Counties, Pennsylvania. By J. D. Sisler.
Bulletin No. 53—Coal Reserves in Clearfield County, Pennsylvania. By John F. Reese.
Bulletin No. 54—Bituminous Coal Reserves in Pennsylvania. By John F. Reese.
Bulletin No. 56—Oil Fields Rejuvenated. By Robert B. Bossler.
Bulletin No. 25—Geological Survey of Alabama—Statistics of the Mineral Production of Alabama for 1919 and 1920. By J. H. Wingard.
Museum Paper No. 5—Alabama Museum of Natural History.
University of California, Geological Series, Vol. 14, No. 1—Geology and Ore Deposits of the Santa Fe District, Mineral County, Nevada. By Bruce L. Clark.
Vol. 14, No. 2—The Chuquicamata Ore Body. By John A. Hendricks.
Vol. 14, No. 4—A New Family and New Genus from the Tertiary of the Pacific Coast. By Bruce L. Clark.
Vol. 14, No. 3—Faunal and Stratigraphic Relationships of the Empire Formation, Coos Bay, Oregon. By Henry V. Howe.
Circular No. 4—North Carolina Geological Survey. Drainage Assessments; Their Imposition and Their Collection Under the North Carolina Drainage Laws. By Frank Nash.
Thirty-second Annual Report of the Transvaal Chamber of Mines.
Annual Report of the Department of Mines, New South Wales, for 1921.
Thirtieth Annual Report of the Ontario Department of Mines. Pt. III—Gowganda and Other Silver Areas. By A. G. Burrows.
Pt. IV—Natural Gas in 1920. By E. S. Estlin.
Pt. VI—Boston-Skead Gold Area. By A. G. Burrows and P. E. Hopkins.
Bulletin 549—Canada Department of Mines—Report on Structural Materials Along the St. Lawrence River, Between Prescott, Ont., and Lachine, Que. By Joseph Keele and L. Heber Cole.

Societies and Educational Institutions.

Monthly Bulletin of the Canadian Institute of Mining and Metallurgy, September, 1922.
American Institute of Mining and Metallurgical Engineers, September, 1922.
American Philosophical Society Proceedings—Vol. LXI, Nos. 1 and 2. List of the Society, August, 1922.
Colorado Scientific Society Proceedings, Vol. XI—The Manufacture of Lubricating Products from Wyoming and Colorado Crude Oils. By L. C. Welch.
Aspects of Colorado Oil Shale Industry. By Arthur Hoskin.
Vitamines. By Carroll E. Edson, A. M. M. D.
Concrete Pavements. By Lt. Col. H. C. Boyden.
American Institute of Mining and Metallurgical Engineers Transactions, Vol. LXVII, 1922.
Proceedings of the Mining and Metallurgical Society of America.
Philippine Journal of Science; Vol. 20, Nos. 5 and 6.
Economic Geology; Vol. XVII.
The Geographical Review.
The Journal of Geology; Vol. XXX; No. 6.
The Mining Congress Journal, October, 1922.
Monthly Bulletin of the Canadian Institute of Mining and Metallurgy, October, 1922.
Bulletin of the Institution of Mining and Metallurgy, September, 1922.
Boletin de la Real Academia de Ciencias y Artes de Barcelona: Vol. IV, Num. 6.
Memorias de la Real Academia de Ciencias y Artes de Barcelona; Vol. XVII, Num. 13—Evolucion Historica de la Medicina la Ensenanza. Por El Academico Numerario. Prof. Dr. I. Valenti Vivo.
Vol. XVII, Num. 14—Oceanografia Practica. Por El Academico Numerario. Excmo. Sr. D. Jose Ricart Y. Giralt.
Vol. XVIII; Num. 15—Insectos Nuevos O Poco Conocidos. Por El Academico Correspondiente. R. P. Longinos Navas, S. J.

Books.

Study of Minerals and Rocks. By Austin Flint Rogers.
Mining and Engineers Handbook—2 Vols. By Robert Peele.
Geological Notes on Oil Structures. By Edward Allison Hill.

Maps.

U. S. G. S. Topographical Sheets:
Round Mountain Quadrangle, Fresno County.
Pozo Farm Quadrangle, Fresno County.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

Architect and Engineer, San Francisco.
Arizona Mining Journal, Phoenix, Arizona.
Asbestos, Philadelphia, Pennsylvania.
American Petroleum Institute, New York.
Brick and Clay Record, Chicago.
Chemical Engineering and Mining Review, London, England.
Cement, Mill and Quarry, Chicago, Illinois.
Engineering and Mining Journal-Press, New York.
Financial Insurance News, Los Angeles, California.
Hercules Mixer, Washington, Delaware.
Journal of Electricity and Western Industry, San Francisco.
Metallurgical and Chemical Engineering, New York.
Mining and Oil Bulletin, Los Angeles.
Mining and Engineering Record, Vancouver, B. C.
Oildom, New York.
Oil Weekly, Houston, Texas.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil, Paint and Drug Reporter, New York.

Oil Trade Journal, New York.
Oil Age, Los Angeles.
Oil News, Galesburg, Illinois.
Petroleum Record, Los Angeles.
Petroleum Refiner, Kansas City, Missouri.
Petroleum Age, New York.
Petroleum World, Los Angeles.
Queensland Government Mining Journal, Brisbane, Australia.
Rock Products, Chicago, Illinois.
Southwest Builder and Contractor, Los Angeles.
Stone, New York.
Salt Lake Mining Review, Salt Lake City, Utah.
Standard Oil Bulletin, San Francisco.
Safety News, Industrial Accident Commission, San Francisco.
The Record, Associated Oil Company, San Francisco.

Newspapers.

The following papers are received and kept on file in the library:

Amador Dispatch, Jackson, Cal.
Arkansas Oil and Mineral News, Hot Springs National Park (Arkansas).
Bakersfield Morning Echo, Bakersfield, Cal.
Blythe Herald, Blythe, Cal.
Bridgeport-Chronicle-Union, Bridgeport, Mono Co., Cal.
California Oil World, Los Angeles, Cal.
Colusa Daily Sun, Colusa, Cal.
Daily Midway Driller, Taft, Cal.
Del Norte Triplicate, Crescent City, Cal.
Exeter Sun, Exeter, Cal.
Georgetown Gazette, Georgetown, Cal.
Gateway Gazette, Beaumont, Cal.
Gilroy Gazette, Gilroy, Cal.
Goldfield News, Goldfield, Nevada.
Guerneville Times, Guerneville, Cal.
Humboldt Standard, Eureka, Cal.
Healdsburg Enterprise, Healdsburg, Cal.
Inyo Independent, Independence, Cal.
Inyo Register, Bishop, Cal.
Lake County Bee, Lakeport, Cal.
Mariposa Gazette, Mariposa, Cal.
Mining and Financial Record, Denver, Colo.
Mountain Democrat, Placerville, Cal.
Mountain Messenger, Downieville, Cal.
Nevada Mining Press, Reno, Nevada.
Oroville Daily Register, Oroville, Cal.
Oatman Mining Press, Oatman, Arizona.
Oregon Observer, Grants Pass, Oregon.
Petroleum Reporter, Etna Mills, Cal.
Plumas National Bulletin, Quincy, Cal.
Plumas Independent, Quincy, Cal.
Placer Herald, Auburn, Cal.
Sacramento Union, Sacramento, Cal.
San Diego News, San Diego, Cal.
Santa Barbara Daily News, Santa Barbara, Cal.
Shasta Courier, Redding, Cal.
Siskiyou News, Yreka, Cal.
Siskiyou Standard, Fort Jones, Cal.
Stockton Record, Stockton, Cal.
Sunset Journal, Sunset District, San Francisco, Cal.
Tuolumne Prospector, Tuolumne, Cal.
Ventura Daily Post, Ventura, Cal.
Weekly Trinity Journal, Weaverville, Cal.
Western Sentinel, Etna Mills, Cal.

PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of consumers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

Sufficient publicity has not heretofore been given to this feature of the Bureau's work, but in 'Mining in California' a suitable medium is provided for current inquiries of this nature, and, therefore, written or verbal inquiries that come to the attention of the Bureau are summarized in each issue.

The name of the product wanted or offered, only, is published; the name of the owner of the deposit, or buyer, and other details being supplied upon request.

In writing, the reference number of the item should be given.

Mineral Products or Deposits for Sale.

02–124 Gold placer mine, 140 acres all gravel patented land.
02–125 Feldspar; tonnage.
02–126 Limestone deposit. Four miles to railroad, Tulare County.
02–127 Gold prospect. Four-foot vein assays $30–$50. Mono County.
02–128 Magnesite mine. One hundred tons on dump and large tonnage in sight. Reasonable price.
02–129 Silver property. Group of seventeen claims at Randsburg, close in.
02–130 Chrysotile asbestos, fiber up to one inch, Tulare County.
02–131 Copper-gold-silver prospect, adjoins Greenhorn Mine, Shasta County. Timber. Can be worked by tunnel.
02–132 Gold property. Large fissure vein. Twenty-one claims in Argus Mountains. Good road and water. Thirteen miles from Trona.
02–133 Amphibole asbestos, in Inyo County, six miles from railroad.
02–134 Copper-gold prospect.
02–135 Magnesite.
02–136 Soapstone and green talc.

Mineral Products or Deposits Wanted.

03–116 Ground flint, ground feldspar, and clays.
03–117 Montmorillonite (rock soap); and bentonite.
03–118 Ochre; limestone; gypsum; magnesite.
03–119 Spodumene and amblygonite.
03–120 Colemanite; deposit or tonnage.

EMPLOYMENT SERVICE.

Following the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

The Bureau registers technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

A list of applicants for positions and 'positions open,' received by the Bureau during each 30-day period preceding the date of publication of the Monthly Chapter is carried in each issue.

Each notice is designated by a key number, and communications sent to the Bureau in reply to any notice will be forwarded to the proper party without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau, to avoid possible loss.

Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

01–38 Assistant Geologist. Technical graduate. Has taught crystallography, mineralogy, lithology, and field geology. Age 21; single. Minimum salary wanted, $125 a month. References.

01–39 Assayer or General Foreman of a lead smelter. One and one-half years' experience as helper, and 4 years as assayer and melter. Age 27; single. Salary wanted, $150. References.

01–40 Engineer and estimator of building construction. (Technical or executive work.) Five and one-half years' experience as engineer, estimator, draftsman, and designer. Age 30; married. References.

During the month one registered applicant was placed.

NOVEMBER, 1922

REPORT XVIII OF THE STATE MINERALOGIST

DISTRICT REPORTS OF MINING ENGINEERS.

In 1919–1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each division working out from a local branch office.

This move brought the Bureau into close personal contact with operators, but did not materially shorten the time between the gathering of data in the field and their publication in the Report of the State Mineralogist at the end of an annual or biennial period.

Mining activities and development noted by district engineers in their respective fields are now embodied in monthly reports published in each issue of 'Mining in California,' thus making these data available within a maximum period of thirty days, and the Monthly Chapter as far as possible a compendium of current mining progress throughout the State.

The counties included in each field division and the location of the local offices are shown on the accompanying outline map of the State. (Frontispiece.)

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the State's oil fields is included under this heading.

REDDING FIELD DIVISION.

W. Burling Tucker, Mining Engineer.

Lassen County.

A rich strike of gold ore is reported from the *Buckskin mine* in the Hayden Hill district. At a depth of 150 feet, a ledge of free gold ore was struck and samples taken from the vein show high values. This discovery is the most important made in this district in many years. H. P. Anderson, superintendent.

At the *Juniper mine* in the Hayden Hill district, a new shaft has been recently sunk and it is planned to connect this shaft with the old shaft, thus giving two openings on the property. C. L. Joslyn, superintendent.

Shasta County.

COPPER.

Afterthought Mine. The property is located in sections 10, 11, 25, and 5; T. 33 N., R. 2 W., near the town of Ingot, which is twenty-four miles northeast of Redding. The property is owned by the Afterthought Copper Company, George L. Porter, president; C. A. Crowl, secretary; John Tait Milliken, general manager and consulting engineer. Offices, 1321 Pierce Building, St. Louis, Missouri.

Since Report XIV of the State Mineralogist, (pp. 760–761), a new reverberatory furnace and a 300-ton flotation plant were installed in 1918, and operated during 1919. The Harwood process was applied to the complex copper-zinc ores.

Ore deposits: The copper-zinc ore deposits are limited to zones of disturbance in which the country rock is crushed and sheared. The Copper Hill lode consists of two short, nearly vertical ore bodies,

approximately 350 feet apart. They lie close to the contact in rhyolite that encloses fragments of slate. The shear zone contains massive irregular lenticular ore bodies. The two vein systems or lodes are known as the Afterthought and Copper Hill lodes, which strike northwest and southeast, and dip 70 degrees to the northeast.

Mine developments: No. 4 tunnel, the main working adit, is driven N. 85° E., 600 feet, then as a drift southeast 500 feet on the Afterthought lode, and northwest 400 feet on the Copper Hill lode. About 350 feet southeast of the vertical shaft from the surface, a winze has been sunk to a depth of 400 feet. Levels have been driven every 100 feet in the winze below the adit. Total amount of underground workings is approximately 10,000 feet.

Approximately 300,000 tons of ore is reported to be developed, carrying 5.5 ozs. silver, .03 ozs. gold, 16 per cent zinc, and 3 per cent copper. The ore is complex copper-zinc ore finely disseminated, composed largely of sphalerite, pyrite, chalcopyrite and galena, with local traces of bornite. The gangue which forms less than 5 per cent of the ore is barite with some quartz and a trace of calcite.

Mill and smelter: The tonnage treated in the 300-ton flotation plant was a minimum of 275 tons and a maximum of 400 tons, producing about 150 tons of collective concentrate. This shows a ratio of concentration of about 2:1. The collective concentrate, when treated preferentially, gives 60 tons of copper concentrate and 90 tons of zinc concentrate. The ore treated by the mill ran 17 per cent zinc, 3.0 per cent copper, 6 ozs. silver, and .03 ozs. gold. The copper concentrate produced ran 7.2 per cent copper, 12.3 per cent zinc, 23.4 per cent iron, 8.2 per cent barite, 10.7 per cent lime, 10.5 per cent alumina, and 10.5 per cent silica. The zinc concentrate produced ran 2.6 per cent copper, 47.1 per cent zinc, 4.2 per cent iron, 3.3 per cent barite, 4.4 per cent lime, 3.8 per cent alumina, and 3.2 per cent silica.

Method of treatment: The ore is crushed to 2-inch ring and ground to pass 48-mesh; it is then subjected to flotation, producing a collective concentrate and a final tailing. The collective concentrate is thickened, filtered, dried and roasted lightly; after cooling, it is subjected to flotation again, this time producing a froth called the zinc concentrate, and a tailing called the copper-iron concentrate. These concentrates are then filtered and dried. (See flow sheet, p. 597.)

Crushing plant: Ore from mine is dumped into 500-ton bin. The ore from bin passes over grizzly with 2-inch openings; the oversize is crushed to 3 inches in 15-inch by 30-inch Blake crusher. The oversize then passes to 9-inch by 15-inch Blake crusher. The discharge from this crusher joins the fine material from 2-inch grizzly and is elevated and conveyed to 1000-ton ore bin at top of mill.

Grinding: The ore from bins is then fed by short conveyors to two No. 6½ Marcy ball mills, each running in closed circuit with a Dorr duplex classifier. Each mill handles 160 tons per 24 hours, and is driven by a 125-h.p. motor. Five-inch forged chrome-steel balls are used and the mills operated at 28 r.p.m.

Collective flotation: The pulp from the classifiers goes direct to 10 sub-aerated Janney machines, ten per unit. Each unit consists of seven roughers and three cleaners. The tailings from cleaners are returned to the head of the mill by means of three-inch sand pumps. The cleaned collective froth goes direct to two 21-foot Dorr thickeners.

The overflow from thickeners is returned to the mill circuit. The thickener discharge runs by gravity to two 8-foot by 8-foot Oliver filters. Filter cake goes to 5-foot by 35-foot cylindrical dryer. The dryer discharges into a 30-ton hopper. The concentrate from the dryer is fed to the top of a 25-foot 9-hearth wedge type Skinner roaster. Roasted concentrates pass through a 60-foot Edwards cooler and are then elevated to a 150-ton bin.

Flow-Sheet of 300-ton Mill
Afterthought Copper Co
Ingot, Shasta County.

Preferential flotation: The discharge from the cooler is conveyed to sludge-tanks, water being added before going to a 12-cell mineral separation sub-aerated flotation machine. Two 16-foot Dorr thickeners are provided for the zinc and copper concentrates. From each of these thickeners, the pulp is drawn to one of four 6-leaf 4-foot American filters; two for copper and two for zinc concentrates. Tailing from the collective department is partly dewatered in 30-foot Dorr thickener. Zinc concentrates pass through the dryer and then go to zinc-concentrate storage bin. Copper concentrates after passing through the dryer are conveyed by a 16-inch belt conveyor to a copper concentrate storage bin, and from this bin to a reverberatory furnace. Recovery on the collective concentrate was 90 per cent of the copper and about 80 per cent of the zinc, while the recovery made by preferential flotation was low, due to lack of agitation and capacity of the minerals separation machine.

The property has been idle since 1919, but eight men are employed on development and maintenance work under the supervision of Robert Milliken, superintendent.

Bibliography: State Mineralogist Report XIV, pp. 670, 671.
Bulletin No. 50, pp. 102-105.
A. H. Heller. Mining and Scientific Press, August 2, 1919.

Deep Pit Group of Mines. This group of mines is situated one-half mile south of Heroult, in section 36, T. 34 N., R. 4 W., on the south side of Pit River. Elevation is 900 feet. Owned by T. H. Peterson of Heroult. Holdings consist of 14 claims located along a massive outcrop of iron gossan, which has a general northerly and southerly course. This gossan outcrop can be traced for one mile and is approximately 500 feet wide. Developments consist of a number of tunnels from 20 to 100 feet in length, at different intervals along the outcrop. In these tunnels some pyrite ore has been developed with slight traces of copper.

GOLD.

Janice Group of Mines. This group is situated in Spring Creek mining district, in sections 11 and 12; T. 32 N., R. 6 W., 3 miles northwest of Keswick. Elevation is 1200 feet. Holdings consist of five claims. A series of parallel east and west veins occur in quartz-hornblende-diorite. Dip 65 degrees north. The veins are from 2 to 4 feet wide, the quartz showing free gold with some chalcopyrite and pyrite. Developments consist of two shafts, one 40 feet, the other 50 feet deep. Idle. Frank Sullivan of Shasta, owner.

Peerless Group of Mines. Formerly known as the *Anavina Mine*, is situated 8 miles southwest of Redding, in section 23; T. 31 N., R. 6 W., in the Centerville mining district. Owners: C. S. Jones of Redding, Frank Broadbent and Joseph John of San Francisco. Located in 1885 and worked from 1885 to 1893 by the Anavina Mining Company. There are five claims in the group. Three parallel veins having a general north and south course and dipping 75 degrees to the east, occur in the meta-andesite. The principal development work has been confined to the Peerless vein, which strikes N. 15° W. and dips 75 degrees east. Width, 2 feet. This vein occurs along a fault fissure, cutting the meta-andesite at right angles to the strike of the formation. The vein quartz shows some free gold, with chalcopyrite, pyrite, and

galena. At an elevation of 1200 feet, a shaft has been sunk on the vein to a depth of 65 feet, with drifts driven on the 50-foot level north and south. At the elevation of the shaft, a tunnel has been driven 350 feet north on the vein. This vein north of the shaft was extensively worked for pockets and is said to have produced from $6,000 to $10,000. Three men are employed.

PLACER.

Lost Channel Mine. The property lies immediately south of the Clear Creek drainage in the Igo mining district, 12 miles southwest of Redding. Holdings consist of 580 acres, located in sections 34, 3 and 4; T. 31 and 30 N., R. 6 W. Elevation is 1100 feet. Owner, C. A. Russell of Igo; under option to J. W. Newell of Fullerton, California. The 'channel' is in all probability a section of the ancient bed and wash of Clear Creek. The width of this old channel is from one-half to fully one mile across. The present drainage of the Upper Dry Creek, passes directly across the course of the old channel in a southwesterly direction. Deepest depth of the channel is 80 feet.

Character of bedrock: At the northern end of the property, the wash overlies the slates and tuffs. For a distance of about one mile southwesterly, a soft decomposed granite bedrock exists, lying between the slates and sandstones. The sandstone is on the southernly end of the property.

Developments: On the south side of Dry Creek, there is fully 7,000 to 8,000 feet of workings near the Dunham tunnel. Since Report XIV (p. 791), the ground was prospected by a series of drill holes sunk on the north township line, 100 feet apart to a depth of 50 to 65 feet. North of the Dunham tunnel, 12 prospect shafts were sunk, 200 feet apart, east and west across the channel, the depth of these shafts to bedrock being from 18 to 80 feet. Gravel tested ran from 4 to 60 cents per cubic yard, the average value being 12 cents per yard. The ground east and west of Harrison Gulch averaged 50 cents per cubic yard. Three channels have been developed, known as East, West, and Tom White. General course of the channel is north and south. In recent development work, a shaft has been sunk 34 feet deep to bedrock on Los Angeles Gulch. This shaft is one mile north of the Dunham tunnel. To the south of this shaft, two other shafts have been sunk to bedrock. These three shafts are 100 feet apart. Gravel from these three shafts averaged 32 cents per cubic yard. Present work is confined to drifting south on the channel. The gravel mined in the south drift for a height of two feet above bedrock, averaged $10 per cubic yard.

Character of Gold: Very little gold is shown of a size that could be classed as small nuggets except in the main channel, and in the present workings. The distribution in the general wash shows gold running about 10 colors—3 to a cent—on an average. Fineness, 0.873. Total production is reported to be $3,000,000 from 1865 to the present time.

Equipment: Consists of 2 h.p. Fairbanks-Morse gas engine which drives hoist, rod pump and washing machine. Capacity of washer is 30 tons per 24 hours. Three men are employed.

IRON.

The *Noble Electric Steel Company* of San Francisco, who are operating the *Shasta Iron mine* near Heroult, are shipping 160 tons of iron ore per week to steel plants at San Francisco and Los Angeles. E. Y. Dougherty, manager.

Siskiyou County.

The Granite Mine, situated on Humbug Mountain, about 16 miles northwest of Yreka, is to be reopened by the Garrett interests. It is proposed to drive an 800-foot crosscut tunnel below the old workings.

In the Humbug district, it is reported that *John Dowling* and *William Bannister* have discovered an extensive deposit of rich gravel on the slope of Humbug Mountain.

The Oak Bottom Placer Syndicate and *The Victory Gold Mining Company*, two of the largest hydraulic operators in Siskiyou County, both of whom have a number of properties in the Salmon River district, are preparing to operate this winter on a large scale. The Oak Bottom Company has installed a large hydraulic plant and flume line. John Nefroney is manager of the Oak Bottom Company.

The Eliza Mine, Yreka, is being reopened by R. H. DeWitt of Yreka.

Trinity County.

Layman Mine property is situated in section 29; T. 32 N., R. 11 W., in the Hayfork mining district, 4 miles southeast of Hayfork. Elevation is from 3000 feet to 3800 feet. Owners: L. J. Layman, Olonza Layman and Benjamin Murphy of Hayfork. Holdings consist of six unpatented claims, 120 acres. A series of parallel quartz veins occur in the slate and schist. Widths vary from a few inches up to 4 feet. The general trend of the veins is northwestward with dips of about 30 to 45 degrees to the north. The narrow veins, as a rule, are high grade, showing considerable free gold. The shoots of ore are short, about 80 feet being the maximum. The different veins have been developed by a number of tunnels and open cuts. The most recent work has been on the Gold Hill claim. At an elevation of 3400 feet, a crosscut tunnel was driven 45 feet to the vein, which strikes N. 80° W., and dips 50 degrees north. The vein developed in these workings is 12 feet wide. This vein has been drifted on 50 feet, and a winze sunk on the hanging wall to a depth of 20 feet. Ore has been stoped above the tunnel level to the surface, a distance of 25 feet. This ore is reported to have milled $15 per ton. Property was operated during the early part of 1922. Five-stamp mill on the property.

Bibliography: State Mineralogist Report XIV, p. 894.

Hayfork Mine property is situated in section 18; T. 31 N., R. 11 W., in the Hayfork mining district, 3½ miles southeast of Hayfork. Elevation is 3400 feet. Holdings consist of five claims; 100 acres. Vein strikes N. 60° W., and dips 40 degrees south, in schist. Development consists of two crosscut tunnels, the lower one being 500 feet and the upper, 300 feet in length. Two men employed. Owner: Dr. C. A. Mueller, of Redding, California.

Strode Mine. Formerly known as the *Oro Grande*, in sections 8 and 9, T. 37 N., R. 7 W., in the Trinity Center mining district, 2½ miles northeast of Carrville in the Shasta Forest Reserve. Elevation is 2600 feet. Owners: Strode Mining Company, J. S. Maxwell, president; John Phillips, secretary. Offices, 713 Caswell Block, Milwaukee, Wisconsin.

Holdings consist of 11 claims. The vein occurs on a contact between serpentine and porphyry and is from 2½ to 4 feet wide, striking northwest and dipping 40 degrees northeast. The main tunnel, No. 6, driven westward, cut the vein 300 feet from the portal, then drifted on the vein 1000 feet. There is a raise from No. 6 tunnel, 140 feet in ore to No. 5 tunnel. Throughout this raise, the vein averages 4 feet wide. An intermediate drift, 40 feet above No. 6 tunnel, developed a shoot of ore 200 feet long. From No. 5 tunnel, 100 feet above No. 4 tunnel, the ore shoot has been stoped. This ore is reported to have milled $13 per ton. A new tunnel has been driven 1200 feet, 210 feet below No. 6 tunnel, and it is reported No. 1 ore shoot has been opened up on this level for a distance of 300 feet. The vein is 2 to 6 feet wide and is said to carry high values in gold. The compaiy is continuing development work on this level to cut No. 2 ore shoot. On this level the vein has an average width of 3 feet. The quartz is white with occasional iron stains, and some pyrite.

Mine equipment: Consists of air compressor, machine drills, blacksmith shop and tools.

Mill: Blake crusher, two Challenge ore feeders, ten 1000-lb. stamps, and amalgamating plates. Six men are employed. James F. Meikel, superintendent.

Bibliography: State Mineralogist Report XIV, p. 896.

GOLD DREDGING.

The gold dredge now being constructed by the *Lewiston Dredging Company,* 7 miles above Lewiston on the Trinity River, is expected to be floated this month. The company has acquired four tracts of ground, which gives control of some three miles of ground along the Trinity River. The construction camp comprises a machine shop, equipped with machine-tools, a lodging house, a boarding house, office buildings and cottages. Water is pumped from a well by means of a Gould plunger pump having a capacity of 100 gallons per minute. A 10,000-gallon redwood tank gives 110 feet pressure for the water supply of the camp.

The *Gardella Gold Dredge,* which is located on the south side of the Trinity River below Lewiston, is operating steadily. Claude V. Enslow, superintendent.

The Trinity Gold Dredging Company, H. E. Chesboro, general manager, is operating their dredge 4 miles north of Lewiston on the Trinity River.

The Estabrook Dredge, near Carrville, which has been shut down for the past three years, is being repaired and it is reported that it will resume operations at an early date.

Lawrence Gardella, of Oroville, has taken a bond and lease on the Bragdon and the Fog & Lawrence tracts, which are situated in sections 18 and 7, T. 35 N., R. 7 W., on the Trinity River, 4 miles northwest of Minersville. This ground is being prospected with drills to determine its possibilities for dredging operations.

The Pittsburg-Comstock Company of Virginia City, Nevada, have recently acquired a stretch of placer ground on Canyon Creek between Junction City and Dedrick, known as the *Dannenbrink property,* and some adjoining claims. The company plans to start operations at an early date. F. M. Gibson, superintendent.

AUBURN FIELD DIVISION.

C. A. Logan, Mining Engineer.

El Dorado County.

Losh Slate Quarry. Frank A. Losh, Placerville, Cal. Formerly considerable good black roofing slate was produced in the Kelsey district, but at present this is the only active quarry. It is one-half mile by road from the Chili Bar bridge over the South Fork of American River and 4 miles from Placerville, and contains 18 acres covering 1250 feet along the strike of the slate beds. There was some production 30 years ago from the pit on the property beside the road to Kelsey.

Losh began work in August, 1921, and worked until December. He resumed work in May, 1922, and has been continuing steadily since, with six men employed early in November. The old pit is about 50 feet deep, 40 feet wide and 40 feet long. Losh is opening up the front to get a working face 20 feet below the present floor. Two men were splitting and trimming slate. Losh stated that he has been forced to turn away orders lately but is accumulating a stock and expects to be in the market the coming summer.

The slate appears to be of good quality, free from pyrite, and is sought by architects. A wide range of roofing sizes from 6″ by 12″ to 12″ by 24″ is being made. When in active operation it should be possible to greatly undersell eastern slate, with an equally good or better product. Slate roofs, properly applied, are everlasting, absolutely fireproof and far superior to the patented composition roofing materials that have been in common use recently. Slate sawed into various sizes can also be used for many other purposes such as blackboards, electric switchboards and insulation, and in building.

Other slate quarries in this county that have been described in our past reports are: California Slate Quarry, California-Bangor Slate Quarry, Chili Bar Quarry and Eureka Slate Quarry. The last named property, lying a mile south of Kelsey, is now nominally owned by the Sierra Slate Company, 4 and 6 White street, New York, but is under a heavy mortgage held by the Easton Bank of Easton, Pa. It was last worked in 1914-1915 by W. J. Dingee. At that time it was thoroughly equipped with quarrying machinery, five hoisting engines, two air compressors, saws, rubbing bed planers, slate makers' shanties and all accessories for operation on a big scale. A tramway was built from the quarry to Placerville, a length of 13,000 feet, to deliver the slate to the railroad for shipment, but the use of this is said to have been stopped by order of public officials, on account of danger where it crossed roads. Financial reverses in other lines of business in which the operator embarked are said to have contributed largely to failure. The quarry and all the equipment and a number of houses built for employes, have been lying idle for several years. This quarry and others have large reserves of good slate.

Placer County.

Work was resumed at the *Canada Hill mines* in the eastern part of the county, late in the summer.

Drilling with a Star drill rig was continued at the *Carmack Placer mines*, a mile from Canada Hill, during the past summer. Little progress was made as the work was done by men inexperienced in this class of prospecting.

Considerable good pay gravel has been blocked out in the lower workings of the *Glen Drift mine* in Duncan Canyon since last year's report and the gravel that was washed in the course of driving the adit ahead yielded well. The operating company has been handicapped by lack of funds and has been unable to work the mine to the best advantage.

The prospect adit of the *Gold Dollar Mining Company* at the *Blue Eyes* property on the side of Duncan Canyon has reached a length of 1400 feet and late in October was reported to show heavy boulders in the face.

The dredger of the *Pacific Gold Dredging Company* on the North Fork of American River near Applegate has been taken over by Matt Langstaff, Charles Geisendorfer, Dan Russell and other well-known residents of Placer County. They are working upstream toward the bridge on the Forest Hill road.

The buildings at the *Pine Nut mine* on Duncan Canyon were destroyed by fire during the summer.

Valley View Products Company. The water that issues from copper mines is not generally considered to be of any value except for the copper that may be recovered by precipitation, and miners as a rule avoid contact with it. Two enterprising men, Ed Gaylord and Judge J. B. Landis of Auburn, owners of the old Valley View mine, six miles northwest of Lincoln, have found that the water issuing from the mine gave good results in the external treatment of certain ailments, and numerous local people have testified to marked benefits obtained. The water is said to be helpful especially in cases of skin diseases, infected wounds and poison oak. It is being marketed under the name of Kilaga Water by the Valley View Products Company.

An analysis of the water in its natural strength was made by Smith, Emery and Company and appears below. This water is from a winze in an old tunnel. The lower workings have shown an ore with a low percentage of copper and considerable pyrite and zincblende.

Analysis of water from winze in Valley View mine:

		Parts per million
SiO_2	(Silica)	172.2
Fe	(Iron)	7555.2
Al	(Aluminum)	4362.8
Mn	(Manganese)	16.5
Cu	(Copper)	822.8
Zn	(Zinc)	2806.4
As	(Arsenic)	0.6
Ca	(Calcium)	247.0
Mg	(Magnesium)	1520.3
K	(Potassium)	118.5
H_2SO_4	(Sulphuric acid) as SO_4	48070.3
Volatile and organic matter and water of crystallization		13446.4
Total solids		81139.0

Specific gravity at 60° F., 1.0677.

Plumas County.

Feather Forks Gold Gravel Company at Little Grass Valley, nine miles north of La Porte, has made good progress during the short season of 1922. The property was described in the 1921 report. (See Marguerite mine.)

A sawmill, new hoist and 30-h.p. steam boiler have been installed during the summer. Two small reservoirs have been built to store water for washing gravel, and pipe lines have been built to bring water to the camp.

The gravel channel has now been followed 550 feet (October 27) and there is a total of about 1500 feet of underground workings. The gravel mined during the year is said to have averaged about $8 a yard. The production in June with 12 men was $6,500 and for 1922 to the end of October is placed at $20,000 by E. C. Miles, general manager. The company officials claim in their last report that gravel to the amount of 112,933 cars of 12 cubic feet capacity has been developed, of which about one-third is boulders. The gravel is said to pay in places to a height of 12 feet above bedrock.

To provide ventilation and a second exit, a second shaft 250 feet deep is being sunk 500 feet south of the working shaft. The mine operations are superintended by John and Gilbert McFarlane.

Jamison Mine. The sale of this old producer near Johnsville to the *Plumas Eureka Annex Company* was announced recently. The Jamison has been for many years one of the few producing quartz mines of the county and has a total production probably over $2,000,000. The price paid by the purchasers is said to have been $12,000. The property is valuable on account of its water rights which take in several small lakes nearby. Working cost has always been low on account of cheap water power, owning their own timber, and use of tunnels for drainage. In the past three years the mine has been leased, as the owners concluded they could no longer work it profitably because of the low grade of ore in sight and unsatisfactory labor conditions. There is not claimed to be any important amount of ore left in the mine. There is a heavy flow of water coming from the drain tunnel, which is in poor shape. The purchasers have been doing surface repair work during the summer.

Maxine Mine. The surface plant at this drift mine, which adjoins the Feather Fork property in Little Grass Valley, was destroyed by fire recently and the mine is idle, as winter is too near to permit rebuilding this year. The company is being organized. The mine was described in the 1921 report.

Morington Mine. This property and the plan conceived for working it were described by the writer in the 1920 report, and the question was there raised as to whether or not the plan to be followed could be successful. Since the above report was written, two summers have been spent in attempting to divert the water from the river bed and to prospect and work the gravel in the channel. During the past summer, a crevice at the junction of Willow Creek was prospected but did not produce. One other place was prospected by shaft, but this also was disappointing. The latest report is that the majority stockholders have decided to give up the project. It is estimated that about $160,000 was raised by the sale of stock and expended upon the

property. Some of the minority stockholders believe that the property is worth working by other methods. It is true that the work so far done has not prospected the ground.

Plumas Eureka Mine. The mill at this well-known property at Johnsville has been operated only about two months in 1922. There is claimed to be a good reserve of ore in the Mohawk Flat vein. The recent work on this has been through a raise 534 feet long from the Eureka tunnel and the method of working has proven difficult and it has been hard to keep a crew at work. The Mohawk tunnel, about 1000 feet long, could be cleared out and offers a better entry, it is believed, for exploiting this ore body, which is held to be of sufficient size and value to warrant the work. Chas. D. Stark, Jr., is superintendent.

Plumas Eureka Annex Company has made little progress during the year in developing their claims southeast of the Plumas Eureka mine.

COPPER MINES.

Beardsley Copper Company. The mill on this company's claims was completed this fall and has been waiting for a water supply to begin operations. The property was described in the 1920 report.

Engels Copper Mining Company. A holding company, called the *California Copper Corporation,* has lately been formed to stabilize the control of the stock of this company. The stock of the holding company will be exchanged for shares of a like par value in the Engels Copper Mining Company. It is stated that the holders of a majority of the Engels stock have already signed the agreement for the exchange. J. F. Humburg is president, and I. J. Truman, Jr., is secretary of the new company, and E. E. Paxton, for some years general manager of the Engels concern, is a director.

The mines and mill have continued active on an enlarging scale during the year. No. 10 tunnel is considerably over half finished and it is estimated that it will be completed by June 15, 1923, to the point where a connection will be made with No. 7 level. When the workings are thus connected, it is planned to abandon the tramway used now to deliver from the Engels mine to the mill.

The company has been employing about 550 men the past summer. An average of about 1,000 tons of ore has been milled daily. The report for the first half of 1922 showed a total of over 178,000 dry tons of ore crushed, 11,816 dry tons of concentrate produced, from which 6,763,783 lb. of copper, 98,097 oz. silver and 919 oz. gold were recovered. The May output of copper was 1,270,581 lb. and a low operating cost record of 10.81 cents per lb. exclusive of depreciation, depletion, etc., was claimed. The total operating and development cost was given in the last report as 12½ cents a pound, as compared with 19.58 cents a pound for 1918. Based on the figures published in that report, the company should produce about $2,000,000 this year, and is thus seen to be the largest producer among the mines of the state.

Walker Copper Mine has been operating at the capacity of the mill, about 160 tons a day. Since the 1920 report, in which the writer described the mine and mill, there was temporary cessation of work. Since resumption, the No. 8 or bottom adit has been connected by raise with the upper workings and work is now done through No. 8. The tramway was completed shortly after our 1920 report. This tramway

is nine miles long, connecting with the Western Pacific Railway at Spring Garden. It carries sixty buckets 1500 feet apart and delivers 800 pounds of concentrate every three minutes. An hour and a half is required for the buckets to make the trip one way.

Yuba County.

A. C. Bates Mine is three-quarters of a mile southeast of Brownsville on Dry Creek and contains two parallel claims on parallel ledges 300 feet apart, striking nearly north. On one ledge near the creek a shaft has been sunk 110 feet on the vein with 10 feet of drift at the 100 foot level. This shaft is now nearly full of water. An adit has been driven east 142 feet at a point 250 feet south of the shaft and the owner estimates it has 125 feet to go to reach the second vein. A. C. Bates, the owner, states the walls of syenite and diabase are 11 feet apart in the bottom of the shaft.

Bates has built and is experimenting with a small mill of his own invention which he calls a high speed perpendicular arrastra. It consists of a series of disc drags resting loosely on each other, the bottom muller working on an iron bed. A rotary and rocking motion at the rate of 90 r.p.m. is used. A 3-foot water wheel furnishes power, using water under 40-foot fall from a ditch crossing the claims. He is crushing a few hundred pounds of ore a day from the shaft just above the water level, and claims to be making wages while he perfects the details of his mill. For saving the concentrate, he is using a small concentrating device also of his own invention, employing a series of baffles in a sluice, but not yet perfected to the point of doing good work.

B. A. C. Mine is still in litigation. The latest decision was in favor of E. A. Hoeppner of Brownsville, who spent a large sum in equipping and prospecting the property, without success.

The property is one-half mile north of Brownsville. It has been developed by an incline shaft 535 feet deep on the dip of vein, giving a vertical depth of 332 feet. The vein strikes N.N.W. and dips 34 to 37 degrees east. The following levels and drifts have been run:

No. 1—north 200 feet, south 400 feet
No. 2—north 80 feet, south 440 feet
No. 3—north 20 feet, south 580 feet
No. 4—north 215 feet, south 115 feet
No. 6—north 25 feet, south 50 feet
No. 7—north 90 feet, south 325 feet
No. 8 (from winze)—20 feet

According to an assay map of the mine, a few small areas assayed well, but in general the recorded results are too low to pay, especially in No. 7 level. There is some ore indicated in the upper levels, but whether or not this would be sufficient to pay the expense of reopening the mine and getting it out is a question, the answer to which depends on the condition of the drifts after unwatering and the amount of water to be pumped. A heavy flow of water was encountered in the bottom and was not brought under control when the mine was closed.

The property is equipped with a good 5-stamp mill, tube mill and cyanide plant, planned to handle 50 tons daily. Very little ore from the mine was crushed in it.

Beik Prospect. Wm. Beik of Challenge, and Jos. Supple of Portland, Oregon, owners. This contains 80 acres in Sec. 9, T. 19 N.; R. 7 E.; one-half mile from Woodleaf Beik reports that 50 tons of ore were taken from a hole 20 feet long by 20 feet deep. Thirty tons of this was milled at the Horseshoe mill and according to Beik yielded $305, besides which some gold still remained on the plates when the mill was burned. The vein is said to be 3 feet wide, strikes nearly north and dips vertically. No work is being done now.

Golden Arrow Mining Company. M. A. Miller, president, office in Oakland, Cal. The property was formerly called the *Old Spanish mine* and had an interesting early history, but no definite record is available of the output. It comprises 27 acres in the N.W. ¼ of Sec. 32, T. 19 N.; R. 6 E.; for which patent is being sought by O. N. Pauly.

The old surface workings were about 50 feet deep for about 200 feet on the vein. A new drift is being run on the vein 90 feet below the surface and is now (October 28) 300 feet long. The vein pinches and swells and is up to 3 feet wide.

Horseshoe Mine is a mile and a half northeast of Challenge in the S.W. ¼ of Sec. 21, T. 19 N.; R. 7 E.; and is leased to Jos. Supple of Portland, Oregon.

A crosscut has been run 600 feet to the vein and there is a drift 220 feet north on the vein, which is about 20 inches wide, strikes north and dips west. A depth of about 200 feet below the surface has been reached in the drift. Both walls are hard green schist.

The mill, which had previously been burned down, was rebuilt late in 1921. It contains 5 medium weight stamps and power is furnished by a 25-h.p. steam engine, using wood for fuel. Since it was rebuilt, 37 tons of ore has been milled and is said to have yielded from $3 to $8 a ton, in different small lots. Two men are at work putting up a raise about 20 feet beyond where the adit strikes the vein. This has about 50 feet to go to connect with an old shaft supposed to be 90 feet deep.

Kingbird Mine. This mine, which was briefly described in the 1921 report, has been idle since March, 1922. It is a mile northeast of Clipper Mills.

The mill was operated from December, 1921, to March, 1922, and the tunnel reached a length of 575 feet. Gil Peyton, the former superintendent, departed for the east early in the year and took the original records. According to the foreman, Goken, about 700 tons of ore averaging $7 a ton was milled. Kingbird Mines Company, Lincoln Bldg., Philadelphia, was organized to operate the property but has done no work since March.

Yuba Gold Mining Company. J. N. Sobrero, president, at the mine. C. A. McCumber, secretary, office, 314 Montgomery Street, San Francisco, Cal.

This company has been organized to reopen the old *Hansonville mine,* beside the Marysville-La Porte road, one-quarter of a mile from Rackerby. The old shaft is 220 feet deep, according to such fragmentary information as can be had, with levels at 80 and 140 feet, but the mine has been idle so long that no definite data are available. The vein strikes northeast and dips 45 degrees northwest. Two mills have been burned down on the property, and it has the local reputation of having produced good ore and of always paying its own way. The present

operators claim to have reports showing the mine produced 6100 tons of ore averaging $12 a ton. The men in charge of the work at the mine are experienced miners who have been operating the Jamison mine in Plumas County for several years under lease. They are cleaning out the old shaft.

SAN FRANCISCO FIELD DIVISION.

C. McK. Laizure, Mining Engineer.

Napa County.

Oil Possibilities in Berryessa Valley.

Subsequent to the publication in 1921 of Vander Leck's report on the oil possibilities in the Sacramento Valley (including the eastern slope of the Coast Ranges and foothills of the Sierra Nevadas) as a part of his work on the Petroleum Resources of California, issued as Bulletin No. 89 of the State Mining Bureau, there has been considerable new 'wildcat' drilling started in this northern territory.

So-called 'wildcat' drilling has been an important factor in keeping both the United States and California well in the lead in the production of petroleum in recent years, and the development of prospective new fields in northern California has attracted the attention of the public in growing measure as operations have progressed.

For the purpose of outlining the development work under way, and the results attained to date, by companies that have elected to drill in Napa County, the writer spent several days during October in making a hurried reconnaissance of Berryessa Valley where some seven wells are in process of drilling.

A possible oil-bearing area of Cretaceous formation in northeastern Napa County is shown on the map of California accompanying Bulletin No. 89.

Situated within this formation lies the Berryessa Valley 'wildcat' oil field. The geology of this area of Cretaceous sediments, as a whole, and the factors favorable and unfavorable to the accumulation and production of oil are discussed by Vander Leck in the above bulletin. A generalized cross-section of the area along a northeasterly line passing close to Knoxville and Rumsey, Yolo County, is also given. This line just cuts the northernmost part of Napa County. No features of the geological structure of Berryessa Valley, farther south, in the vicinity of Monticello, are given, and as there was no activity at the time, the discussion of oil indications in the central portion of the valley was limited to the listing of records of wells drilled some twenty years ago. These were the Harris well, 400 feet in depth, in Sec. 29, T. 9 N., R. 3 W.; and the Fearless well in Sec. 26, T. 9 N., R. 3 W., which was drilled to a depth of 1475 feet. Showings of oil were obtained in both these wells.

Berryessa Valley is comparatively isolated and surrounded by high ridges, that on the eastern side forming the boundary between Napa and Yolo counties. This ridge rises abruptly from the valley floor and is composed of upturned Knoxville carbonaceous shales, sandstones, and minor beds of pebbly conglomerate dipping steeply to the east. The formations are cut by the deep canyon of Putah Creek at a point a little south of Monticello, where a large part of the series is exposed to view.

The enclosing ridge on the west is composed of the Franciscan formation. Against this the upturned Knoxville sediments contact.

Encouraged by strong seepages of oil in the Knoxville formation along this contact, and after study of the structural features to determine the most likely points at which oil could accumulate, large acreages throughout the valley were secured by oil operators for the purpose of developing a producing field.

The principal holdings are those of the Griffiths Oil Company and the Associated Oil Company of California, both of which started active development this year.

The Griffiths Oil Company drilled four prospect wells on steeply dipping monoclinal structure in Sec. 29, T. 8 N., R. 3 W., and obtained a high-grade paraffin base oil in a ten-inch hole at a depth of 165 feet. A small pump has been placed on this well.

The Associated Oil Company is drilling, also in section 29, about one-half mile south of the Griffiths discovery well. In their well No. 2, high gravity paraffin oil was obtained in quantity, variously estimated as making from one to ten barrels daily, at 1365 feet. Drilling was continued with three shifts daily, and at present this well is down 1700 feet.

From section 29, the oil-bearing formations penetrated strike about N. 30° W., outcropping at points slightly closer to the Cretaceous-Franciscan contact on the west, as they extend northward.

About three miles north of the discovery well the level floor of Berryessa Valley is much constricted by a series of low rounded hills extending from the base of the Franciscan to the road going to Monticello, and reaching north and south for several miles. This generally elevated portion appears to be made up of one or more transverse folds. On the south, where exposed along the banks of Sugarloaf Creek, the strata show a series of small anticlinal and sinclinal folds with dips east and west of low angle.

A half mile north of Sugarloaf Creek, about where the east line of section 7 would run, there is an outcrop of sandstone and shale dipping northward at a low angle, exposed in a draw. From one-quarter to one-half mile farther north, a bed of fossiliferous limestone is exposed, dipping south at a flat angle. Still farther north, toward 'the island' there are other exposures in small gulches, which substantiate the view that in general the formations in this vicinity form several transverse easterly and westerly folds whose axes are approximately level, modified by minor folding at right angles.

This structure seems to offer advantages in its retentive features, not generally found in the Berryessa Valley field, where steeply dipping monoclinal structure largely prevails; and if there are accumulations of oil, in quantity, in the district, it is extremely probable that a thorough prospecting of the area along these transverse folds by wells of sufficient depth to penetrate the oil-bearing formations will be rewarded by a highly remunerative production.

The Griffiths Oil Company has a complete standard rig capable of drilling to a depth of 5000 feet at their well No. 5 located on this structure in what would be the E. ½ Sec. 7, T. 8 N., R. 3 W.

At present this well is down 2000 feet, at which depth there is some gas coming from the hole. Gas and showings of oil were encountered

above this depth, but the principal oil-bearing formation is not expected to be reached under 3400 feet, and drilling is being continued.

The Sugar Loaf Oil Company's well is being drilled in T. 8 N., R. 3 W., on the east side of Putah Creek slightly north of east from the Griffiths Well No. 5 and about one mile south of the town of Monticello.

Also on the eastern side of the valley, and about six miles north of Monticello, the Wreden Oil Co. of Los Angeles is drilling.

The Napetro Producing Company, controlled by the Humboldt Trading Company, also has a drill in operation in the Berryessa field in Sec. 20, T. 8 N., R. 3 W.

Berryessa Valley proper terminates on the south about opposite the point where Putah Creek turns eastward and cuts its way through the Vaca Ridge. The road south from the valley follows Steel Canyon until the canyon opens out into the smaller Capell Valley near the center of T. 7 N., R. 3 W. The Capell Valley Corporation is drilling here on Section 16. This well is approximately 4½ miles south of the Associated Oil Company's well and the Griffiths discovery well in Berryessa Valley.

Unfortunately the U. S. Geological Survey topographic maps do not include Berryessa Valley, the northern boundary of the Napa quadrangle coinciding with the line between townships 7 and 8 north; neither is there a geological folio covering this territory. A large scale topographic map alone would be of much assistance in gaining a comprehensive view of the relative positions of the various horizons exposed at different points and their bearing on the structural geology.

Although it is probably true that petroleum in 'gusher' quantities is not likely to be found in the Cretaceous formations in California, the oil so far obtained in this formation is a high-gravity paraffin base oil varying in color from amber to light green or white, and much of it resembles a refined product as it comes from the well, more than it does a crude oil.

A matter of particular interest, in connection with the showings of oil in the Berryessa Valley, is the report that the oil contains ichthyol.

This has been substantiated by an analysis of the oil from the Griffiths Oil Company's well No. 1, made by Wrana, King & Co., which showed 3.57 per cent ammonium ichthyol-sulphonate.

Ichthyol, according to Collom (see page 107 *ante*), is employed in pharmaceutical practice as an antiseptic and medicament. When used in an ointment, it is said to have great penetrating qualities.

The scarcity of true ichthyol in the United States has resulted in much research work seeking to extract ichthyol oil from domestic bituminous material. Thus far, true ichthyol has been produced only in Austria, and since the war it has been increasingly difficult to obtain. American-made substitutes, synthetically derived, sell for from $3.50 to $5 per pound. True ichthyol ranges much higher in the New York market. It was quoted and sold at from $12 to $36 per pound during 1916 and 1917.

The development of even a moderately producing oil field in the Sacramento Valley area would be an asset of much value to the northern part of the state.

Locally, in the Berryessa Valley, operations to date show that excellent strides have been made in the short time since activities commenced, and the results so far obtained may well encourage companies drilling here to put forth every effort to prove up their holdings.



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LOS ANGELES FIELD DIVISION.

M. A. NEWMAN, Mining Engineer.

Inyo County.

Pacific Coast Borax Company. The main borax deposits of this company are situated near Ryan, 20 miles northwest of Death Valley Junction. At Death Valley Junction the company has a large crushing and concentrating plant to which 300 tons of second-class ore is shipped per day from the different mines. Ryan is connected by a narrow gauge railway with Death Valley Junction.

The borax occurs both as colemanite and ulexite, the former being the hydrous borate of calcium ($Ca_2B_6O_{11}5H_2O$), while the latter is the hydrous borate of calcium and sodium ($NaCaB_5O_9 8H_2O$).

At the concentrating plant, Stebbins dry concentrators are used to separate the shaly material from the borax with excellent results. The conditions here are ideal for dry concentration as the ore passes through the revolving roasters before being concentrated, thus being absolutely without moisture when it is ready for the Stebbins machines. The company is now building a refinery at Wilmington, California.

It is a pleasure to note that the company has provided excellent housing accommodations for all of its employees and has succeeded in creating a general spirit of contentment at the camp. About 300 men are employed at the mine and mill.

Maj. J. Boyd is superintendent of the mine and F. W. Corkill, mill superintendent.

Paddy Pride Mine. Situated nine miles west of Zabriskie, a station on the Tonopah and Tidewater Railroad.

Shipping at present one car of high grade silver-lead ore per month.

Tecopa Consolidated Mining Company. This company owns silver-lead deposits nine miles southeast of Tecopa, a station on the Tonopah and Tidewater Railroad. It has a 100-ton concentrating plant at Tecopa. Owing to the excellent market for lead today, it is at present increasing its scale of operations.

San Bernardino County.

Allured Copper Mine. This property is situated 12 miles northeast from Cima, a station on the Salt Lake branch of the Union Pacific. It consists of nine claims. There are several veins occurring in a limestone formation. The copper occurs as a carbonate running 20 to 25 per cent copper. Copper sulphides also are found, these running 7 per cent copper. It is stated that this property will soon be developed by Mr. W. A. Allured and associates.

California Rand Silver, Inc. This company has declared dividend No. 34 for 2 cents a share, and special dividend No. 9 for 10 cents a share, the two calling for a distribution of $153,000. This is the sixth extra dividend during 1922, the total dividends to date for the year being 82 cents per share or $1,049,600. The total dividends distributed by the company in the three years of its existence are $1.65½ per share or $2,118,400.

Extraction and Progress.

During the month of October the total extraction from the mine footed up 10,151 tons, distributed as follows:

Milling ore	5,250 tons
Shipping ore	1,166 tons
Waste	3,735 tons
Total output	10,151 tons

Also there was a production of 320,460 gallons of water from shaft No. 2. Within the last few days, however, this water flow has decreased by fifty per cent.

The total advancement for the month was 1,711 feet, as follows:

Raises	110 feet
Crosscuts	154 feet
Drifts	1,290 feet
Shafts	74 feet
Stations	83 feet
Total	1,711 feet

Mill Operations for October.

Total ore milled	4,729	tons
Daily average for 31 days	152.55	tons
Daily average for running time	166.65	tons
Average gold heads	$1 87	
Average silver heads	17 34	
Total value		$19 21
Average gold tails	$0 40	
Average silver tails	1 43	
Total value		$1 83
Average gold extraction	78.60	per cent
Average silver extraction	91.75	per cent
Average total extraction	90.48	per cent
Recovery, per ton		$17 38
Total recovery on 4729 tons		$82,190 02
Average concentrate value, per ton		$319 00
Tons of concentrates produced at $319		257.65
Tons of concentrates shipped to smelter		256.00

By the end of November it is expected that the mill, with its new equipment, will be treating 200 tons of ore daily. But owing to the necessity of rapid marketing of the product, due to the limitations of the Pittman Act, it was decided at the meeting of the board of directors, on November 2, to still further increase the capacity of the mill so as to handle 400 tons of ore daily. Work in that connection will be begun at once under the direction of Mill Superintendent Coleman, with the hope that the new machinery will be in operation by February 1. It is estimated that the cost will be $60,000.

Financial.

During the month 941 tons of ore were shipped to the smelter in addition to the concentrates, and smelter returns totaled $146,785.10.

After paying the dividends named above, the company has cash on hand in the sum of $313,707.06.

California Rock Salt Company. This company is working a deposit of rock salt four miles southeast of Saltus, a station a few miles east of Amboy on the Santa Fe Railroad. The deposit occurs in an old lake bed and is overlaid by about 3 to 4 feet of overburden, consisting of sand and gravel which is removed by scrapers. The salt deposit which is 8 feet thick is then mined, the salt being hauled to Saltus over a narrow-gauge railway for crushing. At present the company is extracting about 1000 tons per month. It is sold mainly to ice cream manufacturers. The company has offices at 2436 Hunter street, Los Angeles, with officers as follows: president, Mrs. Lathrop; manager, Mr. Lathrop; superintendent, M. Staples.

Olympus Gold Mine. This property is situated 22 miles north of Daggett in the Paradise Range at an elevation of 2200 feet. There are several veins in a granite formation that course northwest and southeast, dipping at an angle of about 30 degrees to the northeast. The property is developed by tunnels and incline shafts. The vein varies in width from 5 feet to 25 feet. The company claims there is developed at least 50,000 tons of gold ore which will run approximately $6 per ton.

At the present time a Victory ball mill having a capacity of 50 tons per day is being installed. Mr. M. W. H. Williams and H. Galerone are respectively president and superintendent of the company.

Randsburg Silver Mining Company (Coyote). This company has started to ship its high grade ore and to date five cars have been sent to the Humboldt smelter in Arizona. The ore averages about 100 ounces per ton. It is common knowledge in Randsburg that litigation over apex and extra-lateral rights may be commenced any day by the California Rand Silver, Inc. Yet it is just possible that, as no injunction has been asked for by the California Rand Silver to stop shipments by the Coyote, some understanding has been reached by these two companies to avoid costly lawsuits which would primarily benefit only the various lawyers and geologists who would be retained by both sides.

Silver Bow Mine. This property is situated in the West Calico district about 14 miles north of Daggett, a station on the Santa Fe Railroad.

The vein strikes approximately east and west, dipping at an angle of 30 degrees to the north. It occurs in what may be called a porphyritic rhyolite. An incline shaft has been sunk to a depth of 200 feet on the vein with levels at a depth of 120 and 160 feet, each being about 90 feet in length. The vein averages 4 feet in width, and the owners claim it will run 20 ounces silver per ton. The vein filling consists largely of calcite and the silver mainly occurs both as a chloride and bromide, though also found in lead carbonate and galena which occur in small quantity. The property is owned by W. A. Swan, Ed Reiber, R. Finley and Arthur Kunze of Daggett.

It may be of interest to note that the old Calico Mining District, which is only about three miles south of West Calico, produced about 10,000,000 ounces of silver during its period of activity, 1881 to 1893, when silver averaged $1 per ounce. In 1892, silver dropped to $0.87 and in 1893 to $0.78 per ounce, with the result that only mines having high grade ores could continue to operate.

As an example of the costs and metallurgical losses which prevailed at Calico during its most prosperous period, the following may be illuminating.

The *King Mine* of this district was operated during 1883, 1884, 1885 and 1886. It produced 37,000 tons having a gross value of $1,355,000 or $36.61 per ton. It paid dividends of $450,000 or $12.16 per ton. If the tailing loss amounted to 20 per cent or $7.32 per ton, the cost of mining, milling, haulage and general expense must have been $17.13 per ton. It can readily be seen why those mines which had exhausted their richer ore bodies could not operate when silver dropped to $0.78 in 1893.

The silver status at present is somewhat analogous to that which existed in 1891. Under the Pittman Act, silver is bought by our government at $1 per ounce. This act has but a few more months to run. At its conclusion, the law of supply and demand will regulate the price of silver and we may then expect $0.65 to $0.70 silver. It is therefore a serious question to those opening up silver prospects to know how low grade a silver deposit they may be able to operate upon.

Vanderbilt Mining Company. This company recently acquired the holdings of the Green Campbell Estate, situated at Vanderbilt, five miles east of Ivanpah, a station on the Union Pacific (Salt Lake) Railroad. These properties have been shut down for the last twenty years. The present company has unwatered the mines to the 200-foot level and cleaned out the old drifts and other workings. They claim to have on the 200-foot level one shoot of ore 140 feet long with an average width of nine feet, assaying $23 per ton. Also another shoot that is 400 feet long, 3 feet wide, that will assay $20 per ton. The values are mainly gold. The company proposes to sink the Rose Shaft 150 feet deeper or to the 300-foot level.

The property looks very promising from the development point of view and gives promise of again becoming a large producer. C. C. Barclay, president and general manager; J. J. Hurlburt, vice president; P. V. Hammon, secretary. C. A. Vanderbilt, treasurer. Offices at 715 O. T. Johnson Building, Los Angeles.

OIL FIELD DEVELOPMENT OPERATIONS.

R. E. Collom, State Oil and Gas Supervisor.

From October 7, 1922, to and including November 11, 1922, the following new wells were reported as ready to drill:

Company	Sec	Twp.	Range	Well No.	Field
FRESNO COUNTY:					
Salvia Oil Company	24	20	11	21	Coalinga
KERN COUNTY:					
Pacific Oil Company	35	30	24	105	Elk Hills
Orval Overall and associates	33	25	30	1	Lost Hills
Associated Oil Company	22	3	23	61	Midway
C. C. M. O. Company	26	31	22	26	Midway
Fresno-Taft Oil Company	55	32	23	1	Midway
Honolulu Cons. Oil Company	6	32	24	15	Midway
Midland Oilfields Co., Ltd.	24	31	23	2	Midway
Midway Vivian B. Oil Company	35	32	23	3	Midway
Morse & Reed	2	31	22	1	Midway
Pacific Oil Company	15	32	24	89	Midway
Record Oil Company	28	31	23	6	Midway
Heard & Painter Company	3	11	24	21	Sunset
E. M. Byers	2	27	18	New 1	
LOS ANGELES COUNTY:					
Standard Oil Company	18	3	10	M. C. 95	Coyote Hills
Standard Oil Company	18	3	10	M. C. 96	Coyote Hills
Apex Petroleum Corporation	16	4	12	Morris 1	Long Beach
Bartholomae Oil Syndicate	26	4	12	2	Long Beach
Black Diamond Oil Trust	36	4	12	Murchison 1	Long Beach
F. E. Brittain, Tr.	19	4	12	3	Long Beach
Bush-Voorhis Oil Company	19	4	12	6	Long Beach
Cady & McGee	20	4	12	1	Long Beach
Cal-Mex Oil and Refining Co.	19	4	12	Kirkpatrick 2	Long Beach
Calmont Oil Company	19	4	12	4	Long Beach
Dabney Oil Syndicate	29	4	12	21	Long Beach
Downs-Butterfield Syndicate	19	4	12	1	Long Beach
R. W. Edens	19	4	12	Butler 7	Long Beach
Fred B. Foster & Company	19	4	12	Berry 1	Long Beach
Fred B. Foster & Company	19	4	12	Butler 1	Long Beach
General Petroleum Corporation	19	4	12	Jonah 2	Long Beach
General Petroleum Corporation	20	4	12	Scoco 4	Long Beach
General Petroleum Corporation	20	4	12	Scoco 3	Long Beach
George F. Getty	20	4	12	Malloy 5	Long Beach
H. & T. Syndicate	19	4	12	1	Long Beach
Hagar & Denliston	19	4	12	3	Long Beach
Hagar & Denliston	16	4	12	2	Long Beach
Henderson Petroleum Syndicate	20	4	12	Barry 1-A	Long Beach
Henderson Petroleum Syndicate	26	4	12	Lekas 2	Long Beach
Hub Oil Company	19	4	12	Janich 1	Long Beach
Hub Oil Company	19	4	12	Rissman 1	Long Beach
Industrial Oil Syndicate, No. 2	19	4	12	1	Long Beach
Interstate Oil Corporation	19	4	12	Olson 1	Long Beach
McIntyre Bros.	19	4	12	1	Long Beach
Carl Maier	19	4	12	1-A	Long Beach
Carl Maier	36	4	12	Harris-Maier-Brayton 1	Long Beach
Marine Oil Corporation	19	4	12	5	Long Beach
Monrovia Oil Company	29	4	12	1	Long Beach
Moore-Tobias	19	4	12	Neet 1	Long Beach
Pacific Corporation	20	4	12	16	Long Beach
Pacific Corporation	19	4	12	5	Long Beach
E. A. Pond	24	4	12	1	Long Beach
Petroleum Midway Co., Ltd.	29	4	12	Griswold Two 1	Long Beach
Progressive Burnett Syndicate	30	4	12	2	Long Beach
W. R. Ramsey	29	4	12	1-B	Long Beach
Shell Company	29	4	12	Andrews 4	Long Beach
Shell Company	29	4	12	Hamilton 1	Long Beach
Shell Company	20	4	12	Cosgbom 2	Long Beach
Signal Hill Drilling Company	30	4	12	Benwell 2	Long Beach
Simplex Petroleum Corp.	19	4	12	Garrison Pier 1	Long Beach
Superior Oil Company	29	4	12	Crew 2	Long Beach
Superior Oil Company	19	4	12	Britton 2	Long Beach
Jos. K. Tobin	20	4	12	1	Long Beach
Transport Oil Company	30	4	12	3	Long Beach
Umpire Petroleum Corporation	29	4	12	Grimes 1	Long Beach
Union Oil Company	30	4	12	Long Beach Com. 7	Long Beach
Wellton Oil Syndicate	19	4	12	1	Long Beach

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES CO. (Continued):					
Standard Oil Company	9	4	14	Felker Com. 1	Redondo
Amalgamated Oil Company	5	3	11	Butterworth 5	Santa Fe Springs
Amalgamated Oil Company	6	3	11	Dewenter 2	Santa Fe Springs
Amalgamated Oil Company	6	3	11	Jordan 1	Santa Fe Springs
Amalgamated Oil Company	5	3	11	Butterworth 2-A	Santa Fe Springs
Amalgamated Oil Company	5	3	11	Butterworth 6	Santa Fe Springs
Are Bee Oil Syndicate	7	3	11	1	Santa Fe Springs
Coalinga Mohawk Oil Company	6	3	11	Batson 2	Santa Fe Springs
Co-Operative Petroleum Syn.	7	3	11	1	Santa Fe Springs
Ferdon & Vurpillat Oil Land Syndicate	32	2	11	1	Santa Fe Springs
Fullerton Oil Company	4	3	11	Gum Grove 1	Santa Fe Springs
General Petroleum Corporation	5	3	11	Santa Fe 37	Santa Fe Springs
General Petroleum Corporation	32	2	11	Pacific 1	Santa Fe Springs
George F. Getty	6	3	11	Shafer 6	Santa Fe Springs
George F. Getty	6	3	11	O'Connell 7	Santa Fe Springs
George F. Getty	6	3	11	8	Santa Fe Springs
George F. Getty	6	3	11	9	Santa Fe Springs
Gilbert Petroleum Corporation	7	3	11	1	Santa Fe Springs
Globe Petroleum Corporation	6	3	11	2	Santa Fe Springs
A. L. Irish	5	3	11	1	Santa Fe Springs
Jameson Petroleum Company	6	3	11	6	Santa Fe Springs
Jameson Petroleum Company	6	3	11	5	Santa Fe Springs
C. C. Julian	1	3	12	4	Santa Fe Springs
Kirkpatrick Petroleum Co.	6	3	11	2	Santa Fe Springs
McKeon Drilling Company	6	3	11	Woodard 1	Santa Fe Springs
McKeon Drilling Company	6	3	11	Bossick 1	Santa Fe Springs
Petroleum Midway Co., Ltd.	6	3	11	Mattern Three 1	Santa Fe Springs
Petroleum Midway Co., Ltd.	6	3	11	Mattern Three 2	Santa Fe Springs
Petroleum Midway Co. Ltd.	6	3	11	Patterson 1	Santa Fe Springs
Russel Petroleum Company	1	3	12	1	Santa Fe Springs
Santa Fe Dome Oil Company	5	3	11	1	Santa Fe Springs
Schaff-Noble Oil Syndicate	6	3	11	1-A	Santa Fe Springs
Schaff-Noble Oil Syndicate	6	3	11	2	Santa Fe Springs
Shell Company	31	2	11	GHN Com. 4	Santa Fe Springs
Shell Company	5	3	11	Slayden 1	Santa Fe Springs
Standard Oil Company	31	2	11	Santa Gertrudes 2	Santa Fe Springs
Standard Oil Company	6	3	11	Koontz 1	Santa Fe Springs
Standard Oil Company	5	3	11	So. Whittier Com. 7	Santa Fe Springs
Standard Oil Company	5	3	11	So. Whittier Com. 6	Santa Fe Springs
Union Oil Company	31	2	11	Bell 3-A	Santa Fe Springs
Union Oil Company	6	3	11	Bell 12	Santa Fe Springs
Union Oil Company	6	3	11	Bell 13	Santa Fe Springs
United States Royalties Co.	6	3	11	1	Santa Fe Springs
Whiston & Cox Oil Company	7	3	11	1	Santa Fe Springs
Whitley Oil and Refining Co.	16	2	11	8	Whittier
Artesia Oil Company	25	3	12	1	----------
Calpetro Producing Syndicate	22	3	12	1	----------
J. J. Rekar	18	1	9	1	----------
Ventura Oil Syndicate	25	1	12	1	----------
MERCED COUNTY:					
Henry L. Kims	31	9	9	1	----------
ORANGE COUNTY:					
Huntington Beach Oil and Gas Company of Oregon	2	6	11	1	Huntington Beach
Globe Petroleum Corporation	34	5	11	3	Huntington Beach
Miley Keck Oil Company	2	6	11	31	Huntington Beach
Miley Keck Oil Company	2	6	11	30	Huntington Beach
Miley Keck Oil Company	2	6	11	18	Huntington Beach
Miley Keck Oil Company	2	6	11	20	Huntington Beach
Miley Keck Oil Company	31	5	11	32	Huntington Beach
Olig Crude Oil Company	2	6	11	2	Huntington Beach
Petroleum Midway Co., Ltd.	11	6	11	Brown 1	Huntington Beach
Petroleum Midway Co., Ltd.	2	6	11	Columbia 2	Huntington Beach
Shell Company	34	5	11	Slater 2	Huntington Beach
Standard Oil Company	13	6	11	Surf 1-A	Huntington Beach
Standard Oil Company	34	5	11	Bolsa 12	Huntington Beach
Standard Oil Company	34	5	11	Bolsa 11	Huntington Beach
Standard Oil Company	27	5	11	Orange County Title Co. 1	Huntington Beach
Union Oil Company	34	5	11	Copeland 18	Huntington Beach
Union Oil Company	34	5	11	Brooks 5	Huntington Beach
Union Oil Company	1	6	11	Newland 3	Huntington Beach
Union Oil Company	35	5	11	Copeland 17	Huntington Beach
Union Oil Company	35	5	11	Copeland 13	Huntington Beach
Western Star Oil Company	35	5	11	Savage 1	Huntington Beach
Amalgamated Oil Company	33	3	9	Kammerer 2	Richfield
Union Oil Company	29	3	9	Chapman 15	Richfield
Union Oil Company	29	3	9	Chapman 16	Richfield

Company	Sec.	Twp.	Range	Well No.	Field
RIVERSIDE COUNTY:					
Matthews, Rowland & Dalziel	12	3	4	1	
SAN BENITO COUNTY:					
Hamiltonian Oil Company	19	16	11	1	
SAN BERNARDINO COUNTY:					
Del Rosa Oil and Gas Co.	13	1	14	1	
TEHAMA COUNTY:					
Tehama County Oil Co. and Hooker Dome Oil Company	24	26	4	1	
TULARE COUNTY:					
Big Four Oil Syndicate	29	23	27	1	
Tulare Oil Company	1	20	24	1	
VENTURA COUNTY:					
Fred Norton	2	4	22	1	Ojai
Stearns-Maney Oil Company	28	4	23	1	Ojai
Fortuna Oil Company	13	4	16	15	Piru
Oak Ridge Oil Company	13	3	21	Harvey 10	South Mountain
Santa Paula Oil Company	18	3	20	Santa Paula 13	South Mountain
Associated Oil Company	28	5	23	Lloyd 6	Ventura
Associated Oil Company	28	3	23	Lloyd 7	Ventura
Associated Oil Company	19	3	22	Sexton 1	Ventura
Montecito Oil Producing Co.	13	4	25	1	

SPECIAL ARTICLES.

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff containing much information that will add to the permanent value of the Monthly Chapter are included in each number of 'Mining in California.'

It is anticipated that these special articles will cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations, as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the text of new laws and official regulations and notices affecting the mineral industry.

CALIFORNIA'S MINERAL RESOURCES AND THE STATE MINING BUREAU.

By Fletcher Hamilton, State Mineralogist.

Mining in its broadest sense is the basic industry upon which everything, even including agriculture, depends. Relatively few of us are directly interested in the actual production of mineral substances, and as a result the general public is inclined to accept the idea that questions concerning mining are vital to miners alone. This is a grave mistake. As proof of this assertion, it is interesting to note the following extract from an editorial appearing in the Engineering and Mining Journal of New York under date of October 29, 1921:

> The railroads of the country carry material classified as products of mines amounting to over one-half of the total freight, and this is true even during this period of great depression * * *. During the quarter ending June 30, 1921, out of a total of 222,000,000 tons of freight carried, mineral products constituted 124,000,000 tons * * *. Compare these figures with the freight representing products of agriculture, which amounted to 21,000,000 tons; of animal products nearly 6,000,000; forest products nearly 20,000,000; and of manufacturing and miscellaneous, totaling nearly 42,000,000 tons. This relatively vast tonnage of mineral products goes into a multitude of industries of which it constitutes to a large degree the raw materials, or supplies the energy to turn the wheels of industry either directely or through the medium of electricity.
>
> The proper development of our mineral resources, their wise encouragement, and their sane conservation is a problem second to none in importance for our statesmen to consider.

While mining has been one of California's chief industries since the beginning, it is undoubtedly a fact that the general public has no understanding of the possibilities which still remain in this respect. Comparatively speaking, the mineral land located throughout the length and breadth of the state has hardly begun to be developed, even though the total recorded value of metals and minerals marketed since the early days has amounted to $2,500,000,000. It is a fact that each year the output of materials not heretofore produced is noted, and districts formerly considered barren from a mining standpoint are opened up.

The State of California includes a total area of 158,360 square miles. This area is divided into fifty-eight counties. Minerals of commercial value are mined in every county. In the mountainous regions of the state are found the vein-forming minerals largely. In the desert regions of southeastern California ancient lake beds afford vast supplies of salines. Underlying the interior of the central and southern portions are huge reservoirs of crude oil. Building stones and minor industrial minerals of all descriptions are distributed throughout the length and breadth of the state. California yields commercially a greater number and variety of mineral products than any other state in the Union, and probably more than any other equal area elsewhere on earth.

Fuels. Among the most important products of California are its fuels. This subdivision includes coal, natural gas, and petroleum. Deposits of peat are also known in several localities, none of which have as yet been exploited.

Coal was first mined as early as 1860, and until the development of crude oil, was a large industry. Within the last few years, owing to the increasing price of petroleum products, a renewed interest in this branch of the mineral industry has been noted. According to an estimate of the United States Geological Survey, the total workable area of coal fields in California is about five hundred square miles, and the original content of all fields is about one billion short tons. As the total coal production to the end of 1920 has been only a little more than five million tons, it is evident that the original supply remains almost intact.

Large natural gas fields of great commercial importance have been developed in Kern, Orange, Santa Barbara, Fresno and Los Angeles counties, and the annual production of this fuel is constantly increasing.

The oil production of the state for 1921 amounted to 112,599,860 barrels, valued at $203,138,225. This shows a small increase over similar constant figures which have been recorded for several years past. It is believed that this huge production will continue for many years to come and that any shortage of oil or its products will be due to increased consumption. There is, of course, a natural decrease of production from every individual well as time passes after its completion. The average daily production from California wells decreases about two barrels per well each year. However, this decrease has been and will continue to be offset in the future by the continual drilling of new wells. According to the records of the State Mining Bureau, the total production of petroleum since its discovery in California in 1875 to the end of the year 1921 was 1,456,185,961 barrels, which amount sold for approximately $1,195,979,174.

Metals. The total value of metals produced in California during 1920 was $21,211,079. The chief of these is, and always has been gold, followed in order by copper, silver, quicksilver, lead, zinc, platinum, manganese, and iron. Deposits of ores of nickel and vanadium have also been found in the state, although as yet there has been no commercial output. Among the metals which exist here and which have been produced at intervals in the past may be mentioned antimony, cadmium, molybdenum, tin and tungsten. Gold is widely distributed

throughout California, twenty-nine counties being on the producing list. Although the total output of the yellow metal has amounted to $1,735,922,923, this branch of the mining industry will play an important part for many years to come, because, aside from partly developed mines which are known to contain immense ore reserves, it is a well-known fact that thousands of square miles of possible mineral-bearing land remain practically unexplored.

Copper, which is the second in importance among the metals of the state, occurs in Shasta County; also along the foothills of the Sierra Nevadas; and in many localities throughout the Coast Range Mountains; in what is known as the Eastern Belt, lying mostly in Mono and Inyo counties; and in the Southern Belt, lying in San Bernardino, Riverside and San Diego counties.

Silver is sometimes found alone here, as in the case of the deposits near Randsburg, which are now producing at the rate of about one hundred thousand dollars a month, and it is also commonly associated to a great or less extent with all gold, copper, lead and zinc ores.

Quicksilver has for many years been one of the state's staple products, and California supplies approximately seventy-five per cent of the nation's output of this metal. Total production, according to the bureau's records from 1850 to 1920 inclusive, amounted to 2,188,984 flasks, valued at $106,841,606.

Large deposits of iron ore have long been known in several sections of the state, scattered from Shasta County in the north to Imperial County in the south. For economic reasons, this branch of the mineral industry thus far has remained almost dormant, but our iron ore reserves will undoubtedly play their part in the upbuilding of industry as a whole, at some time in the future when petroleum or maybe gold has passed its zenith and is beginning to decline.

Space will not permit of detailed mention of the possibilities connected with many other metals existing here, but it may be truthfully said that in every case their production on almost any sized scale simply depends upon the demands of the consumer.

Structural Materials. Under the heading of structural materials the Mining Bureau lists asphalt, brick, cement, chromite, granite, lime, magnesite, marble, onyx, sandstone, slate, and miscellaneous stone. As far as it is given for the present generation to foresee, California is independent regarding supplies of these substances, fifty-five counties out of the fifty-eight producing structural materials in 1921. While there is nothing sensational in the outlook for their immediate future, the demand is growing steadily, and increased output has been consistently noted during past years, depending largely on general building conditions and the extent to which highway construction and other similar work is carried on.

A vivid illustration of the *possibilities* connected with the production of minerals in this group may be briefly cited here. Chromite was one of the many 'unimportant' minerals which have been on the bureau's list since 1874. Occasionally a year would pass when no production at all would be reported. The average output for a score of years previous to 1916 was less than one thousand tons annually. After the war had been under way for a couple of years, a sudden shortage of chromite developed, due to the entire cessation of imports

and due to the increased demand for this alloy metal in the manufacture of steel. As a result of this condition, a sudden search was made for chromite, and the output in California jumped from 1500 tons in 1914 to 3700 tons in 1915; 49,000 tons in 1916; 52,000 tons in 1917; and 74,000 tons in 1918. After the signing of the armistice this demand ceased as suddenly as it started, and the 1920 production dropped back to only 1770 tons.

Industrial Materials. Abnormal conditions imposed upon many branches of industry in the United States by the war caused a breakaway from many established trade customs and business habits. Especially has this been true in manufacturing lines which had been entirely or partly dependent upon foreign sources for their supply of industrial minerals. America is still a new country; most industries originated in Europe, and were transplanted here more or less recently. Many foreign raw materials have been easily and cheaply obtainable and have been considered as standard almost by inheritance. Development of similar domestic materials has therefore often been neglected, and as the home product sometimes differs slightly in appearance or texture or composition, it has often been thought of as an inferior article.

A new era has undeniably arrived, however, and during the past five years local raw materials have been used to an ever-increasing extent, as a result of the fact that nothing else was obtainable during the war period. The Pacific Coast is still far removed from many of the principal markets of the United States and the industrial world, but facilities are improving and many markets are thus expanding. The West is even yet a land of opportunity, and as its mineral resources are divulged and the possibilities of their broader development studied, the belief is strengthened that California is due to hold her supreme position indefinitely among the important states in the Union in this regard. The leading industrial minerals thus far exploited, from the standpoint of the annual value of their output, are limestone, mineral water, pyrite, pottery clay and diatomaceous earth. Others on the producing list include asbestos, barite, feldspar, fluorspar, gypsum, pumice, silica and talc. The outlook for these substances and others of similar character is particularly bright.

Salines. Salines produced in California include borax, salt, soda, potash and other alkaline compounds. The principal saline resources of the state are located in the desert regions of Imperial, Inyo, Kern, Los Angeles, San Bernardino and San Luis Obispo counties.

The borax output comes principally from Inyo and Los Angeles counties, although a portion of this production is made from the brine of Searles Lake in San Bernardino County. California is the sole producer of borax in the United States, and the output since 1864, according to the records of the State Mining Bureau, has amounted to 1,273,925 tons, valued in the crude state at $43,859,685.

During recent years potash-bearing minerals of all grades have been produced in California, including refined sulphate from cement dust, kelp ash, potash char from molasses distillery waste and waste water in beet sugar manufacture. The principal tonnage, however, has come from the concentrated salts in the brine of Searles Lake. As in the

case of many other mineral substances, the production of this material depends upon economic conditions, and is almost unlimited so far as the supply of raw material is concerned. During the war the demand for potash was comparable with that of chromite, previously referred to. The value of the potash output in 1914 amounted to $460. Spurred on by the war demand, this increased to $19,000 in 1915; $666,000 in 1916; $4,200,000 in 1917 and $6,800,000 in 1918. These figures have temporarily declined, although the value of the 1921 output was $390,210.

Practically all of the salt produced in California is obtained by evaporating the water of the Pacific Ocean, plants being located on the shores of the San Francisco Bay, Monterey Bay, San Diego Bay and at Long Beach. In addition to the inexhaustible supply of this material present in the ocean waters, there are immense deposits of rock salt known to exist at various localities of the desert portion of San Bernardino County.

Summary of Future Outlook. As has already been mentioned, the production of petroleum from proved oil land should continue for many years with profit to the producers, as well as to the benefit of industries dependent upon oil, and to the state at large. It is almost an assured fact that other oil deposits in California remain to be discovered, and further prospecting under the guidance of qualified geologists should be profitable.

In regard to all other minerals, even including gold, the peak of production is not even in sight, and, while there may be fewer discoveries of bonanza ore in the future than there have been in the past, improved methods of mining and treatment of all classes of crude mineral substances will more than offset the exhaustion of the rich and superficial deposits, which made the state famous two or three generations ago.

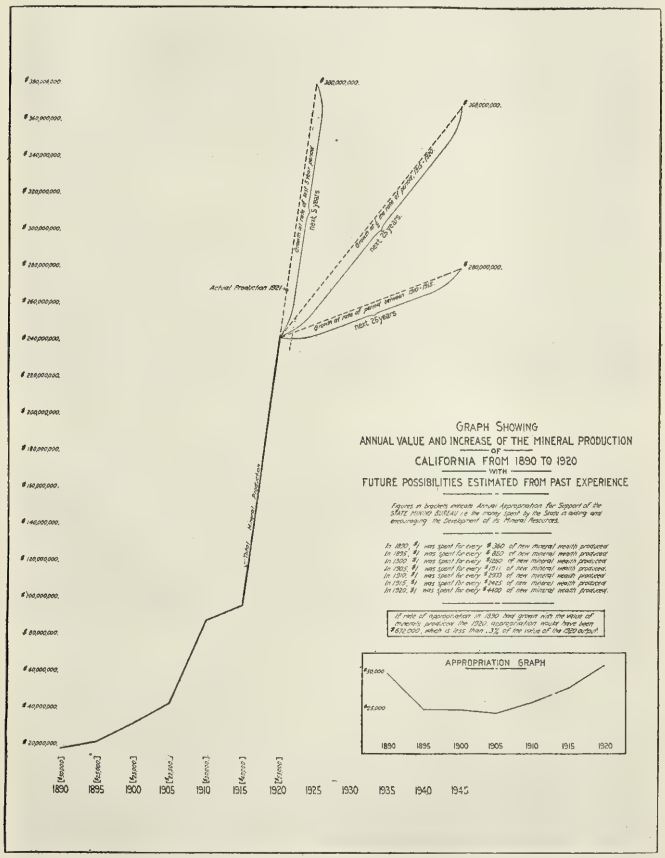
Other features are also working to assist in the upbuilding of the mineral industry as a whole. For example, the new state highway system has already proved to be of considerable aid to many mining districts, particularly in the northern portion of the state where the old roads often became impassable in wet weather, and where, as a result, operations had to be brought to a close for the winter months.

Also, electrometallurgy is gradually replacing processes of treating ores which depend upon various fuels, and as the demand for such products increases, the metallurgist could wish for no better field in which to operate than in the mountainous regions of California, where perpetual streams, offering unlimited power, and mineral deposits are so often side by side.

VALUE OF CALIFORNIA'S MINERAL PRODUCTION.

As will be noted on the accompanying chart (to which the 1921 figures have been added since it was drawn), the value of California's total mineral production has shown a remarkable growth during the past thirty years. In 1890 the figures amounted to slightly over $18,000,000. This has increased at an accelerated rate until in 1921 it had reached the unprecedented figure of $268,157,472.

It is impossible to prophesy what this amount will be in twenty-five years or five years or even one year. However, it is interesting to note the dotted lines which have been placed on the chart representing possibilities, any of which may easily come true. It will be seen that if the



rate of growth of the last five-year period should be maintained until 1925, (and there is no valid reason why this could not be the case), the yearly value of our mineral production would reach the sum of $380,000,000. If the increase is at only one-half the rate of the period from 1915 to 1920, the total figure in another twenty-five years will approximate $368,000,000. If the rate of growth on the other hand drops back to correspond with the period between 1910 and 1915, which, taken as a whole, was a time of overproduction and low prices, the mineral output for 1945 would be valued at $280,000,000 in round numbers. Even though the 1921 figure should never be exceeded and would represent the average for all future years to come, it would be of unquestioned advantage to the state to foster an industry which brings a quarter of a billion dollars worth of new wealth into existence each year. This mineral production accounts for an additional source of taxable wealth and also gives employment and a generous income to thousands of persons who are dependent upon it for their livelihood.

From data furnished by the Industrial Accident Commission, it is estimated that there were employed in the mines, dredgers, quarries, cement and brick plants, approximately 13,000 men during 1921, and approximately 25,000 men in the oil fields exclusive of refineries, making a total of approximately 38,000 men employed in the mineral industries in California last year. The production for the year of $268,157,472 worth of minerals, therefore, represents, in round numbers, an average output of $7,000 for every man employed, or an average of $8,300 per man in the oil fields and $5,000 per man in the other branches.

STATE AID TO MINING IN CALIFORNIA.

The state renders various services to the mineral industry through the medium of the California State Mining Bureau. The work of the bureau is primarily of an economic nature. The organic act under which it operates might be condensed to read "The bureau is created for the purpose of assisting in all possible ways in the development of the state's mineral resources." This sounds like a simple set of instructions; however, a brief consideration of the limiting conditions under which the bureau must function somewhat dispels that illusion. They are:

1. Funds available;
2. Area to be covered and scope of the mineral industry in California.

In regard to the first condition, it may only be remarked that the securing of an appropriation commensurate with the importance of the work in hand depends all too often on considerations other than an unbiased and intelligent understanding of the subject. Work undertaken in good faith and forwarded efficiently and vigorously may be nullified by loss of legislative support at a moment when it is only partly completed. Insufficient funds may render impossible the carrying on of broad investigative campaigns, which would result in bringing millions of dollars into the pockets of the citizens of the state. A bureau of this sort should not only be created and given a field in which to work, but it should receive a consistent allotment. By referring to the chart previously mentioned, it will be noted that the

bureau's appropriation in 1920 was only a fraction more than the appropriation in 1890, and the fluctuations in the funds available during the intervening years were obviously based on no definite program. Even in 1890, $360 worth of new mineral wealth was produced in California for every dollar spent by the state in attempting to aid that production. At that same ratio, which is less than three-tenths of one per cent, the 1920 appropriation would have amounted to approximately $672,000 instead of $55,000! However, while it is true that infinitely more good could be accomplished with more money, and that the amount appropriated annually is ridiculously small compared to the amount the state derives from its mines, oil fields and quarries, the fact remains that only a minority of the people in the state are *directly* interested in mining, and therefore demands made upon the legislature have not been so popular as others which had to do with activities touching larger bodies of our citizens.

Owing to the fact that the allotted funds have been fairly constant (even though small) during the past several years, the bureau has been enabled to gradually evolve a program which, it is believed, has given the public full value received, and has accomplished, at least in some degree, its primary object.

The area to be covered and the scope of the industry in this state have been briefly touched upon in preceding paragraphs.

To assist in the development of the mineral industry, or group of industries indicated, which are scattered over an empire larger than the New England States, New York, New Jersey, Delaware and Ohio put together, the bureau has worked out a plan of action, which will be briefly described as follows:

Work of the Bureau. Bureau headquarters are located in the third floor of the Ferry Building, San Francisco. Here are the offices of the State Mineralogist, executive offices of the mining and oil departments, statistical division, library, museum containing about 18,000 mineral specimens, the laboratory for the free determination of mineral samples, and the drafting room.

The business management of the bureau and the direction of all its works are conducted at the San Francisco office. This office is also a general information bureau open to the public at all times. A large proportion of the time of the State Mineralogist and all the technical staff is taken up in answering inquiries, both written and personal, received from persons who are interested in every conceivable phase of the mineral industry, many of whom live in other states and foreign countries.

Mining Department. Branch offices of the mining department are located in Redding, Shasta County; Auburn, Placer County; and Los Angeles. Each office is in charge of a mining engineer of practical experience, and each district engineer has a definite field to cover. Including the central California district, which is handled from the San Francisco office, the state is thus divided into four distinct fields, in each of which there is a representative of the bureau readily accessible to the local mining public. This representative has his home in his district and his interests are not those of a traveling investigator, but of a citizen of the section in which he lives. He becomes personally

acquainted with the miner and the prospector, a class of men who are often reticent and diffident, and after gaining their confidence, his value to them and to the bureau is greatly enhanced. Remote mines are brought into closer touch with the bureau through the medium of the district engineer. His knowledge of routes of travel and familiarity with local conditions save time and prevent lost motion, and the perspective he gains permits him to evaluate more correctly what he sees and hears. The district engineer has a working program somewhat as follows:

1. He is assigned the duty of preparing formal bulletins upon special subjects which are usually peculiar to some branch of mining in his district. The completion of a report of this kind may require months or even years. It demands exhaustive investigation and often research work.

2. Interwoven with and overlapping the work mentioned under number one comes the careful, constant survey of the field to which the engineer has been assigned. He keeps advised as regards new discoveries, development of all mining properties, and all other details of the industry as far as it is possible to do so.

3. The district engineer is the servant of his local mining public just as the State Mineralogist is the servant of all of the people of the state. This has been mentioned last, but as a matter of fact a call for any assistance that a bureau representative is authorized to render takes precedence over all else. Other work is set aside until such a call has been responded to and cared for to the best of his ability.

Statistical Department. The statistical section keeps an up-to-date list of all owners and operators of mineral deposits and mines in the state. By correspondence and personal visits production data are obtained and published annually. Not only is such information of well-recognized value, but buyers and consumers are being continually referred to producers through the medium of the bureau's records, in a direct and satisfactory manner. By means of an addressograph and other modern office equipment, the vast amount of detail work required to make a recurring statistical inquiry dependable and authentic is efficiently carried on.

Laboratory. In the laboratory free determination is made of specimens sent in from any point in the state. This service is widely used and is of particular value to the man of limited means who may have discovered minerals with which he is not familiar. Instead of being forced to pay to have a sample analyzed, which may very possibly be valueless from a commercial standpoint, he may first be advised by the bureau as to what the possibilities are in this regard.

Library. The library, which is freely available for reference to all, contains approximately five thousand books, most of which are related to mining and engineering, and it also contains a file of local newspapers from most of the mining towns of California, as well as a file of the principal technical magazines published throughout the United States.

Museum. The museum, which has gradually been built up during the past forty years, contains approximately 18,000 specimens of ores, wall rocks and minerals, mostly from California, but in part, from many other states and foreign countries. It ranks among the first five of such collections located in North America.

Situated as it is in the Ferry Building, which is a union depot and gateway to San Francisco for hundreds of thousands of persons daily, the museum attracts a great deal of attention and undoubtedly is a direct aid in developing the mineral industry of the state.

For example: When the call came for chromium and manganese in 1917 the museum was thronged with men who came to scrutinize the minerals containing those metals, so that they would be able to prospect with greater intelligence.

Drafting Room. This is purely and simply a workshop, and is the only branch of the bureau that isn't primarily at the service of the public. In the drafting room are prepared well-logs, maps, sketches, etc., for the many publications and reports which are under way at all times.

NEEDS OF THE MINERAL INDUSTRY.

The mineral industry merits stronger support than it is now receiving from the state government.

As has been pointed out, the undeveloped mineral resources of California offer almost unlimited possibilities.

The State Mining Bureau is doing everything in its power to help turn these possibilities into realities.

Wonderful opportunities to add to the state's wealth and prosperity are offering themselves, many of which cannot be taken advantage of because the funds at hand are insufficient to adequately cover the field.

As an illustration, the situation relative to "industrial minerals" may be briefly cited; similar conditions confront practically every other branch of the mining industry. Eastern manufacturing concerns are coming to California in ever increasing numbers. Some of them have built branch factories here during the past year; others are contemplating such a move, but are not yet thoroughly convinced that their requirements can be fulfilled.

Inquiries are coming to the Mining Bureau by the score from every part of the country, asking for details as to quantity available and quality of raw materials suitable for the manufacture of abrasives, acids, alloys, aluminum, asbestos products, barium compounds, bleaching powders, brick, cement, chalk, chemicals of all kinds, chinaware, clay products, concrete, enamels, ferro-alloys, filters, fertilizers, glass, graphite, insulators, iron, lime, lithium, marble, mica, molybdenum, munitions, paint, paper, pavements, plaster, pottery, pumice, refractories, roofing, sewer pipe, slate, sulphur, talcum, tiling, whiting, zinc compounds, and other products too numerous to mention, all of which are latent in California.

A study of our potential supply of industrial materials offers a most promising field for fruitful endeavor.

Competition may often be close between a California product and one situated elsewhere. Information as to transportation facilities and other economic considerations are often the pivots upon which capital and business will turn toward, or away from, a proposed project. Authentic facts are necessary to attract permanent industries.

The bureau is doing what it can to collect, correlate and publish such facts. Coming from a source known to be authoritative, they carry weight which would not be accorded the statements of a promoter or other private party with selfish interests at stake.

Under present conditions this work can only be done piecemeal, and by slow degrees.

SECRETARY'S OFFICE.

W. W. THAYER, Secretary.

The California State Mining Bureau was created April 16, 1880, by legislative act. In March, 1893, the original act was repealed and an amended act approved and passed by the legislative body. Again on June 16, 1913, a new Mining Bureau Act was approved which became effective August 10, 1913, repealing all former acts, and forming the basic law under which the Bureau now functions.

It is doubtless true that both the mining and lay public have not in the past always recognized the part played by the Bureau in the development of the state's mineral resources. Innumerable inquiries regarding them, originating within and without its borders and in foreign countries, have been answered with ultimate results reflected by a consistent growth in the value of the state's mineral output since the records of production were first compiled by the Bureau in 1887.

This organization has been occupied for 42 years in actively and in all possible ways assisting in the development of California's mineral resources. Its work, whenever possible, is made a matter of permanent record by means of published bulletins and reports. These publications form a cumulative, live and up-to-date history of mining progress in the state. Prospective investors from other states and other lands come to the State Mining Bureau for information as to the location of mineral deposits, the extent and value of their mineral content, and names of owners with whom they may enter into business transactions. Owners and operators—producers of raw materials—who live here come to the Bureau to find out where they may be able to market their output, and to learn whether or not the mineral they have discovered is commercially valuable, and if it meets the requirements of the consumer.

It is believed that a better understanding of the economic position occupied by the Bureau will be imparted to the public, whose funds support it, by embodying in the Monthly Chapter a review of the executive activities.

The responsibility for the coordination of effort of each department, to the end that the utmost efficiency may be maintained with the limited and variable appropriations accorded the Bureau by successive legislatures, rests upon the office of Secretary.

Activities referable to that office, such as reports of new maps and publications issued, amount of mail handled, changes and enlargements in offices, changes in personnel of the staff, property and equipment, financial statements, etc., are therefore included herein.

As a means of illustrating the organization of the Bureau, the accompanying chart is presented on page 630.

The Bureau headquarters are located in the third floor of the Ferry Building, San Francisco. Here are the offices of the State Mineralogist, executive offices of the mining and oil departments, statistical division, library, museum laboratory, and drafting room.

The business management of the Bureau and the direction of all its work are conducted at the San Francisco office. This office is also a general information bureau open to the public at all times. A large proportion of the time of the State Mineralogist and all the technical

staff is taken up answering inquiries, both written and personal, received from people who are interested in every conceivable phase of the mineral industry, many of whom live in other states and foreign countries.

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Branch offices of the mining department are located in Redding, Shasta County; Auburn, Placer County, and Los Angeles. Each office is in charge of a graduate mining engineer of practical experience, and each district engineer has a definite field to cover. Including the Central California district, which is handled from the San Francisco office, the state is thus divided into four distinct fields, in each of which there is a representative of the Bureau readily accessible to the local mining public. This representative has his home in his district, and his interests are not those of a traveling investigator, but a citizen of the section in which he lives. He becomes personally acquainted with the miner and the prospector, a class of men who are often reticent and diffident, and after gaining their confidence his value to them and to the Bureau is greatly enhanced. Remote mines are brought into closer touch with the Bureau through the medium of the district engineer. His knowledge of routes of travel and familiarity with local conditions save time and prevent lost motion, and the perspective he gains permits him to evaluate more correctly what he sees and hears. The district engineer has a working program somewhat as follows:

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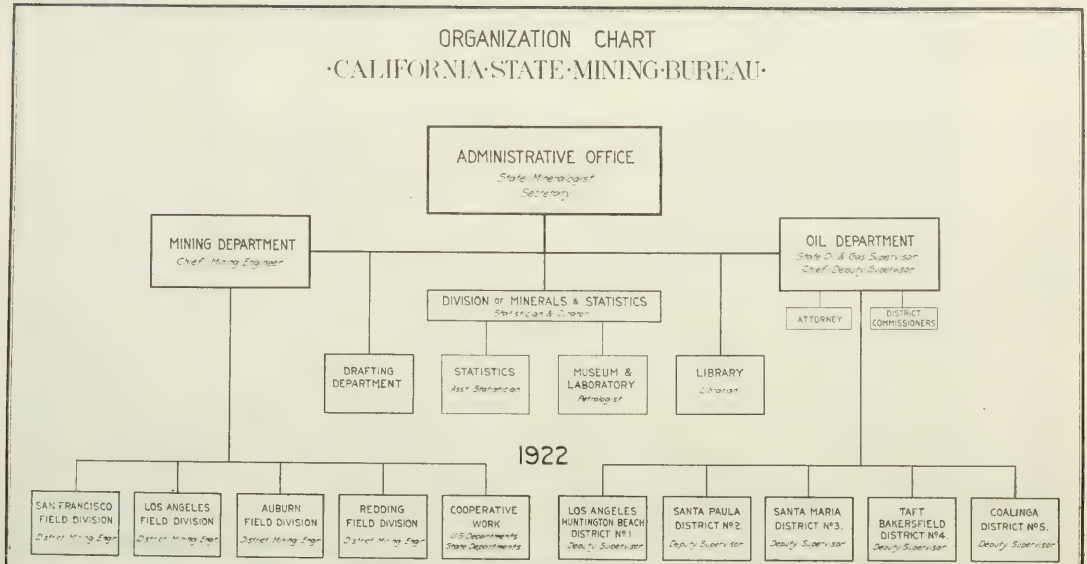
2. Interwoven with and overlapping the work mentioned under number one comes the careful constant survey of the field to which the engineer has been assigned. He keeps advised as regards new discoveries, development of all mining properties, and all other details of the industry as far as it is possible to do so.

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Petroleum Department.

Conservation of the oil and gas resources of California has for over six years been provided for by state supervision. The most obvious and serious cause of waste in California oil fields has been due to waters which flood productive formations; consequently legislation has been aimed directly at that feature.

The department of petroleum and gas was established by law August 9, 1915. Under this law the State Mineralogist is authorized to appoint as oil and gas supervisor an engineer or geologist experienced in the development of petroleum. This office has supervision over the drilling, operation, maintenance and abandonment of oil and gas wells. The staff of the petroleum department is composed entirely of men technically trained as mining engineers, civil engineers or geologists.


ORGANIZATION CHART
·CALIFORNIA·STATE·MINING·BUREAU·
ADMINISTRATIVE OFFICE
State Mineralogist
Secretary
MINING DEPARTMENT
Chief Mining Engineer
OIL DEPARTMENT
State Oil & Gas Supervisor
Chief Deputy Supervisor
DIVISION OF MINERALS & STATISTICS
Statistician & Curator
ATTORNEY
DISTRICT COMMISSIONERS
DRAFTING DEPARTMENT
STATISTICS
Asst Statistician
MUSEUM & LABORATORY
Petrologist
LIBRARY
Librarian
1922
SAN FRANCISCO FIELD DIVISION
District Mining Engr
LOS ANGELES FIELD DIVISION
District Mining Engr
AUBURN FIELD DIVISION
District Mining Engr
REDDING FIELD DIVISION
District Mining Engr
COOPERATIVE WORK
U.S. Departments
State Departments
LOS ANGELES HUNTINGTON BEACH DISTRICT Nº1
Deputy Supervisor
SANTA PAULA DISTRICT Nº2.
Deputy Supervisor
SANTA MARIA DISTRICT Nº3.
Deputy Supervisor
TAFT BAKERSFIELD DISTRICT Nº4.
Deputy Supervisor
COALINGA DISTRICT Nº5.
Deputy Supervisor

For administrative purposes, branch offices of the petroleum department, each in charge of a deputy oil and gas supervisor, are maintained in Coalinga, Bakersfield, Taft, Santa Maria, Santa Paula, Los Angeles and Huntington Beach.

The business of the department concerning oil operations is transacted in the branch offices, between the field representatives of the companies and the deputy supervisor in charge of the district. At each field office there are models, maps, cross-sections, and all the various data used in determining the specifications to be applied to any well.

The department of petroleum and gas is supported financially by assessment levied directly upon oil land and oil and gas produced, and is independent in this regard of the varying appropriations which support the other activities of the Bureau. Up to date the amount expended has been less than one mill per barrel of oil produced. The cost of state supervision, looked at from another angle, has averaged about $40 per well, which has come under the Bureau's supervision. When it is remembered that the average cost of drilling an oil well in California is not less than $40,000, the insignificance of this tax is emphasized.

A detailed description of the operation of the oil and gas law would occupy the space of a small pamphlet, but the records are available for the inspection of any one interested, and it is confidently stated that the general plan of supervision, based upon scientific and technical methods, has unquestionably demonstrated its usefulness and will undoubtedly be retained in California.

Division of Minerals and Statistics.

The statistical section keeps an up-to-date list of all owners and operators of mineral deposits and mines in the state. By correspondence and personal visits, production data are obtained and published annually. Not only is such information of well-recognized value, but buyers and consumers are continually referred to producers through the medium of the Bureau's records, in a direct and satisfactory manner. By means of an addressograph and other modern office equipment, the vast amount of detail work required to make a recurring statistical inquiry dependable and authentic is efficiently carried on.

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The museum, which has gradually been built up during the past forty years, contains approximately 18,000 specimens of ores, wall rocks and minerals, mostly from California, but in part from many other states and foreign countries. Situated as it is in the Ferry Building, which is a union depot and gateway to San Francisco for hundreds of thousands of persons daily, the museum attracts a great deal of attention and undoubtedly is a direct aid in developing the mineral industry of the state.

For example: When the call came for chromium and manganese—in 1917—the museum was thronged with men who came to scrutinize the minerals containing those metals, so that they would be able to prospect with greater intelligence.

Library.

The library, which is freely available to all for reference, contains approximately five thousand books, most of which relate to mining and engineering, and it also contains a file of local newspapers from most of the mining towns of California, as well as a file of the principal technical magazines published throughout the United States.

New Publications.

Summary of Operations—California Oil Fields, July, 1922, Vol. 8, No. 1.
Summary of Operations—California Oil Fields, August, 1922, Vol. 8, No. 2.

Distribution of Publications.

The Bureau's publications are constantly in demand, requests for copies coming from all over the United States and foreign countries.

Publications were distributed during the month as follows:

Publications	Number Distributed
Report XII State Mineralogist	3
Report XIV State Mineralogist	6
Report XV State Mineralogist	2
Report XVII State Mineralogist	5
Mines and Mineral Resources of Colusa, etc.	1
Mines and Mineral Resources of Del Norte, etc.	1
Mines and Mineral Resources of Fresno, etc.	2
Mines and Mineral Resources of Imperial, etc.	4
Mines and Mineral Resources of Alpine, etc.	5
Mines and Mineral Resources of El Dorado, etc.	1
Mines and Mineral Resources of Los Angeles, etc.	5
Mines and Mineral Resources of San Bernardino, etc.	5
Mines and Mineral Resources of Nevada County	5
Mines and Mineral Resources of Plumas County	5
Mines and Mineral Resources of Sierra County	1
Bulletin No. 6, California Gold Mill Practices	3
Bulletin No. 37, Gems, Jewelers' Materials, Ornamental Stones of California	8
Bulletin No. 50, Copper Resources of California (revised)	1
Bulletin No. 72, Geologic Formations of California	16
Bulletin No. 75, Mining Laws—United States and California	30
Bulletin No. 76, Manganese and Chromium in California	2
Bulletin No. 78, Quicksilver Resources of California	3
Bulletin No. 85, Platinum Resources of California	5
Bulletin No. 89, Petroleum Resources of California, with special reference to unproved areas	46
Bulletin No. 90, California Mineral Production for 1920, with County Maps	101
Mining in California (monthly), Vol. 18, No. 7, July, 1922	150
Mining in California (monthly), Vol. 18, No. 8, August, 1922	2750
Summary of Operations, California Oil Fields (monthly)—	
Vol. 8, No. 1, July, 1922	3000
Vol. 8, No. 2, August, 1922	3100
County Maps and Registers of Mines	5
Copper Deposit Map	1
Inyo County Geological Map	3
Minaret Map	1
Tuolumne County Mineral Map	1
Map accompanying Bulletin No. 89	46
Geological Map of California, mounted	9
Oil Field Maps	303

Mails and Files.

The Bureau maintains in addition to its correspondence file a mine report file, which includes reports on some 7500 mines and mineral properties in California. Also, there is available to the public a file of the permits granted to mining and oil corporations by the State Commissioner of Corporations.

During the month 872 letters were received and answered. They are practically all requests for information, and the inquiries cover all phases of prospecting, mining and developing mineral deposits, reduction of crude minerals and marketing of refined products.

Drafting Room.

This is purely and simply a workshop, and is the only branch of the Bureau that is not primarily at the service of the public. In the drafting room well logs, maps, sketches, etc., are prepared for the many publications and reports which are under way at all times.

Changes in Personnel.

The Secretary is authorized by the State Mineralogist to announce the resignation of E. S. Boalich as Chief Mining Engineer of the California State Mining Bureau, who has accepted an appointment as Mine Valuation Engineer in the Bureau of Internal Revenue at Washington, D. C. Mr. Boalich has been on the staff of this Bureau for about six years. Through his resignation the Department has lost a valued employe; one who has always rendered loyal and efficient service.

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Statistician and Curator.

In the two preceding issues of this bulletin (September and October, pages 429-484 and 560-586, *ante*, respectively) are given the completed figures of the mineral production of California for the year 1921, segregated both by economic groups of substances and by counties of origin.

Herein, in the tabulations following, we present the total mineral yield of each county of the state, from the earliest available records to and including the year 1921. In a number of cases, it is known that there was production of specific minerals or metals in years previous to the earliest years shown in these tabulations; but, unfortunately, there are few detailed or accurate records showing county segregations prior to 1894 when compilation of the statistical records of the California State Mining Bureau began. For gold and silver, the published reports of the U. S. Geological Survey and the Director of the Mint give county segregations back to 1880; but, prior to that year, we have only the state total annually. In the case of quicksilver, there are authentic records for all of the important mines, from which the writer has compiled county tables for the early years.

The 'Unapportioned' column is necessitated by the fact that in many cases there is but a single operator or mine producing a given mineral in the county. As it is the bureau's policy not to reveal the individual's private business without his consent, we combine the values of such products under the county where the mineral is taken out.

Year	Brick		Chromite		Pottery clay		Coal		Manganese	
	M.	Value	Tons	Value	Tons	Value	Tons	Value	Tons	Value
1890			[1]397	$534					[1]	
1891			257	344						
1892			--	--						
1893										
1894	7,500	$37,500							468	$4,962
1895	12,000	60,000			--				600	5,400
1896	7,000	35,000							318	3,415
1897	6,500	35,750					21,900	$50,370	504	4,080
1898	7,000	35,000					70,500	176,250	440	2,102
1899	10,000	60,000					80,703	242,109	290	3,090
1900	5,000	40,000					91,731	332,066	130	1,300
1901	9,590	67,130					87,424	262,272	423	4,365
1902	10,000	60,000					67,850	203,550	870	7,140
1903	16,300	82,400					[2]			
1904	16,500	90,000					[3]		60	900
1905	12,000	95,500								
1906	21,345	413,750			10,000	$10,000				
1907	28,770	474,350			12,610	14,299				
1908	1,800	10,800	70	595	16,370	44,822			260	4,680
1909	14,800	140,000	[2]		45,348	205,194				
1910	20,919	195,889	69	552	9,541	63,925				
1911	19,660	153,330	60	500	10,500	8,300				
1912	12,800	133,100							20	360
1913	13,977	122,937			3,000	2,700				
1914	22,668	159,205			5,000	1,000				
1915	14,841	132,765							319	3,652
1916	23,551	315,941	612	7,344	4,060	2,750			562	9,005
1917	and tile	290,033	52	960	6,502	4,524			1,211	30,250
1918		258,812	220	14,600	2,675	3,850			2,746	109,874
1919		369,778	80	1,264	5,011	12,127			[2]	
1920		664,918			3,001	3,762			[2]	
1921		365,853			6,079	7,405			[2]	
Totals		$4,899,741	[1]1,817	$26,693	139,697	$384,658	[4]420,108	$1,266,617	[1]9,221	$194,575

[1]There was some production of chromite, manganese and salt in Alameda County in the years previous to those here shown but the separate county figures are not available.

[2]Includes crushed rock, macadam, ballast, rubble, rip-rap, sand, gravel.

[3]See under "Unapportioned."

COUNTY, 1890-1921.

Pyrites		Salt		Miscellaneous stone[2] value	Miscellaneous and unapportioned		
Tons	Value	Tons	Value		Amount	Value	Substance
		[1]					
		44,450	$125,125	$73,463	1,265 cu. ft.	$1,000	Building stone.
		43,810	114,575	94,372	500 cu. ft.	300	Sandstone.
		55,826	122,810	69 405			
		61,353	139,830	73,300			
		87,890	155,812	73,845	2,000 cu. ft.	750	Sandstone.
		78,434	137,088	66,512			
		64,718	158,674	107,551			
					30 tons	180	Magnesite.
					13,728 lbs.	2,162	Copper.
4,500	$18,000	114,450	324,136	107,201	190 tons	1,100	Magnesite.
					1,500 lbs.	52	Lead.
14,323	53,301	80,000	160,000	182,295	100 tons	500	Magnesite.
21,811	88,500	76,877	143,605	200,702	10,000 tons	15,000	Lime.
15,043	62,992	52,990	76,340	284,181			
15,503	63,958	49,100	54,200	449,029			
14,000	56,000	68,450	126,838	496,482	500 tons	1,750	Glass sand.
16,482	54,410	54,922	163,127	512,607	1,416 tons	14,400	Asphalt.
					11,943 tons	143,376	Asphalt.
13,404	70,782	78,462	108,694	465,653	3 tons	48	Soapstone.
					250 tons	625	Glass sand.
8,105	40,516	104,978	214,808	340,208	18,290 tons	241,475	Asphalt.
						233,033	Unapportioned, 1900-09, inclusive.
10,938	53,170	131,868	285,217	408,591	18,290 tons	197,783	Asphalt.
					40 tons	260	Soapstone.
6,340	31,352	121,540	201,542	404,615			
7,267	29,068	126,211	212,150	420,283			
6,029	24,128	129,318	233,388	456,064	5,000 bbls.	5,000	Lime.
9,829	34,696	126,983	292,641	381,135	50 tons	250	Limestone.
					150 tons	1,500	Magnesite.
11,287	45,148	103,768	220,977	457,381	10 tons	20	Limestone
						1,740	Asbestos, chromite, pottery clay.
16,394	65,110	111,206	263,773	403,587		26,657	Limestone, magnesium chloride, magnesite.
[3]		148,846	315,970	413,845		83,141	Lime, limestone, magnesite, magnesium salts, potash, pyrites.
9,113	45,565	130,132	410,345	311,320		19,169	Asbestos, magnesium salts, potash, limestone.
8,978	42,902	157,751	552,178	309,572		16,864	Magnesium salts, manganese, potash.
10,602	55,251	145,368	574,837	620,758		28,354	Magnesium salts, manganese, mineral paint, potash.
13,449	70,669	108,925	370,296	513,641		25,826	Magnesium salts, manganese, mineral paint, potash.
[2]233,697	$1,005,527	2,658,536	$6,258.976	$8,697,598		$1,062,314	

ALPINE COUNTY, 1880-1921.

Year	Gold	Silver	Copper		Miscellaneous and unapportioned	
			Pounds	Value	Value	Substance
1880	$17,133	$24,146				
1881	2,000	2,100				
1882	20,000	10,000	70,895	$13,115		
1883	10,000	5,000	[1]			
1884	5,000	4,000				
1885						
1896	400					
1897						
1901	23,568	2,860	8,377	1,319		
1902	10,359	3,770				
1903	2,701	146				
1904	4,827	145				
1905	575					
1909					$5,465	Unapportioned, 1900-1909
1913	537	4				
1914						
1919					100	Crushed rock.
					680	Miscellaneous stone.
1920	[2]	[2]			160	Gold and silver.
1921					925	Miscellaneous stone.
Totals	$97,100	$52,171	79,272	$14,434	$7,330	

[1] "Small production of cement copper" reported in 1883, but record does not show exact figures.
[2] Under 'Unapportioned.'

AMADOR

Year	Gold, value	Silver, value	Coal		Copper		Pottery clay		Lime	
			Tons	Value	Pounds	Value	Tons	Value	Barrels	Value
1880	$1,495,053	$1,953								
1881	1,450,000	1,500								
1882	1,500,000									
1883	1,590,000									
1884	2,000,000	2,000								
1885	2,145,591	3,700								
1886	1,874,062	6,136								
1887	1,979,956	2,069								
1888	1,750,000	3,500								
1889	1,560,975	6,398								
1890	1,459,952	9,357								
1891	1,395,962	13,895								
1892	1,210,383	8,008								
1893	1,505,973	5,230								
1894	1,331,916	280	15,280	$23,020			2,500	$3,000		
1895	1,391,929	1,089	21,323	31,985	16,500	$1,650	9,960	10,285		
1896	1,523,351	3,767	19,775	29,662	30,000	3,000	8,413	27,825		
1897	1,324,472	3,477	20,000	25,000			3,492	9,540		
1898	1,806,363	1,742	18,500	29,550	3,000	300	7,197	8,297		
1899	1,544,868	6,902	18,500	23,125			10,700	10,900		
1900	1,373,788	14,915	27,477	41,215	220,000	34,100	11,500	9,100		
1901	1,823,827	7,444	25,000	30,000	52,000	8,190	10,050	7,100		
1902	1,629,151	2,686	5,450	10,912	130,000	14,620	12,723	13,728		
1903	1,609,744	4,336			10,000	900	22,000	19,460		
1904	2,060,574	4,055			14,000	1,400	20,608	10,770	1,700	$1,700
1905	2,445,815	17,930			10,000	1,560	21,775	20,000	1,000	1,500
1906	2,266,373	14,579			8,648	1,069	26,789	28,119	1,000	1,200
1907	2,116,182	13,515			5,300	1,020	12,465	13,992		
1908	1,876,175	13,239			53,940	3,440	23,322	25,369	800	960
1909	2,298,785	16,701			288,472	36,641	33,563	32,724	1,200	1,440
1910	2,646,246	20,916			151,484	14,386	39,446	49,339	1,400	1,680
1911	2,832,395	28,899			227,848	28,481	43,352	37,359	1,200	1,500
1912	2,796,194	32,037			175,608	28,975	35,100	36,856	800	1,040
1913	2,901,898	18,097			19,023	2,949	39,678	38,653	1,000	1,200
1914	3,082,002	17,032	5,700	10,062	5,251	694	32,223	33,114	1,540	2,008
1915	3,894,125	20,409			4,185	732	40,156	38,879	1,000	1,200
1916	3,660,550	18,705	[1]		12,349	3,038	29,246	31,106	[1]	
1917	3,664,164	21,358	[1]		19,352	5,283	[2]28,970	28,625		
1918	3,240,385	29,590	[1]		[1]		13,562	34,346		
1919	2,920,492	33,254	[1]				[1]			
1920	1,788,793	19,780	[1]				25,719	61,808		
1921	2,167,443	35,460					22,124	46,664		
Totals	$86,938,907	$485,940	[1]177,005	$254,531	[1]1,458,960	$193,028	[2]586,633	$686,958	[1]12,640	$15,428

[1]See under 'Unapportioned.'

COUNTY, 1880-1921.

Marble		Brick		Miscellaneous and unapportioned		
Cu. ft.	Value	M.	Value	Amount	Value	Substance
25,941	$35,826					
4,864	6,566					
4,389	5,415					
3,864	6,280					
2,850	3,594					
4,582	7,925					
4,103	5,891				$318,422	Unapportioned, 1900-1909.
2,945	4,630	600	$7,000			
6,300	8,016					
3,074	5,379					
4,785	6,558				750	Glass sand.
2,703	3,950					
				1,000 tons	1,200	Limestone.
				10 tons	1,000	Asbestos.
		2,109	61,369	1,072 lbs.	40	Lead.
				1,000 tons	1,375	Limestone.
				2 tons	200	Asbestos.
		1,429	28,572	41 tons	332	Chromite.
				1,000 tons	1,500	Limestone.
				10,100 tons	10,100	Quartz sand.
		2,000	30,000	11,200 cu. ft.	5,600	Sandstone.
				600 tons	6,000	Soapstone.
		2,000	20,000	90,000 cu. ft.	45,000	Sandstone.
		2,500	25,000	6,000 cu. ft.	3,000	Sandstone.
				700 tons	2,100	Soapstone.
				2,500 cu. ft.	2,500	Sandstone.
				350 tons	2,420	Soapstone.
		2,000	30,000	1,960 tons	3,556	Quartz.
				877 tons	670	Glass sand.
					670	Miscellaneous stone.
					11,237	Other minerals.
				16,888 tons	9,855	Glass sand.
				44 lbs.	2	Lead.
		2,500	50,000	6,250 tons	2,400	Quartz.
				3,960 cu. ft.	1,500	Sandstone.
				610 tons	2,440	Soapstone.
				523 lbs.	25	Lead.
		4,000	80,000	13,339 tons	16,142	Silica.
					1,300	Miscellaneous stone.
					10,950	Other minerals.
				300 tons	3,700	Chromite
				4,341 tons	12,802	Silica.
		[1]		495 tons	2,475	Soapstone.
					1,300	Miscellaneous stone.
		and	Tile		77,752	Brick, coal, lime, manganese, sandstone.
				65 tons	1,420	Chromite.
			95,345	4,771 tons	20,766	Silica.
					1,200	Miscellaneous stone.
					13,033	Coal, lead, manganese, platinum, soapstone, zinc.
				88 tons	4,400	Chromite.
				13,747 tons	61,724	Silica.
			[1]		6,500	Miscellaneous stone.
					66,695	Brick, coal, copper, manganese, mineral paint, platinum, soapstone.
					142,523	Clay and clay products.
			[1]	8,440 tons	67,386	Silica.
					9,953	Coal, manganese, platinum, sandstone, soapstone.
				6,116 tons	36,432	Silica.
			[1]		680	Miscellaneous stone.
					102,707	Brick, coal, mineral paint, platinum, soapstone.
				1,802 tons	20,646	Silica.
			[1]		1,125	Miscellaneous stone.
					97,126	Brick and platinum.
70,400	$100,030		[2]$427,286		$1,147,991	

Year	Diamonds, value	Gold, value	Mineral water		Platinum	
			Gallons	Value	Ounces	Value
1880		$430,501				
1881		650,000				
1882		650,000				
1883		630,000				
1884		680,000				
1885		672,589				
1886		728,160				
1887		632,902				
1888		550,000				
1889		696,628				
1890		268,977				
1891		304,765				
1892		316,999				
1893		307,351				
1894		473,673				
1895		697,261				
1896		749,316	1,900	$775		
1897		667,025	2,160	900		
1898		514,508	2,685	960		
1899		486,846	2,480	1,240		
1900		485,589	15,000	1,515		
1901		864,978	10,400	1,455		
1902		916,782	14,000	1,500		
1903		1,571,507	13,000	1,550	14	$210
1904		1,932,552	12,600	1,512	66	1,000
1905		2,607,500	15,000	1,500	110	1,770
1906		3,016,747	19,500	1,950	26	475
1907		2,786,840	21,400	2,140		
1908		3,139,398	22,450	2,450		
1909		2,987,079	25,400	1,400		
1910		2,487,791				
1911	$150	2,323,396				
1912		2,346,229				
1913	175	2,269,849	1,000	250		
1914	100	1,700,000	1,200	300	119	381
1915	300	1,545,976	5,000	850	126	3,997
1916	357	1,257,231	3,150	1,125	76	3,472
1917	125	922,271	3,500	1,450	119	9,106
1918	125	645,975	3,900	1,680	114	7,723
1919	[2]	378,297	6,532	2,388	33	5,071
1920	400	467,900	6,400	5,200	fine oz. 42	4,714
1921	331	456,760	2,900	4,100	31	2,432
Totals	[2]$2,063	$28,218,128	322,657	$38,130	876	$43,781

[1]Includes crushed rock, rubble, rip-rap, sand, gravel.
[2]See under 'Unapportioned'.

COUNTY, 1880-1921.

Silver, value	Miscellaneous stone[1], value	Miscellaneous and unapportioned		
		Amount	Value	Substance
$1,247				
1,000				
3,700				
13				
6				
500				
518				
5,815				
229				
610				
5,504				
8,936				
5,390				
7,885		700 M.	$4,200	Brick.
9,317		250 M.	1,500	Brick.
		150 tons	3,000	Mineral paint.
5,009		300 M.	1,800	Brick.
		900 tons	9,900	Mineral paint.
13,082		600 bbls.	600	Lime.
4,634		900 M.	7,200	Brick.
		1,500 bbls.	1,500	Lime.
2,219		800 M.	5,000	Brick.
		400 bbls.	750	Lime.
		1,200 M.	7,200	Brick.
358		250 bbls.	250	Lime.
		190 tons.	250	Limestone.
2,302		670 M.	4,020	Brick.
7,134		400 M.	3,200	Brick.
10,853		130 M.	1,300	Brick.
8,967				
12,708	$7,916			
7,205		200 M.	1,200	Brick.
	32,140		107,170	Unapportioned, 1900-1909.
6,429	34,932	645 lbs.	27	Lead.
5,102	78,208			
5,567	51,879			
5,163	258,503			
4,000	50,895	513 lbs.	20	Lead.
		90 lbs.	4	Lead.
3,433	67,143		540	Chromite.
		11 lbs.	2	Copper.
3,332	67,892	1,451 tons	13,940	Chromite.
			9,576	Other minerals.
		5,746 tons	104,085	Chromite.
2,991	89,870	378 lbs.	32	Lead.
			329	Copper, manganese, natural gas.
2,410	77,822	3,325 tons	134,535	Chromite.
			2,765	Manganese and natural gas.
1,911	92,765		1,105	Gems and natural gas.
2,253	[2]		161,095	Natural gas and miscellaneous stone.
1,759	203,900		548	Other minerals.
$169,491	[2]$1,113,865		$588,643	

CALAVERAS

Year	Gold, value	Silver, value	Copper		Mineral paint (ochre)		Clay	
			Pounds	Value	Tons	Value	Tons	Value
1880	$320,865	$643	[1]					
1881	800,000	1,200						
1882	670,000							
1883	500,000							
1884	485,000							
1885	527,538	2,558						
1886	639,457	4,926						
1887	640,417	1,477						
1888	580,000	1,500						
1889	592,243	1,071						
1890	618,821	2,499						
1891	738,883	4,860						
1892	794,531	24,441						
1893	1,669,192	122						
1894	2,119,365	5,183	654,866	$64,951	115	$2,530		
1895	1,717,916	77	175,895	16,925				
1896	1,546,398	500	87,557	8,990				
1897	1,439,861	1,745			150	2,400		
1898	1,019,023	3,462	18,400	2,052	100	225		
1899	1,265,564	9,813	165,484	27,586				
1900	1,649,126	80,702	980,934	150,585	400	3,800		
1901	2,024,685	44,687	1,701,389	263,000	125	500		
1902	2,072,939	46,234	2,087,501	251,062	259	778		
1903	1,904,125	68,280	2,246,075	297,263	200	1,000		
1904	1,789,184	65,611	2,592,124	414,399	70	385	100	$100
1905	1,836,816	78,859	3,666,810	572,022	379	1,900	40	300
1906	1,644,234	74,099	5,082,320	956,315			50	250
1907	1,097,974	54,420	3,941,883	609,203				
1908	1,378,511	62,727	4,804,446	555,704	50	250	25	250
1909	1,440,511	71,418	5,438,908	690 632			100	500
1910	1,147,705	82 866	7,345,321	778,369			30	250
1911	1,112,315	67,032	6,190,153	773,769			50	200
1912	962,145	70,748	6,125,415	1,010,693			4,281	4,431
1913	1,175,208	61,076	5,063,187	784,794	28	190	2,000	4,500
1914	1,336,875	60,442	4,468,998	594,377			280	280
1915	1,391,134	53,298	4,031,149	705,451	[2]			
1916	1,356,120	83,643	6,099,509	1,500,479				
1917	1,471,442	87,984	7,720,861	2,107,795	[2]			
1918	871,263	84,150	6,762,882	1,670,432				
1919	1,550,574	35,876	2,049,330	381,175				
1920	1,439,745	16,701	2,112,186	388,642				
1921	1,495,758	10,232	[2]					
Totals	$50,833,463	$1,427,222	[2]91,614,183	$15,581,665	[2]1,876	$13,958	6,956	$11,061

[1]The Union Mine at Copperopolis was a producer as early as 1861, but there are no detailed, annual figures available for Calaveras County earlier than here shown.
[2]See under 'Unapportioned'.

COUNTY, 1880-1921.

Mineral water		Limestone		Quartz crystals, value	Miscellaneous and unapportioned		
Gallons	Value	Tons	Value		Amount	Value	Substance
				$18,000	717 tons	$3,583	Pyrites.
				17,500			
					3,500 bbls.	5,500	Lime.
					25 tons	375	Chromite.
		3,087	$15,430	10,000	20 tons	300	Chromite.
		3,994	7,635		40 tons	280	Chromite.
					13.9 ozs.	250	Platinum.
		6,872	16,955	10,000			
		14,165	31,446	10,000			
		4,590	11,987			$50,075	Unapportioned, 1900-1909.
		6,283	16,976				
10,000	$5,000	3,943	11,733		220 lbs.	10	Lead.
7,528	3,764						
					2,500 lbs.	25	Graphite.
11,500	5,500	2,000	1,400		7,006 lbs.	308	Lead.
						9,300	Other minerals.
					650 tons	4,550	Chromite.
15,508	6,517				290 tons	2,618	Fuller's earth.
					30 lbs.	1	Lead.
					9 ozs.	294	Platinum.
					163 lbs.	8	Lead.
15,343	5,752					1,900	Miscellaneous stone.
						4,350	Asbestos, fuller's earth, mineral paint, platinum, silica.
					1,636 tons	12,570	Chromite.
					7,238 lbs.	499	Lead.
18,255	7,025				54 ozs.	2,453	Platinum.
						2,503	Miscellaneous stone.
						300	Other minerals.
					1,613 tons	34,245	Chromite.
					6,395 lbs.	550	Lead.
16,985	7,009				20 ozs.	1,433	Platinum.
						2,700	Miscellaneous stone.
						3,992	Clay, fuller's earth, mineral paint, silica, zinc.
					3,830 tons	159,453	Chromite.
10,938	6,069				10 ozs.	598	Platinum.
						420	Miscellaneous stone.
						2,067	Asbestos and lead.
					2,019 lbs.	107	Lead.
4,384	1,034				8 ozs.	1,076	Platinum.
						600	Miscellaneous stone.
						8,116	Other minerals.
					20 fine ozs.	2,002	Platinum.
5,120	512			[3]		2,400	Miscellaneous stone.
						30,048	Quartz crystals and lead.
					12 fine ozs.	876	Platinum.
2,809	791					17,527	Miscellaneous stone.
						17	Copper and lead.
118,370	$48,973	44,934	$119,062	[2]$65,500		$365,374	

COLUSA

Year	Gold and silver, value	Quicksilver		Sandstone	
		Flasks	Value	Cubic feet	Value
1875		700	$58,905		
1876		407	17,908		
1877		466	17,382		
1878					
1879					
1880	[2]$4,908				
1881	3,500				
1882	2,575				
1883	1,000				
1884	1,530				
1885	45,000				
1886	11,617				
1887	7,461				
1888	6,000				
1889	13,626				
1890	2,810				
1891					
1892					
1893	300				
1894				20,000	$7,500
1895		1	40		
1896		58	2,054		
1897		43	1,510		
1898					
1899					
1900		275	12,359		
1901	1,800	235	10,575	88,931	80,082
1902	850	605	26,500	99,395	87,456
1903		510	21,708	146,828	312,500
1904		[3]400	16,526	100,000	290,000
1905		326	12,321	118,954	276,908
1906				88,821	101,802
1907	742	17	648	86,954	78,259
1908	584	21	900	73,284	43,971
1909	[4]	11	545	47,070	24,634
1910	[4]			112,947	56,505
1911	[5]3,118	5	230	101,029	50,027
1912				51,137	15,804
1913				34,927	15,550
1914				16,000	$7,300
1915					
1916		285	26,648	[6]	
1917					
1918					
1919					
1920					
1921					
Totals	[6]$107,421	4,365	$226,359	[6]$1,186,327	$1,448,298

[1]Includes crushed rock, rubble, rip-rap, sand, gravel.
[2]1880 to 1890, U. S. Mint reports.
[3]Flasks of 75 pounds since 1904; previously 76½ pounds.
[4]Included with Lassen County production.
[5]Includes Lassen County production.
[6]See under 'Unapportioned.'

COUNTY, 1875-1921.

Mineral water		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Gallons	Value		Amount	Value	Substance
			40 tons	$400	Salt.
50,090	$12,530				
31,500	1,620		8 tons	160	Salt.
21,000	1,050		21 tons	429	Salt.
5,000	1,120		20 tons	300	Salt.
53,500	12,350		20 tons	80	Salt.
92,200	20,220		18 tons	270	Salt.
			270 M.	2,160	Brick.
142,305	79,698		18 tons	396	Salt.
174,000	85,900		18 tons	360	Salt.
156,170	38,051	$1,250	18 tons	180	Salt.
			300 M.	1,800	Brick.
160,000	80,000		18 tons	225	Salt.
197,375	49,344		150 tons	1,700	Salt.
254,075	51,233	3,500	16 tons	240	Salt.
200,000	88,000	850	10 tons	125	Salt.
150,000	75,000	620		104,508	Unapportioned, 1900-1909.
150,000	75,000	16,500			
126,300	68,150	16,702		1,596	Unapportioned.
165,330	39,061	15,300			
132,720	32,931				
92,000	24,951				
91,480	15,003	$1,000			
[2]		550		15,605	Mineral paint, mineral water, sandstone.
[2]		600		15,721	Mineral paint and mineral water.
[2]		700		15,700	Chromite, mineral paint, mineral water.
		4,900		2,400	Other minerals.
		57,488			
		80,000		438	Other minerals.
[3]$2,445,045	$851,212	$199,960		$164,803	

CONTRA COSTA

Year	Brick		Coal*		Lime	
	M.	Value	Tons	Value	Barrels	Value
1894			35,000	$94,000		
1895			48,635	139,655		
1896	150	$4,500	44,892	118,709		
1897			39,267	105,180		
1898	5,000	25,000	47,000	113,340		
1899			53,013	131,613		
1900			51,248	145,000		
1901			35,000	100,000		
1902	800	11,600	13,960	31,160		
1903	2,600	16,000			5,300	$4,500
1904	9,385	67,495			12,187	10,359
1905	10,979	73,948			20,244	13,925
1906	23,267	169,022				
1907	48,573	403,564			1,413	1,413
1908	55,844	335,737				
1909	41,033	268,122			14,062	15,468
1910	30,284	199,079			17,338	14,750
1911	36,463	271,575			11,872	8,645
1912	32,621	283,718			14,870	12,640
1913	30,411	212,953			150,551	127,968
1914	16,064	129,543	67	268	5,666	4,724
1915	14,915	139,862	[2]			
1916	16,672	148,730	[2]			
1917	and tile	172,653	[2]			
1918	and tile	148,831				
1919		[2]				
1920	13,608	312,398				
1921		[2]				
Totals		[3]$3,394,330	[3]368,082	$978,925	253,503	$214,392

[1]Includes crushed rock, rubble, rip-rap, sand, gravel.
[2]See under 'Unapportioned.'
[3]Estimated.
*Coal mining began in the Mount Diablo section of Contra Costa County at least as early as 1861, but there are no segregated county figures available earlier than those here shown. For 1867-1882 (inc.), there are records which indicate for the Mount Diablo field a total of approximately 2,500,000 tons, valued at $14,300,000.

COUNTY, 1894-1921.

Limestone		Mineral water		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Tons	Value	Gallons	Value		Amount	Value	Substance
		7,600	$3,700	$9,000	1,400 tons	$2,200	Pottery clay.
		5,000	1,200				
		9,300	3,100				
		10,000	3,500				
		12,000	1,900				
		12,000	1,900				
		31,200	8,736		31,700 lbs.	3,645	Copper.
18,000	$22,500	78,000	19,500				
		78,000	19,000	23,060			
34,800	43,500	[2]		76,120			
				75,025			
22,038	43,038			210,350	2,057 tons	21,870	Asphalt.
9,140	18,282	109,400	5,470	236,047	9,500 tons	123,500	Asphalt.
					6,000 tons	7,500	Pottery clay.
22,556	42,837	199,800	10,590	233,782	17,085 tons	222,105	Asphalt.
						683,392	Unapportioned, 1900-1909.
22,912	37,064	2,500	375	235,655			
68,708	46,208	206,500	10,325	257,503			
25,879	45,291	200,000	10,000	478,102			
26,259	34,976	192,292	4,989	660,405		921,349	Other minerals.
32,657	43,661	364,288	3,643	308,727		658,755	Other minerals.
11,989	14,565	[3]350,000	4,000	397,330		757,748	Asbestos, cement, coal.
[2]		351,724	6,154	363,753		760,423	Cement, clay, coal, limestone.
		436,265	8,563	322,507		772,934	Cement and coal.
		30,376	3,038	324,884	100 tons	300	Pottery clay.
						847,198	Cement and copper.
		[2]		275,309		193,340	Clay and clay products.
						926,909	Cement and mineral water.
				432,654	1,743 tons	3,319	Pottery clay.
						1,333,682	Cement and mineral water.
		600,300	6,099	415,127		198,248	Clay and clay products.
						1,003,258	Other minerals.
[2]294,938	$391,922	[3]3,286,545	$135,782	$5,335,300		$9,441,675	

DEL NORTE COUNTY, 1883-1921.

Year	Gold, value	Silver, value	Platinum		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
			Ounces	Value		Amount	Value	Substance
1880	$215,403	$300						[2]
1881	60,000							
1882	80,000							
1883	135,000							
1884	100,000							
1885	29,390	9						
1886	76,189							
1887								
1888								
1889	21,800							
1890	900							
1891	5,586							
1892	4,102							
1893	10,352							
1894	8,000							
1895	8,250							
1896	24,150							
1897	16,710							
1898	9,057							
1899	4,450							
1900	3,483							
1901	10,612							
1902	5,450							
1903	7,183							
1904	7,399		1.5	$18				
1905	10,590		1.5	22				
1906	5,945	33						
1907	878	3						
1908	3,488	19				74,787 lbs.	$9,984	Copper.
1909	1,610	52				24,449 lbs.	13,085	Copper.
							20,000	Unapportioned, 1900-09.
1910	2,388	62				26,670 lbs.	3,395	Copper.
1911	1,743	7						
1912	3,940	10						
1913	2,498	16						
1914	2,035	9	14	643	$3,250			
1915	1,018	6			3,500			
1916	405	2	2	73	1,685		267	Chromite and copper.
1917	1,373	8	10	853	2,700	3,275 tons	97,255	Chromite.
							2,151	Other minerals.
1918	565	4	1	97	8,000	7,143 tons	360,485	Chromite.
							2,584	Other minerals.
1919	867	6			6,300		67	Other minerals.
1920					9,000		2,781	Chromite and copper.
1921	[3]	[3]	[3]		5,580		449	Gold, platinum, silver.
Totals	[3]$892,899	[3]$546	[3]30	$1,706	$40,015		$509,503	

[1]Includes crushed rock, rubble, rip-rap, sand, gravel.
[2]Gold and chromite were produced in Del Norte County earlier than the years shown, but the amounts are not separable by counties.
[3]See under 'Unapportioned.'

EL DORADO

Year	Gold, value	Silver, value	Copper		Lime	
			Pounds	Value	Barrels	Value
1880	$389,383	$208				
1881	550,000	900				
1882	660,000					
1883	530,000					
1884	575,000	16,000				
1885	35,000					
1886	619,992	1,822				
1887	706,871	365				
1888	650,000	500				
1889	427,638	408				
1890	204,583	275				
1891	173,279	359				
1892	198,321					
1893	294,610	1,220				
1894	366,707	356			10,000	$8,000
1895	700,101	448			28,500	28,500
1896	812,289	534			4,413	4,158
1897	674,626	886			13,500	6,750
1898	501,966	4,174			3,360	3,360
1899	404,497	8,414			7,935	7,935
1900	368,541	25,129	3,125	$500	7,500	6,000
1901	292,036	5,977			11,000	11,000
1902	335,031	52	2,128	319	24,599	16,176
1903	277,304				5,600	7,000
1904	474,994				12,864	7,075
1905	384,735	2,525	160,000	24,960	9,260	6,946
1906	431,746	2,690			19,217	21,138
1907	319,177	2,301		122		16,198
1908	342,033	5,504	603	83	15,921	20,192
1909	238,284	1,299			13,828	14,591
1910	171,304	967			11,300	9,944
1911	133,967	1,010			15,086	12,309
1912	105,565	843			14,023	11,218
1913	62,688	250	693	107		
1914	133,886	654			14,000	12,082
1915	401,288	1,353	417	73	15,911	12,872
1916	361,821	1,496	[3]		[3]	
1917	24,758	85	18,982	5,182	[3]	
1918	28,352	722	22,259	5,498		
1919	30,121	279				
1920	13,379	155				
1921	34,109	301				
Totals	$14,379,992	$90,669	[2]208,207	$36,844	[2]257,817	$243,444

[1]In addition to the segregated figures herein given, a large tonnage of limestone is annually shipped from El Dorado County for use in cement manufacture, and whose value is included in the state total for cement.
[2]Includes crushed rock, rubble, rip-rap, sand, gravel.
[3]See under 'Unapportioned.'

COUNTY, 1880-1921.

Limestone		Slate		Miscellaneous stone[2], value	Miscellaneous and unapportioned.		
Tons	Value	Squares	Value		Amount	Value	Substance
[1]							
		1,800	$11,700				
		1,350	9,450				
		500	2,500				
500	$250	400	2,800				
		400	2,800				
		600	4,500				
		3,500	26,250			$251,820	Unapportioned, 1900-09.
		5,100	38,250				
		4,000	30,000				
		6,000	50,000		10 tons	162	Asbestos.
1,050	5,775	4,000	40,000		112 tons	2,625	Asbestos.
		10,000	100,000		20 tons	1,000	Asbestos.
	15,318	7,000	60,000				
		6,000	50,000	$1,600	200 M.	3,000	Paving blocks.
		6,961	45,660	530	3,763 tons	5,645	Sand (glass).
		1,000	8,000	2,616	1,200 tons	1,800	Sand (glass).
1,000	1,000			5,465	3,701 lbs.	167	Lead.
				4,375			
				4,678			
				2,600	90 lbs.	4	Lead.
		[1]		7,500		5,250	Slate and soapstone.
					5,260 tons	72,560	Chromite.
[1]				12,000		19,613	Lime and limestone.
					886 tons	1,717	Silica.
						1,480	Copper and soapstone.
					8,319 tons	167,950	Chromite.
[1]				6,200		104,851	Lime and limestone.
					2,684 tons	4,506	Silica.
						70	Other minerals.
96,673	218,120			20,500	11,936 tons	674,856	Chromite.
						11,236	Pyrites, silica, soapstone
					378 tons	6,510	Chromite.
41,025	112,423			1,700	1,600 tons	13,950	Soapstone and talc.
						1,169	Other minerals.
41,109	139,873			5,500	2,640 tons	18,200	Soapstone.
						9,325	Other minerals.
15,296	66,143			2,750	1,652 tons	9,453	Talc.
	[3]$588,902	[3]58,611	$481,910	$68,014		$1,393,919	

FRESNO

Year	Gold, value	Silver, value	Copper		Petroleum		Brick		Miscellaneous stone[1], value
			Pounds	Value	Barrels	Value	M.	Value	
1880	$143,433								
1881	90,000								
1882	80,000								
1883	100,000								
1884	80,000								
1885	74,500	$2,456							
1886	151,186	2,701							
1887	205,242	274							
1888	200,000	2,800							
1889	185,988	4,629							
1890	49,951	1,816							
1891	82,607	10,396							
1892	[2]112,981	[2]6							
1893	7,118								
1894	8,202								
1895	47,249								
1896	28,235	100			14,119	$56,750			
1897	43,144				70,140	70,840			
1898	27,557				154,000	154,000	2,500	$18,000	
1899	18,142				439,372	439,372	5,500	38,500	
1900	27,346	479			547,900	547,900	4,250	35,062	
1901	21,462		1 159,672	$182,648	525,433	236,444	5,000	35,000	
1902	54,427		3,000,000	345,000	571,233	199,931	6,000	45,000	
1903	21,538	111			2,214,160	730,673	8,000	68,000	$11,038
1904	7,809	4	2,500	319	5,114,958	1,520,847	4,800	32,400	
1905	40,037	9,187	1,440,000	224,640	8,890,000	2,400,300	9,000	60,000	
1906	8,493	83	440,000	88,000	8,402,000	1,974,470	8,000	64,000	
1907	2,401	26	250,000	50,000	9,050,300	3,620,120	9,250	57,350	10,500
1908	1,054	11			10,725,389	5,898,964	13,220	100,960	16,900
1909	17,539	8,503	876,837	111,341	15,406,619	9,243,971	7,950	49,375	28,400
1910	3,373	2,980	486,725	61,999	18,651 470	9,277,241	9,533	76,267	58,089
1911	17,441	81			19,499,611	9,344,085	4,500	28,500	318,911
1912	6,094	23			19,510,932	8,487,255	5,000	40,000	307,158
1913	2,846	15			18,956,965	7,927,736	5,500	44,000	416,437
1914	10,231	31			15,952,190	7,210,389	4,500	36,000	237,963
1915	4,151	246	65,903	11,533	14,021,025	7,641,459	4,750	33,250	193,705
1916	693	69	29,173	7,177	14,594,246	7,530,631	[3]		95,830
1917	5,745	289	40,662	11,101	16,259,797	13,414,333	[3]		136,719
1918	4,795	37			16,068,919	19,138,083	and tile	89,156	244,647
1919	5,540	67			16,091,037	20,805,711	[3]		241,213
1920	7,793	227			15,375,454	22,801,798	12,517	196,756	535,587
1921	13,085	75			12,161,565	18,643,679	[3]		486,057
Totals	$2,014,428	$47,722	7,791,472	$1,093,758	259,268,894	$179,317,042		[3]$1,153,576	$3,339,154

[1]Includes crushed rock, rubble, rip-rap, sand, gravel.
[2]To end of 1892, includes Madera County, which was created March 11, 1893.
[3]See under 'Unapportioned'.

COUNTY, 1880-1921.

Mineral water		Magnesite		Natural gas		Miscellaneous and unapportioned		
Gallons	Value	Tons	Value	M. Cu. Ft.	Value	Amount	Value	Substance
						216 tons	$700	Coal.
						500 tons	4,000	Gypsum.
						600 tons	4,800	Gypsum.
1,200	$400					50 tons	400	Gypsum.
1,886	350							
2,000	900					100 tons	600	Gypsum.
2,000	900					16 tons	320	Asphalt.
5,000	4,000						268,534	Unapportioned, 1900-1909.
5,142	5,142							
5,000	4,500							
7,200	7,200					839 tons	10,068	Asphalt.
4,800	2,400	38	$120			579 tons	6,948	Asphalt.
						500 tons	5,500	Asphalt.
						9,000 tons	26,000	Clay
		850	8,500			400 tons	4,400	Asphalt.
		1,400	22,400			200 tons	2,600	Asphalt.
							750	Gems.
		220	2,195				250	Gems.
						50 tons	950	Chromite.
		2,000	20,000	200,000	$21,380		700	Gems.
						336 flasks	14,125	Quicksilver.
		1,135	9,080	236,100	23,610	375 flasks	15,086	Quicksilver.
				250,000	15,000	148 flasks	7,259	Quicksilver.
				2,894,334	253,906	1,300 tons	13,600	Chromite.
							450	Other minerals.
						9,060 tons	151,824	Chromite.
						11,000 cu. ft.	25,000	Granite.
[2]		5,829	49,082	2,346,917	163,941	668 lbs.	46	Lead.
							36,900	Brick, fuller's earth, mineral water.
						6,289 tons	109,292	Chromite.
[2]		6,077	57,422	4,097,626	347,501		31,500	Granite.
							44,150	Asbestos, brick, mineral water, quicksilver.
						2,314 tons	86,181	Chromite.
		1,795	16,151	5,009,327	267,123		26,800	Granite.
						35 flasks	3,652	Quicksilver.
		600	5,950	5,191,287	411,356		34,500	Granite.
							140,128	Chromite and brick.
		906	8,725	3,721,313	201,865		49,600	Granite
							17,000	Other minerals.
							125,276	Clay and clay products.
		945	9,540	1,886,081	190,181		28,610	Granite.
							2,000	Other minerals.
[3]34,288	$25,792	21,795	$209,165	25,833,485	$1,893,863		$1,300,499	

GLENN COUNTY, 1893-1921.

Year	Amount	Value	Substance
1893 and previous	3,319 long tons	$49,700	Chromite.
1909	140,000 tons	49,000	Macadam.
1910	278,000 tons	34,020	Rubble.
1911	421,775 tons	51,430	Sand and gravel.
1912	543,675 tons	32,950	Sand and gravel.
1913	416,640 tons	27,776	Sand and gravel.
1914		30,553	Miscellaneous stone.
	746 lbs.	131	Copper.
1915		46,526	Miscellaneous stone.
		10	Other minerals.
1916		41,180	Miscellaneous stone.
		39,982	Other minerals.
	879 tons	21,474	Chromite.
1917	369 tons	9,721	Manganese.
		33,260	Miscellaneous stone.
		817	Other minerals.
1918	1,129 tons	57,263	Chromite.
		32,436	Miscellaneous stone.
1919		58,137	Miscellaneous stone.
		1,500	Other minerals.
1920		134,707	Miscellaneous stone.
1921		103,197	Miscellaneous stone.
Total value		$855,770	

IMPERIAL COUNTY, 1907-1921.

Year	Brick		Gold, value	Silver, value	Miscellaneous stone, value	Miscellaneous and unapportioned		
	M.	Value				Amount	Value	Substance
1907	1,000	$10,000						
1908	2,225	22,250	$3,848	$123		375 lbs.	$51	Copper.
1909	2,000	20,000	59,705	524				
1910	1,680	10,078	[2]87,341	[2]237				
1911	1,200	7,000	[2]97,855	[2]189				
1912	3,250	20,000			$10,000			
1913	5,500	44,000	31,700	94	12,000	750 cu. ft.	7,260	Marble.
1914	4,900	29,400	210,428	8,961		13,081 lbs.	1,740	Copper.
1915	2,958	17,916	14,369	42	40,095	65 lbs.	11	Copper.
							5,000	Other minerals.
1916	[3]		23,338	155	34,834		47,006	Brick, copper, lead, pumice, strontium.
1917	and tile	19,260	919	5	65,660	1,907 tons	38,140	Manganese.
							5,416	Copper, potash, pumice.
1918	and tile	11,670	247	1,248	34,787	1,241 tons	46,900	Manganese.
							14,849	Copper, lead, pumice.
1919	[3]			8,607	63,900		67,936	Brick, lead, pumice, salt.
1920	[3]			2,183	127,412	624 tons	16,500	Pumice.
							23,787	Other minerals.
1921	654	6,363	537	920	171,173		3,825	Other minerals.
Totals		[3]$217,937	$532,287	$23,288	$559,861		$278,412	

[1]Imperial County was created August, 1907, from a part of San Diego County.
[2]Includes production of San Diego County.
[3]See under 'Unapportioned'.

HUMBOLDT

Year	Gold, value	Silver, value	Mineral water		Brick	
			Gallons	Value	M.	Value
1880	$153,940	$80				
1881	75,000	300				
1882	100,000					
1883	80,000					
1884	115,000					
1885	29,730					
1886	83,591					
1887	111,532					
1888	100,000					
1889	143,701	274				
1890	93,612	82				
1891	99,329	19				
1892	87,515					
1893	66,354					
1894	41,326	14	20,000	$7,200		
1895	92,635		24,000	12,000		
1896	65,093		15,000	10,000		
1897	94,992	57	10,000	2,000		
1898	57,512				300	$2,500
1899	65,059		6,000	1,500	410	3,870
1900	109,444	[1]136	6,000	2,000	795	7,100
1901	98,487	[1]59	7,825	2,000	1,005	7,810
1902	60,015		10,000	2,500	2,170	17,040
1903	38,509				1,060	10,445
1904	62,061				2,565	21,350
1905	45,824				860	7,600
1906	48,295	240			915	8,690
1907	40,109	214			140	1,400
1908	33,066	325			760	8,585
1909	25,690	94			1,310	9,750
1910	35,289	150			476	4,048
1911	34,966	169			357	2,880
1912	31,271	150			772	6,415
1913	25,611	132			500	4,150
1914	18,686	57			607	6,120
1915	15,947	62	2,000	500	463	5,565
1916	21,279	55	3,000	750	[2]	
1917	23,086	95	[2]		[2]	
1918	8,028	72	[2]		[2]	
1919	16,260	134	[2]		[2]	
1920	2,538	19			[2]	
1921	2,054	37				
Totals	$2,552,436	$3,026	[3]$103,825	$40,450	[3]15,405	$135,318

[1]Recalculated to 'commercial' from 'coining value' as originally published.
[2]See under 'Unapportioned'.
[3]Includes crushed rock, rubble, rip-rap, sand, gravel.

COUNTY, 1880-1921.

Miscellaneous stone[1], value	Natural gas		Miscellaneous and unapportioned		
	M. Cu. Ft.	Value	Amount	Value	Substance
$199,240					
251,586					
233,454					
193,502					
297,276					
160,845					
				$362	Platinum.
				140	Platinum.
			12.5 ozs.	204	Platinum.
			30.8 ozs.	555	Platinum.
13,074			1,280 cu. ft.	1,280	Granite.
29,170	600	$300	2,450 tons	7,640	Clay.
				20,985	Unapportioned, 1900-1909.
36,700	1,000	500	250 tons	750	Clay.
37,756	300	150	937 tons	937	Clay.
229,730	300	150	396 tons	400	Clay.
439,808	300	150	7,750 lbs.	1,201	Copper.
208,204	300	150	3 ozs.	115	Platinum.
335,292	[2]			1,320	Copper and natural gas.
60,260	[2]		7 ozs.	296	Platinum.
				192,255	Brick, clay, granite, natural gas.
			6 ozs.	351	Platinum.
27,014	[2]			9,312	Brick, clay, mineral water, natural algas, volcanic ash
			370 tons	21,744	Chromite.
			210 tons	429	Clay.
51,082	640	85		116	Granite.
			1,520 tons	57,751	Manganese.
			2 ozs.	140	Platinum.
				2,516	Brick, mineral water, pumice.
25,198	[2]			9,271	Brick and clay.
				1,148	Mineral water and natural gas.
			859 tons	18,513	Manganese.
133,290	[2]			5,436	Brick, clay, granite, mineral water, natural gas, volcanic ash.
131,688	[2]		75 tons	190	Pottery clay.
				4,628	Brick, mineral water, natural gas, platinum ,pumice.
$3,094,169	[3]3,440	$1,485		$359,861	

INYO COUNTY.

Year	Gold, value	Silver, value	Lead		Copper		Zinc		Borax, value
			Pounds	Value	Pounds	Value	Pounds	Value	
1880	$48,648	$173,916							
1881	170,000	140,000							
1882	220,000	130,000							
1883	90,000	38,000							
1884	80,000	82,000							
1885	24,998	73,461							
1886	20 156	101,670							
1887	10,649	103,370							
1888	25,000	75,000							
1889	193,957	30,706							
1890	62,432	88,320							
1891	35,466	112,730							
1892	13,930	35,995							
1893	25,945	52,475							
1894	52,639	83,640	900,000	$27,000					$81,298
1895	92,142	188,329	1,498,000	46,438					40,000
1896	238,507	108,619	1,220 000	36,600					24,900
1897	159,840	50,063	564,000	19,176					
1898	137,107	73,503	580,000	21,170	49,829	$3,986			33,000
1899	114,187	57,529	662,000	28,135					24,000
1900	213,655	113,483	971,000	38,840					13,901
1901	162,406	56,573	601,000	24,040	8,566	1,349			24,250
1902	74,397	14,484	257,500	9,013	1,100	126			36,394
1903	66,045	18,200	95,000	3,420	23,450	3,098			26,400
1904	150,474	7,122	124,000	5,270	25,508	3.252			
1905	135,959	29,741	345,680	16,247	151,606	23.649			
1906	19,449	13,358	208,018	11,857	4,145	800			
1907	57,241	44,440	261,140	13,096	6,779	1,356	144,213	$8,598	*
1908	308,873	30,900	683,401	28,244	6,820	938			*
1909	457,486	47,147	2,364,137	131,199	39,888	5,073			*
1910	408,509	129,590	2,866,227	127,385	58,801	7,489			*
1911	574,945	45,678	1,182,122	53,195	27,889	3,486	*		*
1912	369,758	45,316	1,207,593	54,342	48,584	8.016	*		*
1913	237,310	136,854	3,322,308	146,182	113,860	17,648	*7,149,523	449,701	*
1914	275,000	255,000	4,626,934	180,450	336,422	44,744	399,641	20,381	*
1915	317,905	127,894	4,323,639	203,211	154,722	27,076	4,625,162	573,520	*8,162,727
1916	131,722	232,441	11,185,321	771,787	274,032	67,412	5,758,703	771,666	[1]
1917	125,394	534,599	19,318,642	1 661,403	175,273	47,850	3,525,000	359 550	[1]
1918	100,240	441,548	12,223,471	867,866	338,518	83,614	* 2,517,045	229,051	[1]
1919	69,560	194,151	3,643,485	193,015	169,713	31,567	1,192,353	87,042	[1]
1920	55,654	258,929	4,612,338	368,987	114,286	26,549	[1]		[1]
1921	80,373	86,020	1,052,253	47,351	45,725	5,898			[1]
Totals	$6,208,298	$4,662,774	$80,899,209	$5,134,919	2,205,517	$414,976	[2]25,311,640	$2,499,509	[2]$8,466,870

*Combined to conceal individual annual output.
[1]See under "Unapportioned".

1880-1921.

Soda		Soapstone and Talc		Marble		Miscellaneous and unapportioned		
Tons	Value	Tons	Value	Cu. ft.	Value	Amount	Value	Substance
1,530	$20,000			12,500	$62,500			
1,900	47,500			10,000	50,000			
3,000	65,000			3,000	24,000			
5,000	110,000							
7,000	154,000			4,000	12,000			
10,000	250,000							
1,000	50,000					20 tons	$700	Antimony.
8,000	400,000							
7,000	50,000							
*	*			20,000	20,000	300 tons	2,400	Salt.
*	*			3,000	3,000	400 tons	800	Salt.
*	*			17,000	17,000			
*	*			1,200	4,800			
*	*			1,000	4,000			
*	*							
*	*						1,417,217	Unapportioned, 1900-1909.
*	*					45,000 tons	31,500	Rubble.
*	*					46,450 tons	32,555	Rubble.
							174	Gems.
*	*	1,050	$5,250				648	Rubble.
*	*	1,000	4,400	3,200	11,500		835	Rubble.
						13,500 tons	54,000	Salt.
*	*	390	2,060	3,500	10,500	13,500 tons	54,000	Salt.
112,937	*496,250	1,513	14,000				80,430	Antimony, dolomite, marble, pumice, salt.
						3,596 tons	14,700	Dolomite.
10,593	264,825	685	4,606	1			23,040	Miscellaneous stone.
							2,317,897	Antimony, borax, gypsum, marble, molybdenum, salt, tungsten.
						11,315 tons	22,630	Dolomite.
							3,000	Miscellaneous stone.
19,604	861,160	4,736	41,044				2,639,600	Asbestos, barytes, borax, gypsum, marble, molybdenum, salt, tungsten.
						14,390 tons	32,056	Dolomite.
1		9,635	72,549				5,000	Miscellaneous stone.
						589 tons	854,025	Tungsten concentrates.
							2,491,727	Borax, limestone, salt, soda.
						2,360 tons	12,000	Limestone.
1		1					7,850	Miscellaneous stone.
							2,097,271	Borax, dolomite, marble, pumice, salt, soda, talc, tungsten.
						15,240 tons	31,080	Limestone.
							1,190	Miscellaneous stone.
23,132	933,023	1		1			2,214,008	Borax, dolomite, fuller's earth, marble, volcanic ash, salt, talc, zinc.
						22,112 tons	49,073	Dolomite.
						1,185 tons	8,295	Fuller's earth.
1		4,350	77,250				16,250	Miscellaneous stone.
							1,089,708	Borax, building stone, marble, pumice, soda.
[2]10,716	$3,701,758	[2]23,359	$221,159	[2]78,400	$219,300		$15,625,659	

KINGS COUNTY, 1894[1]-1921.

Year	Brick		Gypsum		Natural gas		Quicksilver		Miscellaneous and unapportioned		
	M.	Value	Tons	Value	M. Cu. ft.	Value	Flasks	Value	Amount	Value	Substance
1894											
1895											
1896											
1897											
1898	1,250	$8,450									
1899	1,650	11,550									
1900	750	5,000									
1901	1,000	5,000								$10,500	Unapportioned, 1900-1909.
1902	3,500	19,000									
1903	3,400	24,200									
1904	3,100	23,300									
1905	3,400	24,000					*250	$9,000			
1906	2,800	20,000									
1907	1,000	8,000							100 tons	1,000	Fuller's earth.
1908	3,000	24,000	100	$400					50 tons	1,000	Fuller's earth.
1909	1,000	8,500	100	300	360	$360			100 tons	2,000	Fuller's earth.
									20 tons	100	Mineral paint.
1910	400	3,200	100	490	1,200	600	100	4,525	100 tons	1,000	Fuller's earth.
									10 tons	270	Mineral paint.
1911			20	100	1,800	800					
1912			50	200	6,000	1,650					
1913			100	300	1,916	575			20 tons	60	Mineral paint.
										400	Other minerals.
1914			20	80	150	500			20 tons	160	Fuller's earth.
1915					258	608	[2]			18,000	Fuller's earth
											quicksilver.
1916					258	608	[2]			26,180	Other minerals.
1917					3,569	2,777					
1918					2,460	590	[2]			8,639	Other minerals.
1919					2,550	1,630	[2]			49,653	Other minerals.
1920					2,765	1,250	436	28,620			
1921					2,090	980	[2]			4,742	Other minerals.
Totals	26,250	$184,200	490	$1,870	25,376	$12,928	*786	$42,145		$123,704	

*Flasks of 75 pounds.

[1]Kings County was created March 22, 1893, from a part of Tulare County, and in 1903 extended by annexing a portion of Fresno County.

[2]See under "Unapportioned."

Year	Asphaltum		Brick		Copper		Fuller's earth		Gold, value	Lime		Limestone		Silver, value	Natural gas		Petroleum		Miscellaneous and unapportioned		
	Tons	Value	M.	Value	Pounds	Value	Tons	Value		Barrels	Value	Tons	Value		M. Cu. Ft.	Value	Barrels	Value	Amount	Value	Substance
1880									$94,314					$300							
1881									100,000					14,000							
1882									260,000					20,000							
1883									150,000					5,000							
1884									100,000					5,000							
1885									72,093												
1886									96,640					1,721							
1887									72,358					150							
1888									60,000					2,500							
1889									242,679					7,517							
1890									117,341					586							
1891									107,735					61							
1892									107,748					73							
1893									85,665					1,754							
1894	6,000	$138,000							310,707	33,000	$26,500			39,700							
1895	1,400	28,000							231,433	23,400	24,980		$10,000	45,064			11,215	$89,334	92 tons	$3,720	Antimony.
1896	2,484	44,850							590,857	37,100	37,329	5,000	5,000	34,650			235	235	15 tons	1,485	Antimony.
1897	4,630	86,350	1,100	$6,600					754,319	53,400	70,370			10,471					25 tons	2,250	Antimony.
																			220 tons	3,000	Antimony.
1898	1,859	50,000	2,000	14,000					1,017,930	42,000	29,900			6,543			10,000	10,000	40 tons	1,160	Coal.
																			40 tons	1,200	Antimony.
1899	2,537	57,670	1,600	11,400			623	$12,400	863,414	64,700	57,600			6,810			15,000	13,500	57 tons	3,382	Borax.
1900	701	14,020	2,525	17,300	4,000	$750	500	3,750	863,352	97,721	91,750			147,795			919,275	827,348			Unapportioned, 1900-1909.
1901	3,112	43,126	4,600	23,400	429,248	67,606	1,000	10,500	1,007,659	82,000	82,760			40,497			3,902,125	1,131,616	1,600 lbs.	64	Lead.
																			50 tons	8,350	Antimony.
1902	10,150	101,500	3,500	24,500	235,840	27,122	937	10,246	1,165,982	99,360	80,856			99,135			9,727,948	1,955,585	1,000 tons	8,000	Gypsum
1903	5,000	100,787	9,000	30,000	4,300	559	250	4,750	1,022,353	101,561	76,240			114,614			18,001,148	3,600,230	28 tons	63	Bituminous rock.
																			1,000 tons	8,000	Gypsum.
1904	12,451	124,110	700	4,900			500	9,500	1,426,523	178,035	172,000			151,180			19,668,045	3,411,408			
																			53 tons	54	Clay.
1905	10,586	103,860	750	6,000					1,160,971	279,650	255,500		44,000	134,944			17,069,715	3,174,966	1,350 tons	11,009	Gypsum.
																			52 tons	18,800	Tungsten.
1906	23,136	231,360	4,275	34,200					986,117	295,613	267,096			129,503			13,826,000	3,765,200	215 tons	752	Clay.
																				183,600	Tungsten.
1907	20,443	266,158	2,168	18,428					878,798	175,000	160,822			86,033			15,700,308	4,673,867	1,000 tons	5,500	Gypsum.
1908	50,000	475,000	2,680	19,552					827,087	116,717	87,785			96,550			18,777,871	9,388,935	500 tons	2,000	Gypsum.
																				500	Lime.
1909	54,599	655,194	3,365	20,634			359	5,385	654,799	115,709	88,869			101,633	38,000	$2,714	24,549,758	12,565,246	1,700 tons	8,300	Gypsum.
																			4,781 lbs.	174	Lead.
1910	76,805	811,846	8,332	63,711					619,974	99,187	80,198		4,331	35,041	975,724	47,364	40,641,159	17,825,212	1,575 tons	8,305	Gypsum.
																			160,000 tons	112,000	Rubble.
																			342 tons	121	Clay.
1911			5,603	41,426	29,441	3,680			557,471	96,500	82,025	600	400	5,833	1,654,389	165,438	46,562,825	20,207,906	230,950 tons	107,880	Crushed rock.
																			853 tons	4,243	Gypsum.
																			2,417 lbs.	109	Lead.
1912			1,890	23,120					830,421	162,831	124,894			11,480	4,400,000	325,484	51,448,067	21,762,532	3,479 tons	18,186	Gypsum.
																			19,664 lbs.	885	Lead.
1913			1,825	22,000	3,498	542			649,712	135,000	91,290			11,851	7,111,237	569,899	58,698,432	27,038,474	208 tons	104	Clay.
																			10,000 tons	22,750	Gypsum.
																			1,376 lbs.	61	Lead.
																				600	Other minerals.
																			349 tons	172	Clay.
																			82 tons	220	Gypsum.
1914			3,854	29,214	7,394	953			594,337	81,690	65,100			8,002	6,508,858	390,532	65,332,833	28,721,046	379 lbs.	15	Lead.
																			20,000 tons	50,000	Salt.
																				180,575	Other minerals.
																			267 tons	11,301	Antimony ore.
1915					1,047	183			983,319	55,178	39,523	1,425	1,710	13,316	12,163,481	737,638	54,810,669	23,184,913	54,371 lbs.	3,085	Lead.
																				59,319	Miscellaneous stone.
																				299,997	Cement, pottery clay, fuller's earth, gypsum, magnesite, salt, tungsten.
																			145 tons	5,880	Antimony ore.
																			24,274 lbs.	1,675	Lead.
																				30,047	Lime and limestone.
1916			3,177	23,824	24,754	6,089	1		747,042	1		1		8,745	16,679,658	1,379,033	54,120,509	34,691,246	4,100 tons	23,700	Silica.
																				63,733	Miscellaneous stone.
																			482,387	Tungsten concentrates.
																			193 tons	363,516	Cement, clay, feldspar, fuller's earth, magnesite, quicksilver, salt.
																			113 tons	16,041	Antimony ore.
1917			and tile	22,785	251,225	68,884			537,852	1		1		7,813	25,819,376	1,445,880	53,065,066	47,387,104	9,684 lbs.	833	Lead.
																			300 flasks	27,250	Quicksilver.
																				31,787	Miscellaneous stone.
																			49 tons	58,148	Tungsten concentrates.
																				139,345	Clay, feldspar, lime, limestone, magnesite, salt.
																				174,419	Miscellaneous stone.
1918			1,678	16,380	95,580	23,608			246,127	23,615	23,615	1		7,817	23,545,178	1,507,912	49,040,917	61,410,496		174,419	Lead, limestone, magnesite, manganese, quicksilver, salt, tungsten.
																			17,000 tons	81,000	Salt.
1919			1,709	175,112			1		150,589	86,952	112,724	1		8,402	25,363,739	1,618,013	47,734,035	64,440,947		28,320	Miscellaneous stone.
																				9,345	Fuller's earth, limestone, quicksilver.
1920			3,830	56,850	206	38			61,187	76,395	106,733			8,385	34,912,865	1,810,147	50,660,438	86,831,991	22,000 tons	87,000	Salt.
																			3,080 tons	20,160	Silica.
																				31,180	Miscellaneous stone.
																				105,270	Cement, gems, lead, quicksilver.
1921			5,840	85,820					64,698	72,629	141,491			1,897	40,136,930	1,926,727	57,434,945	97,630,407	18,500 tons	93,500	Salt.
																				38,208	Miscellaneous stone.
																				829,115	Cement, gypsum, limestone, silica.
Totals	285,910	$3,327,858	75,201	$899,855	1,066,533	$199,744	4,216	$74,531	$21,328,704	[1]2,626,854	$2,447,849		$65,441	$1,433,406	199,309,366	$11,926,751	771,727,454	$573,748,860			$4,757,733

[1]See under "Unapportioned."

LAKE COUNTY, 1873-1921.

Year	Quicksilver		Mineral water		Chromite		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
	Flasks	Value	Gallons	Value	Tons	Value		Amount	Value	Substance
1873	880	$70,790								
1874	1,695	178,280								
1875	8,821	743,287								
1876	14,199	624,756								
1877	18,100	675,130								
1878	14,428	474,681								
1879	15,582	309,303								
1880	17,148	531,588								
1881	17,393	518,833								
1882	10,193	287,748								
1883	6,481	186,329								
1884	4,182	127,551								
1885	4,765	146,524								
1886	3,498	124,179								
1887	4,307	182,509								
1888	6,636	282,030	*	*						
1889	4,713	212,085	*	*						
1890	4,232	222,180	*	*						
1891	4,975	225,119	*	*						
1892	11,140	453,509	*	*						
1893	9,731	357,614	*	*						
1894	12,471	382,954	*	*						
1895	12,856	465,074	87,500	$42,000						
1896	6,307	232,484	65,920	32,460						
1897	3,585	154,546	511,950	76,585						
1898	1,729	64,746	523,000	37,350						
1899	2,954	128,179	166,020	75,924						
1900	3,165	127,345	758,600	45,400						
1901	4,395	211,324	201,706	120,360						
1902	3,611	161,568	241,100	126,663						
1903	2,595	106,397	381,040	187,621						
1904	[2]3,355	109,719	659,000	221,000						
1905	1,462	51,937	489,000	219,500						
1906	1,066	38,909	365,000	160,000						
1907	802	30,604	304,340	130,936						
1908	1,300	54,951	246,545	118,300			$10,000			
1909	1,075	56,277	265,000	108,270					$28,423	Unapportioned, 1900-1909.
1910	1,048	47,422	212,546	95,005						
1911	899	41,363	227,440	58,933						
1912	209	8,786	202,000	114,500						
1913	395	15,891	209,750	109,938						
1914	331	16,236	254,150	47,267						
1915	492	41,660	165,130	24,371			5,000		1,503	Copper, gold, silver.
1916	1 139	106,496	195,650	54,160	871	$15,070	4,500		770	Other minerals.
1917	1,057	107,071	129,157	22,685	1,466	36,326	2,500	85 tons	1,900	Manganese.
									70	Other minerals.
1918	1,540	172,173	87,067	15,006	476	24,790	1,000		2,907	Manganese and natural gas.
1919	229	20,604	62,839	17,471	[3]		1,200		100	Other minerals.
1920	385	24,314	43,693	10,413	84	1,560	13,200	247 tons	7,816	Manganese.
									250	Other minerals.
1921	22	880	54,715	26,751			146,508		250	Other minerals.
Totals	253,082	$9,893,935	7,109,858	$2,304,869	[2]2,897	77,746	$183,908		$43,989	

*Bartlett since 1888 and Witter since 1889 reported to U. S. Geological Survey, but no segregated figures available for Lake County, previous to 1895.

[1]Includes crushed rock, rubble, rip-rap, sand, gravel.

[2]Flasks of 75 pounds, beginning June 1, 1904. Previously 76½ pounds.

[3]See under "Unapportioned."

In addition to the above, Lake County has produced the following:

Borax	Sulphur	Pounds	Value
1864 to 1868 Borax Lake yielded 590 tons refined borax, worth $414,636; 1872 from Lake Hachinhama, 140 tons, worth $89,600; total 730 tons, worth $504,236.	1865	214,650	$8,030
	1866	675,963	21,970
	1867	487,603	13,420
	1868	503,481	10,080
	Totals	1,881,697	$53,500

LASSEN COUNTY, 1880-1921.

Year	Gold, value	Silver, value	Miscellaneous stone, value	Miscellaneous and unapportioned		
				Amount	Value	Substance
1880	$25,900					
1881	71,000	$1,000				
1882	100,000	20,000				
1883	20,000	5,000				
1884	[1]119,060	341				
1885	15,000	150				
1886	25,812	135				
1887	24,108	304				
1888	50,000	200				
1889	97,503	215				
1890	14,890	300				
1891	3,676					
1892	15,400					
1893						
1894	35,283					
1895	25,000					
1896	40,300					
1897	49,100	$50				
1898	37,460	300				
1899	28,898					
1900	19,807	676				
1901	5,900	200				
1902	23,410	244				
1903	91,102	1,203				
1904	116,993	1,515				
1905						
1906	[2]	[2]				
1907	[2]	[2]				
1908	7,284	783				
1909	[3]116,327	[3]1,463			$217,521	Unapportioned, 1900-1909.
1910	[4]82,180	[4]972				
1911	[2]	[2]			1,522	Gold and silver.
1912						
1913		2	$2,030			[5]
1914	1,250	4	775			[6]
1915			870			
1916			9,725			
1917			376			
1918			800			
1919			1,100			
1920			7,313		5,000	Other minerals.
1921	39,943	1,234	42,308			
Totals	[2]$1,303,586	[2]$37,091	$65,297		$224,043	

[1]Lawver, A. M., in 'Production of Precious Metals in U. S.': Report of Director of Mint, 1884, p. 175, 1885.
[2]See under 'Unapportioned.'
[3]Includes Modoc and Colusa Counties' production.
[4]Includes Colusa county production.
[5]Copper production erroneously reported from Lassen County in the years 1913 and 1914, on account of shipping point being Doyle, while producing copper mines were located in Plumas County.

LOS ANGELES COUNTY
(See Page 665)

MADERA

Year	Gold, value	Silver, value	Copper		Brick	
			Pounds	Value	M.	Value
1893	[1]$150,696	$314				
1894	107,791	180				
1895	162,323					
1896	104,339	1,240				
1897	85,963					
1898	94,884	50			400	$2,800
1899	73,758	292			439	3,070
1900	104,134	3,835	500,000	$77,500	500	3,000
1901	82,749	2,600	108,430	17,077	500	3,000
1902	35,128	3	18,600	2,139	230	1,840
1903	93,070	3	36,000	4,680	216	972
1904	75,303	25	10,300	1,313	750	3,750
1905	50,867	10,014				
1906	22,390	508				
1907	13,303	506	1,895	379	1,250	12,500
1908	45,107	1,264	113,293	15,454	250	2,250
1909	14,716	403	5,000	635		
1910	10,076	1,850	336,667	42,876	740	3,700
1911	1,958	77	14,608	1,826	270	1,350
1912	9,162	1,162	248,129	40,941	300	1,500
1913	14,489	1,617	532,403	82,522	315	1,650
1914	4,506	36	33,359	4,703		
1915	11,214	2,126	40,294	7,051	200	1,400
1916	10,306	1,772	124,286	30,574		
1917	18,914	489	372,123	101,590		
1918	7,583	4,206	245,519	60,643		
1919	17,705	1,700	175,405	32,625		
1920	6,382	1,488	89,846	16,532		
1921	1,053	27				
Totals	$1,429,869	$37,785	3,008,157	$541,060	6,360	$42,782

[1]Madera County created March 11, 1893, from a portion of Fresno County. Between 80 per cent and 90 per cent of the gold and silver produced in Fresno County prior to 1893 was from that part now in Madera County.
[2]Includes crushed rock, rubble, rip-rap, sand, gravel.

MARIN COUNTY.

Year	Brick		Miscellaneous stone[1]	
	M.	Value	Tons	Value
1888	1,600	$10,000		
1889	*2,000	12,000		
1890	*5,000	30,000		
1891	*10,000	60,000		
1892	*12,000	72,000		
1893	18,000	108,000		
1894	28,500	172,500		$16,850
1895	29,000	145,000		7,700
1896	15,000	85 000	7,849	8,260
1897	15,000	89,000	6,000	7,200
1898	15,500	66 000	1,710	1,800
1899	16,500	76,000	4,400	5,150
1900	25,000	200,000	3,000	2,500
1901	14,320	100 240	34,000	27,987
1902	14,000	97,700	149,450	105,350
1903	13,819	78,095	144,715	140,332
1904	20,500	132,000	216,576	170,995
1905	22,877	163,585	113,000	44,250
1906	23,900	199,300	54,000	53,000
1907	16,000	118,000	157,100	134,111
1908	10,000	50,000	111,686	66,700
1909	4,500	105,000	132,010	67,910
1910	22,497	99,185	112,000	74,700
1911	19,695	87,445	173,646	108,786
1912	18,000	88,200	5,300	3,000
1913	16,000	70,500	428,357	198,953
1914	15,000	55,000		490,137
1915	10,000	50,000		101,528
1916	[2]			74,000
1917	[2]			158,582
1918	[2]			89,458
1919	[2]			127,111
1920	[2]			208,302
1921	[2]			202,333
Totals	[3]434,808	$2,619,750		$2,696,175

*Estimated.
[1]Includes crushed rock, rubble, rip-rap, sand, gravel
[2]See under 'Unapportioned.'

COUNTY, 1893[1]-1921.

Granite		Miscellaneous stone[2], value	Miscellaneous and unapportioned		
Cubic feet	Value		Amount	Value	Substance
48,858	$31,494				
39,590	49,662				
48,628	73,525	$7,800			
39,030	37,215	1,249			
23,103	49,573	500			
47,433	36,000	2,500			
124,015	80,000			$65,000	Unapportioned, 1900-1909.
96,716	294,799	600			
105,845	78,041	4,000			
128,581	389,860	1,000			
113,627	98,083	500			
42,316	123,106				
65,472	176,416				
99,278	93,372				
140,086	123,668	2,140	2,279 lbs.	84	Lead.
142,622	111,380	5,836			
99,192	74,152	1,112			
99,900	74,190	800			
82,135	56,058	3,213	5,533 lbs.	249	Lead.
150,994	270,123	1,466			
	186,543	6,221	50 tons	1,000	Pumice.
	84,632	37,640		1,000	Other minerals.
128,865	172,191	7,915			
	114,400	1,525	221 lbs.	19	Lead.
	40,355	1,540			
	64,258	1,500			
	98,523				
	461,822	4,765			
	$3,543,581	$93,822		$67,352	

1888-1921.

Mineral water		Miscellaneous and unapportioned		
Gallons	Value	Amount	Value	Substance
		7,000 cu. ft	$5,000	Granite
		700 tons	1,400	Salt.
		150 tons	300	Salt.
52,000	$12,050			
47,500	5,075		42,000	Unapportioned, 1900-1909.
100,000	10,000			
328,740	36,500			
200,000	31,000			
60,000	9,000			
60,000	9,000			
60,000	9,000			
[2]			74,000	Brick and mineral water.
[2]			113,720	Brick and mineral water.
[2]			86,725	Brick, copper, gold, mineral water, silver.
[2]			101,863	Brick and mineral water.
[2]			127,443	Brick and mineral water.
[2]			116,443	Brick and mineral water.
[2]962,240	$121,625		$668,894	

MARIPOSA COUNTY, 1880-1921.

Year	Gold, value	Silver, value	Copper		Miscellaneous and unapportioned		
			Pounds	Value	Amount	Value	Substance
1880	$150,017	$1,300					
1881	200,000	1,200					
1882	250,000	4,000					
1883	220,000	3,000					
1884	180,000						
1885	149,177	100					
1886	197,600						
1887	187,165	96					
1888	175,000	250					
1889	145,819	210					
1890	124,265	22					
1891	84,414						
1892	81,011	67					
1893	164,116	307					
1894	153,708	39					
1895	216,622	7					
1896	335,637	180					
1897	451,427	660					
1898	336,418	993					
1899	562,829	2,207			110 sq'r's	$600	Slate.
1900	157,663	13,853					
1901	504,928	4,787	191,622	$30,180	70,000 lbs.	3,080	Lead.
1902	631,478	3,880	104,700	11,940			
1903	542,355	3,353	61,627	6,808			
1904	429,771	2,839	11,500	1,466			
1905	386,380	5,231	12,541	1,956		25	Platinum.
1906	366,394	3,377					
1907	405,498	1,500			1,142 lbs.	60	Lead.
1908	439,862	4,732	29,124	2,958		36,560	Miscellaneous stone.
1909	396,465	2,729				62,430	Miscellaneous stone.
						8,431	Unapportioned, 1900-1909
1910	317,580	2,364				21,501	Miscellaneous stone.
					800 tons	4,800	Barytes.
1911	172,532	1,390	14,641	1,830			
1912	160,541	6,796	284,587	46,957			
1913	171,034	7,430	416,031	64,485		3,130	Other minerals.
						15,366	Miscellaneous stone.
1914	131,458	677	277,472	36,904	2,000 tons	3,000	Barytes.
					100 cu. ft.	100	Marble.
1915	385,577	2,175	38,630	6,760		17,214	Miscellaneous stone.
						600	Other minerals.
					1,857 lbs.	128	Lead.
1916	401,718	2,680	162,318	39,930		4,143	Other minerals.
						39,372	Miscellaneous stone.
					1,075 lbs.	92	Lead.
1917	313,296	3,221	53,381	14,583		13,399	Other minerals.
						7,646	Miscellaneous stone.
1918	337,682	5,083	30,294	7,483		1,856	Chromite and lead.
						400	Miscellaneous stone.
1919	253,392	4,139	24,879	4,627		8	Other minerals.
						400	Miscellaneous stone.
1920	261,830	4,705	[1]			4,096	Barytes, copper, lead.
						400	Miscellaneous stone.
1921	331,295	5,251				5,655	Barytes and pyrites.
						400	Miscellaneous stone.
Totals	$11,863,954	$109,830	[1]1,713,347	$278 867		$254,892	

[1]See under 'Unapportioned.'

Year	Gold, value	Silver, value	Petroleum		Asphalt—Natural gas (Tons) (M. cu. ft.)		Gypsum		Salt		Gems, value	Mineral waters		Brick		Pottery clay		Sandstone and serpentine		Miscellaneous stone, value	Miscellaneous and unapportioned	
			Barrels	Value	Amount	Value	Tons	Value	Tons	Value		Gallons	Value	M.	Value	Tons	Value	Cubic feet	Value		Amount	Value
1880	$7,700	$66,000	*																			
1881	13,000	39,000																				
1882	17,000	24,000																				
1883	20,000	28,000																				
1884	40,000	11,000																				
1885	22,500	1,945																				
1886	21,500	6,750																				
1887	25,000	25,000																				
1888	20,000	10,000																				
1889	28,393	97																				
1890	74,320	7,366																				
1891	40,759																					
1892	219,204																					
1893	14,200																					
1894	34,300		475,650	$617,065			1,134	$11,340				7,500	$37,500							$5,500	9,500 bbls.	$10,800	Lime.
1895	23,310		979,695	732,817			3,790	37,835				45,000	225,000							47,750			
1896	33,468		953,234	812,800			900	9,180				27,478	179,240					[1]1,500	$6,000	30,000			
1897	60,695		1,327,011	1,227,011			1,000	17,250				30,888	228,200					[2]2,500	2,500	30,635	5 tons	200	Infusorial earth.
1898	21,300		1,462,871	1,462,871			2,500	18,500				25,908	188,385	50	$500			[3]19,500	5,250	32,500	2 tons	50	Sulphur.
1899	13,122		1,409,356	1,409,356	[4]1,151	$23,020	3,563	14,250				193,500	$5,805	23,385	147,400			[5]7,500	7,500	112,001	1,600 cu. ft.	2,000	Marble.
1900	5,508		1,722,887	1,722,887	[4]5,000	100,000	2,500	10,000						35,725	278,925	4,576	10,776	[6]7,500	3,750	24,352			
																		[7]350	2,000				
1901	10,312		2,304,432	1,062,038	[4]10,000	[8]1,500 / 152,838	3,500	35,500	6,650	$10,950				44,435	264,825	130	390	[7]89	90	94,229	10 tons	19	Soapstone.
1902	7,200		2,108,498	1,075,868	[4]6,767	171,904			90	180				52,776	335,670	890	890			105,047	100 tons	300	Mineral paint.
																					14,400 lbs.	504	Lead.
1903	8,674	22	1,960,694	1,294,866	[4]28,308	332,600	5,914	38,441	8,000	20,000		[9]3,000	5,500	79,195	706,334	115	115	[2]2,163	9,734	118,185	60 tons	360	Infusorial earth.
																					1,736 tons	2,558	Glass sand.
																					219 tons	10,124	Soapstone.
1904	12,462	73	2,100,000	1,289,910	[4]30,425	307,068			7,560	24,480		125,750	7,084	128,719	767,827	5,000	5,000	[2]20,211	13,145	33,826	10,000 bbls.	10,000	Lime.
																		[2]292	2,340		700 tons	4,254	Glass sand.
																					228 tons	2,315	Soapstone.
1905	15,035	100	2,854,364	1,656,188	[4]23,718	119,430	11,500	43,500	12,000	20,000		175,000	31,250	109,563	853,810	30,533	16,066	[2]8,784	9,950	89,021			
1906			2,814,000	908,800	[4]25,920	259,200	21,000	69,000	12,000	36,000		85,465	5,128	127,985	826,831	41,350	34,250	[2]19,080	9,540	176,558	18,000 bbls.	18,000	Lime.
																		[2]847	1,694		50 tons	200	Infusorial earth.
																					849 lbs.	169	Copper.
1907			4,318,739	2,633,541	[4]26,610	353,423	7,500	50,000	12,000	36,000		385,000	35,100	101,079	895,272	17,500	20,500	[2]21,196	19,078	36,904	1,000 cu. ft.	3,000	Marble
																		[7]1,000	2,000		25,000 bbls.	25,000	Lime.
1908			6,244,347	4,062,052	[4]25,000	250,000	12,000	75,000	12,000	48,000	$8,500	573,975	42,857	108,414	$00,163	25,034	55,374	[2]5,292	2,000	598,618	200 tons	8,000	Glass sand.
																					1,500 tons	14,400	Glass sand.
1909	864	2	5,409,392	3,513,102	40,740	516,500	10,000	50,000	10,000	30,000	9,500	266,315	19 988	136,202	1,103,892	14,027	26,688			182,377	2,000 cu. ft.	6,000	Marble.
																						842,530	Unapportioned, 1900-1909
																					40 tons	120	Infusorial earth.
1910			5,127,266	3,185,433	[4]45,872 / [4]30,920	$91,1931 / 15,208			6,000	12,000	4,900	319,401	23,999	148,723	1,361,653	490	800			224,091	60 tons	720	Feldspar.
																					50 tons	200	Glass sand.
																					1,000 cu. ft.	4,800	Marble.
1911			4,924,288	3,313,972		[4]15,208			7,592	16,113	5,000	229,019	17,256	160,259	1,442,913	15,650	41,025			553,076	1,100 cu. ft.	3,300	Marble.
1912			4,484,590	2,708,384		[4]8,672			10,360	40,370	3,000	76,495	6,333	174,882	1,692,258	11 929	12 028			955 668	1 800 tons	1 800	Glass sand.
1913	2,322	27	4,143,690	2,672,680	[4]1,287,794	77,378			10,000	40,000	2,500	255,095	15,140	204 912	1 752,106	7,425	20,135			1,008,810	1,800 tons	2,000	Glass sand.
																						240,000	Other minerals.
1914			3,558,609	1,957,270	[4]1,250,000	75,000			20,000	60,000	2,100	331,151	8,025	133,557	1,244 971	8,263	14,566			953,434	13,203 tons	349,969	Borax.
																					10 tons	460	Potash.
1915			2,931,093	1,843,861	[4]1,729,035	120,783					700	350,171	29,491	88,669	820,312	6,507	1,511			1,022,134		330,020	Borate, borax, potash.
																					1,804 tons	224,769	Potash.
1916			2,825,468	1,871,930	[4]2,083,664	139,522			*		600	320,700	8,552	82,005	760,912	6,233	10,549			971,153	612 tons	1,884	Silica.
																						373,374	Borax, copper, graphite, salt.
1917			4,669,583	3,491,430	[4]1,670,476	104,793			*		300	188,368	16,902	and tile	939,081	6,276	10,321	*		668,626	1,710 tons	406,962	Potash.
																						542,788	Borax, graphite, magnesium chloride salt, silica, serpentine, talc.
																					18,630 tons	121,963	Building tile.
1918			10,125,100	13,567,755	[4]2,085,859	224,270			*		*	110,451	15,540	48,381	668,676	12,634	11,820	*		547,199	2,380 tons	462,900	Potash.
																						386,585	Borax, gems, graphite, magnesium chloride, manganese, salt, serpentine.
1919			15,076,633	20,805,754	[4]4,148,476	458,812			*		*	125,400	8,787	and tile	1,185,154	11,329	33,343			715,524		399,007	Borax, gems, graphite, magnesium salts, manganese, salt.
1920	*	*	14,026,536	21,488,653	[4]5,225,825	536,465			6,502	6,577		161,466	10,371	127,854	2,333,941	13,684	91,763			1,704,051	27,954 tons	308,476	Building tile.
																						473,966	Borax, copper, gold, graphite, infusorial earth, lead, magnesium salts, silver.
1921	*	*	12,305,605	25,703,254	[4]4,944,277	638,936			*		*	264,465	13,314	and tile	3,208,448	29,055	62,866			1,763,180		222,943	Borax, gems, gold, graphite, limestone, magnesium chloride, salt, silver.
Totals	[9]$894,140	[9]$216,582	122,964,415	$129,753,447		$5,773,932	87,761	$479,781	[10]140,754	$406,670	[11]$45,200	4,632,310	$326,422		$25,348,840	274,540	$481,176		[12]$99,039	$12,874,735		$5,913,329	

*Commercial production of petroleum in Los Angeles began at least as early as 1874, in the Newhall district, but detailed county segregations are not available for the early years.

[1]Includes granite, crushed rock, rubble, paving blocks, sand, gravel.

[2]Asphalt, tons.

[3]Natural gas, thousand cubic feet.

[4]Included in Riverside County production.

[5]Included in Monterey County production.

[6]Sandstone.

[7]Serpentine.

[8]See under "Unapportioned."

MENDOCINO

Year	Brick		Manganese ore	
	M.	Value	Tons	Value
1880				
1881				
1882				
1885				
1896				
1898	258	$1,080		
1899	200	1,800		
1900	25	400		
1901	200	2,500		
1902	200	2,000		
1903	550	5,580		
1904	260	3,120		
1905	655	6,470		
1906	500	5,000		
1907	400	4,000		
1908	260	2,600		
1909	150	1,500		
1910				
1911	160	1,600		
1912				
1913				
1914				
1915			2,858	$23,036
1916			1,735	43,005
1917	[2]			
1918			1,541	40,515
1919			1,432	58,962
1920				
1921	[2]		[2]	
Totals	[1]3,798	$37,650	[1]7,566	$165,518

[1]Includes crushed rock, rubble, rip-rap, sand, gravel.
[2]See under 'Unapportioned.'

COUNTY, 1880-1921.

Mineral water		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Gallons	Value		Amount	Value	Substance
				$733	Gold.
				125	Silver.
				1,000	Gold.
			50 tons	150	Coal.
			450 tons	2,250	Bituminous rock.
17,470	$6,988				
24,875	8,048				
27,950	8,220				
28,575	7,898				
38,900	15,000				
40,000	12,000			75	Gold.
90,000	18,000			40	Gold.
40,000	9,800			19	Gold.
45,000	9,800				
45,000	9,800				
45,000	9,000	$1,200		18,000	Unapportioned, 1900-1909.
		500			
		300			
		9,450			
		560			
		1,500			
		8,275	300 tons	2,400	Magnesite.
				2,000	Other minerals.
		5,600		4,300	Brick, chromite, magnesite.
		5,000		226	Gold, platinum.
			555 tons	44,200	Chromite.
		7,000		7,214	Chromite, platinum.
		7,500		18,610	Chromite, manganese, natural gas, platinum.
		40,000		1,509	Gold.
				13	Silver.
				3,200	Brick, manganese, natural gas, platinum.
442,770	$114,554	$86,885		$106,064	

MERCED COUNTY, 1880-1921.

Year	Gold, value	Silver, value	Copper		Brick		Miscellaneous and unapportioned		
			Pounds	Value	M.	Value	Amount	Value	Substance
1880	$17,515								
1881	1,500								
1882	10,000								
1883	10,000								
1884	6,500								
1885	10,000								
1886	7,000								
1887	10,767	$5							
1888	10,000								
1889	4,843								
1890	2,000	59							
1891	1,728	17							
1892	445								
1893									
1894	763								
1895	1,500								
1896	1,250								
1897									
1898									
1899									
1900	[1]								
1901	[1]		79,071	$12,453					
1902			14,400	1,656					
1903	[1]	[1]	6,000	780					
1904	[1]	[1]	8,900	1,135					
1905	[1]				600	$3,500			
1906					650	6,000			
1907	822	10			1,250	12,500			
1908	[2]182,970	[2]1,196	694	70	700	6,300	965 lbs.	$36	Lead.
1909	[2]228,492	[2]572			700	6,300		18,264	Unapportioned.
1910	[1]	[1]			700	6,300		64,764	Miscellaneous stone.
1911	[1]	[1]						49,548	Miscellaneous stone.
1912	[1]	[1]						45,000	Miscellaneous stone.
1913	[2]2,255	[2]92	19,240	2,982				30,000	Miscellaneous stone.
1914	[2]111,361	[2]340							
1915	[3]	[3]					690 lbs.	32	Lead.
								94,000	Other minerals.
1916	[3]	[3]					90 tons	720	Magnesite.
								80,810	Gold, platinum, silver.
1917	[3]	[3]						70,500	Miscellaneous stone.
								76,616	Gold, platinum, silver.
1918	41,089	254						32,500	Miscellaneous stone.
								1,005	Other minerals.
1919	[1]	[1]						40,350	Miscellaneous stone.
1920								24,800	Miscellaneous stone.
1921	3,163	87						30,300	Miscellaneous stone.
Totals	[3]$665,963	[3]$2,632	128,305	$19,076	4,600	$40,900		$659,246	

[1]Included with Stanislaus County production.
[2]Includes Stanislaus County production.
[3]See under 'Unapportioned.'
[4]Dredge output included under Stanislaus County.

MODOC COUNTY, 1880-1921.

Year	Gold, value	Silver, value	Salt		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
			Tons	Value		Amount	Value	Substance
1880	$10,000							
1881	20,000	$1,500						
1882								
1883	50,000							
1884	60,000							
1885	60,000							
1886								
1909	[2]							
1910	5,438	75						
1911	19,875	363						
1912	27,893	404	50	$800				
1913	6,061	94	40	720				
1914	1,000	10	40	720				
1915	7,557	104	[3]		$300		$720	Other minerals.
1916	2,729	90	[3]		200		540	Other minerals.
1917					200			
1918	[3]	[3]	[3]		200		8,020	Gold, salt, silver.
1919	6,478	390	[3]		550		1,802	Other minerals.
1920	[3]	[3]	[3]		700		3,968	Gem material (Iceland Spar) gold, salt, silver.
1921			[3]		34,930		1,720	Gem material (Iceland Spar) and salt.
Totals	[3]$277,031	[3]$3,120	[3]130	$2,240	$37,080		$16,770	

[1]Includes crushed rock, rubble, sand, gravel.
[2]Included under Lassen County production.
[3]See under 'Unapportioned.'

MONO COUNTY, 1880-1921.

Year	Gold, value	Silver, value	Lead		Lime		Miscellaneous and unapportioned		
			Pounds	Value	Barrels	Value	Amount	Value	Substance
1880	$2,407,236	$582,905							
1881	3,385,000	300,000							
1882	2,260,000	380,000							
1883	1,750,000	290,000							
1884	1,000,000	285,000							
1885	482,860	91,849							
1886	439,558	163,502							
1887	382,498	118,945							
1888	297,000	75,000							
1889	193,564	86,827							
1890	144,180	52,293							
1891	302,415	18,983							
1892	396,296	271,058							
1893	293,637	11,401							
1894	358,824	11,549	50,000	$1,500					
1895	552,650	84,910	94,400	2,926			800 cu. ft.	$8,000	Onyx.
1896	451,553	82,283	73,500	2,205	500	$2,000	3,000 cu. ft.	24,000	Onyx.
1897	520,101	72,491	32,000	1,088	1,200	4,800			
1898	446,017	66,667	75,000	2,737	3,000	4,000			
1899	697,069	47,547	28,000	1,190	1,200	3,750			
1900	670,200	75,924	50,000	2,000	1,100	4,000			
1901	493,355	25,091	29,000	1,160	2,000	3,000	1,938 lbs.	305	Copper.
1902	510,596	36,548	4,400	154	2,000	2,000			
1903	334,713	20,067	1,000	36	1,818	5,000	1,600 lbs.	208	Copper.
1904	268,950	2,555			215	850			
1905	308,884	11,240							
1906	338,698	13,151							
1907	383,971	20,797					7,100 gals.	5,575	Mineral water.
1908	413,946	26,134						106,772	Unapportioned, 1900-1909.
1909	354,909	37,792							
1910	435,724	9,391							
1911	261,232	35,508	37,000	1,665			8,179 lbs.	1,350	Copper.
1912	377,518	70,602	23,936	1,077	4,961	3,721	79,319 lbs.	12,294	Copper.
1913	147,271	23,263			2,135	1,600	1,000 lbs.	150	Salt.
1914	7,000	10,000						200	Other minerals.
1915	107,302	1,923						300	Other minerals.
1916	237,084	3,606						3,906	Copper, molybdenite salt.
1917	209,040	5,662	1,912	164					
1918	31,252	22,727	1,318	94			160 lbs.	40	Copper.
								750	Other minerals.
1919	29,428	55,558	1,556	82			539 lbs.	100	Copper.
							3,215 lbs.	592	Copper.
1920	144,746	34,369	85,014	6,801				1,000	Miscellaneous stone.
								750	Other minerals.
1921	37,754	15,160	42,962	1,933			2,940 lbs.	379	Copper.
								1,650	Onyx and salt.
Totals	$22,803,751	$3,659,675	630,998	$26,812	20,129	$34,721		$168,321	

MONTEREY

Year	Gold, value	Silver, value	Brick		Diatomaceous earth		Lime		Limestone	
			M.	Value	Tons	Value	Barrels	Value	Tons	Value
1889	$3,500									
1890	11,815									
1891	3,000									
1892										
1893										
1894	8,000									
1895										
1896										
1897									2,000	$2,000
1898			400	$2,400					2,049	1,640
1899			200	1,400					7,744	6,970
1900			200	1,600					8,000	10,800
1901	13,800								5,463	7,500
1902	6,860	$18					22,000	$13,200		
1903	8,920						26,000	23,400	6,516	9,000
1904	6,941		200	1,600			3,240	3,240	4,550	21,500
1905	4,000						10,000	10,000		
1906	625	3			80	$400	40,000	50,000		
1907	1,076	9					100,000	125,000		
1908	1,318	9	426	3,838			50,000	50,000		
1909	333	5	300	2,900	500	3,500	50,006	62,507	10,658	45,678
1910	[2]1,013	10	993	9,957	500	3,500	30,894	29,349	2,500	7,500
1911					850	5,950			2,000	6,000
1912	[3]7,647	67							6,000	8 000
1913	6,491	27			1,700	6,800			6,500	13,000
1914	4,000	20								
1915					[4]					
1916					[4]					
1917					[4]				[4]	
1918					[4]					
1919					[4]					
1920					[4]					
1921					[4]					
Totals	$89,339	$168	2,719	$23,695	[5]3,630	$20,150	332,140	$366,696	[5]63,980	$139,588

[1]Includes crushed rock, rubble, sand, gravel.
[2]Includes Monterey, San Luis Obispo and Santa Cruz counties.
[3]Includes Los Angeles and San Luis Obispo counties.
[4]See under 'Unapportioned.'
[5]Includes molding, building, blast, filter, roofing sand.

COUNTY, 1889-1921.

Mineral water		Glass sand		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Gallons	Value	Tons	Value		Amount	Value	Substance
				$1,500			
5,000	$1,000						
2,000	200						
21,000	1,050			14,025			
1,500	750			8,258			
20,000	4,000			2,775			
15,000	3,250	4,500	$15,750	8,869	200 tons	$1,000	Coal.
15,000	1,750	4,500	12,225	5,200			
55,000	1,250	5,989	4,967	3,167	61 tons	732	Asphaltum.
25,000	1,000	8,295	7,272		124 tons	1,488	Asphaltum.
5,000	1,000	9,257	8,137				
24,000	12,000	750	1,125				
120,000	12,000	11,065	8,178		4,800 tons	24,000	Coal.
		6,805	5,120	31,727	7 flasks	296	Quicksilver.
10,000	2,000	6,496	4,872	43,351	1 flask	49	Quicksilver.
						$44,789	Unapportioned, 1900-1909.
				*	7 flasks	317	Quicksilver.
		7,594	5,890	47,487	700 tons	5,000	Feldspar.
					200 tons	2,500	Fuller's earth.
				27,011	11,000 tons	4,950	Clay.
20,000	7,000	9,016	7,916	60,119	4,000 tons	6,000	Clay.
					320 tons	3,200	Coal.
20,000	7,000	9,141	9,192	12,556		78,332	Other minerals.
					35,000 tons	12,000	Clay.
					300 tons	2,700	Fuller's earth.
					5,992 tons	17,976	Coal.
26,000	7,900	9,210	7,633	39,202		9,450	Other minerals.
					700 tons	3,500	Feldspar.
					450 tons	3,150	Fuller's earth.
						50,137	Coal, feldspar, diatomaceous earth, quicksilver, silica.
8,200	2,050	"		32,799			
5,900	590			58,623		50,659	Barytes, feldspar, diatomaceous earth quicksilver, salt, silica.
					6,392 tons	23,468	Dolomite.
"		"		57,810		57,508	Barytes, diatomaceous earth, limestone, mineral water, quicksilver salt, silica.
					4,900 tons	25,950	Dolomite.
		"		52,697	700 tons	3,800	Feldspar.
						37,240	Barytes, coal, diatomaceous earth, quicksilver, salt, silica.
		"		73,031	8,280 tons	29,120	Dolomite.
						43,353	Barytes, coal, feldspar, diatomaceous earth, salt silica.
200	20	"		[2]84,056	5,755 tons	26,238	Dolomite.
						16,135	Barytes, coal, feldspar, diatomaceous earth, salt, silica (glass sand).
		"		[2]63,316	2,500 tons	8,750	Dolomite.
						98,089	Asbestos, coal, diatomaceous earth mineral water, salt, glass sand
[2]398,800	$65,810	[2]92,618	$98,261	$727,579		$991,876	

NAPA COUNTY,

Year	Quicksilver		Mineral water	
	Flasks	Value	Gallons	Value
Manhattan Mine output, 1863 to 1876	3,594	$235,876	[1]	
1862	444	16,139		
1863	852	35,852		
1864	2,714	124,573		
1865	3,545	162,716		
1866	2,254	119,755		
1867	7,802	360,866		
1868	9,808	450,187		
1869	6,598	302,848		
1870	5,766	330,853		
1872	4,068	258,584		
1873	4,876	321,475		
1874	5,266	423,018		
1875	11,705	1,231,132		
1876	9,453	795,470		
1877	11,303	497,332		
1878	13,127	489,637		
1879	10,810	355,649		
1880	9,446	281,961		
1881	6,830	211,730		
1882	7,746	231,063		
1883	9,013	254,467		
1884	7,785	223,790		
1885	5,188	158,234		
1886	3,891	119,648		
1887	5,656	200,788		
1888	6,247	264,717		
1889	5,150	218,875		
1890	5,402	243,090		
1891	3,934	206,535		
1892	4,896	221,544		
1893	8,612	350,595		
1894	11,505	422,809		
1895	9,705	298,016	97,275	$41,231
1896	9,318	372,500	199,397	99,700
1897	11,411	403,031	218,680	81,335
1898	12,281	459,753	159,896	81,948
1899	12,368	472,972	169,261	63,919
1900	11,696	598,322	171,567	85,964
1901	8,724	403,500	171,000	72,200
1902	7,798	388,176	158,830	109,900
1903	7,142	304,474	236,229	97,048
1904	7,859	333,006	244,400	124,000
1905	[3]5,328	199,586	386,000	104,750
1906	4,853	171 910	279,400	89,500
1907	2,380	86,870	84,000	90,500
1908	2,500	95,400	240,000	103,600
1909	2,340	98,912	145,500	101,030
1910	1,625	80,535	123,072	96,279
1911	646	29,231	152,772	92,960
1912	140	6,441	141,540	86,530
1913	287	12,065	136,750	81,997
1914	287	11,546	151,520	75,548
1915	240	11,772	142,940	73,280
	507	45,224	133,387	73,535
1916	1,150	107,525	152,764	93,370
1917	834	78,320	126,124	70,058
1918	1,297	143,850	92,512	59,620
1919	644	58,140	76,860	60,395
1920	266	18,588	80,431	38,621
1921	35	1,659	72,364	55,760
Totals	339,036	$15,412,132	4,544,471	$2,304,638

[1]Includes crushed rock, macadam, rubble, paving blocks, sand, gravel paving blocks,
[2]Napa Soda Springs have been bottling water for sale since 1860; but no segregated figures available for Napa County previous to 1894.
[3]Flasks of 76½ pounds to June, 1904; of 75 pounds since.
[4]See under 'Unapportioned.'

1862-1921.

Magnesite		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Tons	Value		Amount	Value	Substance
				$93,000	Gold and silver.
				5,000	Gold and silver.
				16,000	Gold and silver.
				22,500	Gold and silver.
				50,000	Gold and silver.
				95,000	Gold and silver.
				57,046	Gold and silver.
$1,500	$6,000			30,517	Gold and silver.
				23,689	Gold and silver.
1,440	10,240		51 tons	2,040	Infusorial earth.
2,200	17,000				
1,500	11,000				
1,143	13,671				
1,263	19,075				
1,180	17,130				
1,983	17,400				
700	11,622		8,919 tons	6,690	Limestone.
150	450	$500	7,086 tons	8,496	Limestone.
61	915	3,375	290,368 bbls.	435,552	Cement.
12	78	4,019			
		500			
		2,777			
		3,000			
		78,728			
		138,636		3,151,182	Unapportioned, 1900 to 1909.
		122,219		2,393,786	Unapportioned, 1910 to 1913.
		127,428			
55	550	172,646			
		243,759		8,000	Sandstone.
		130,316		756,380	Other minerals.
1,050	9,450	108,387		647,625	Cement, sandstone.
			715 tons	11,550	Chromite.
13,960	108,556	88,441	119,500 cu. ft.	5,500	Building stone (tuff).
				663,586	Other minerals.
40,329	387,930	110,039	844 tons	22,020	Chromite.
				752,706	Cement, clay, copper.
29,163	263,367	82,944	667 tons	38,432	Chromite.
				1,088,154	Cement, gold, silver.
10,112	86,752	70,016			
		74,550		98,382	Magnesite, volcanic ash.
		111,100		26,720	Other minerals.
[1]107,801	$981,186	$1,673,380		$11,009,562	

NEVADA COUNTY.

Year	Copper		Gold, value	Granite	
	Pounds	Value		Cubic feet	Value
1880			$2,702,362		
1881			3,700,000		
1882			3,500,000		
1883			3,000,000		
1884			2,950,000		
1885			2,577,573		
1886			3,221,038		
1887			2,719,574		
1888			2,600,000		
1889			2,249,335		
1890			1,969,613		
1891			2,207,886		
1892			1,945,406		
1893			2,087,205		
1894	83,728	$7,535	1,830,155		
1895	83,255	3,325	1,789,816		
1896	28,200	2,820	2,380,756		
1897			1,885,251	1,100	$2,200
1898	30,000	3,000	2,017,628	2,000	1,500
1899	43,438	7,084	2,171,510	2,000	1,500
1900	150,980	20,472	1,812,036		
1901	39,588	6,235	2,121,054		
1902	26,500	3,975	2,142,740	1,000	3,000
1903	4,500	585	2,458,047	2,170	4,160
1904			3,130,304	2,335	5,395
1905			3,179,715	2,155	2,570
1906			2,553,420	9,525	9,300
1907	22,082	4,418	2,162,083	12,840	9,300
1908	30,166	4,104	2,297,963	700	2,100
1909			2,660,235	1,250	2,800
1910			2,533,483	2,225	3,215
1911	1,665	209	2,199,147	1,250	3,500
1912			2,081,958		
1913			2,918,733		
1914	39	5	3,301,948		
1915	1,817	318	3,466,722		
1916	3,487	858	3,669,878	100	100
1917	40,165	10,965	3,682,947		
1918	42,203	10,424	3,070,453		
1919	[2]		2,981,312		
1920	[2]		2,872,471		
1921			2,570,162		
Totals	[1]581,813	$86,332	$109,457,217	[2]40,650	$50,640

[1]Includes crushed rock, rubble, sand, gravel.
[2]See under 'Unapportioned.'

1880-1921.

Lead		Silver, value	Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Pounds	Value			Amount, (tons)	Value	Substance
		$70,144				
		9,500				
		10,000				
		8,000				
		5,000				
		4,835				
		8,333				
		2,477				
		5,000				
		5,633				
		14,713				
		14,184				
		8,326				
		1,229				
		476		290	$5,800	Mineral paint.
		400		150	2,250	Mineral paint.
		8,584				
		8,116				
		19,476		50	1,000	Mineral paint.
				6,000	30,000	Pyrite.
		17,784		300	5,400	Mineral paint.
				5,400	28,620	Pyrite.
		66,841		2,925	17,550	Pyrite.
		18,122		78	429	Pyrite.
		6,124				
		3,252				
		9,555				
		32,523			20	Platinum.
		24,219				
		17,505				
663	$25	21,914	$1,678			
		24,926	1,874		400,000	Unapportioned, 1900-1909.
		16,506				
14,831	667	15,691				
1,785	80	22,830				
2,090	92	26,542	5,000			
145	6	27,000	2,108		60	Gems.
1,567	74	23,762	3,675		1,950	Other minerals.
1,036	71	35,741	1,225	981	12,795	Chromite.
					23,475	Manganese, platinum, tungsten.
[2]		52,335	1,600	1,962	43,449	Chromite.
					47,101	Asbestos, lead, platinum, tungsten concentrates.
[2]		72,557	1,400	3,328	116,993	Chromite.
					29,884	Asbestos, lead, manganese, platinum, tungsten concentrates.
[2]		68,731	1,976		12,034	Asbestos, barytes, chromite, copper, granite, lead, platinum.
[2]		58,476	6,528		17,531	Asbestos, barytes, copper, granite, lead.
		33,906	19,151		17,862	Asbestos, barytes, granite.
[2]22,177	$1,015	$901,268	$46,215		$814,243	

ORANGE COUNTY,

Year	Petroleum		Natural gas		Brick	
	Barrels	Value	M. cubic feet	Value	M.	Value
1889						
1890						
1892						
1894						
1895						
1897	12,000	$12,000				
1898	60,000	60,000			300	$2,400
1899	108,077	108,077			200	1,600
1900	254,397	254,397				
1901	302,652	181,591				
1902	1,103,793	824,492				
1903	1,355,104	1,016,285			1,634	13,000
1904	1,470,000	1,144,542			1,500	9,000
1905	1,510,900	711,633			118	11,800
1906	2,388,000	1,194,000			1,365	13,500
1907	2,426,750	1,456,050			3,176	26,000
1908	3,376,689	2,532,517			4,050	20,450
1909	4,370,957	2,600,709			4,090	20,650
1910	5,044,001	3,177,721			2,950	31,000
1911	6,345,275	4,097,980			1,650	14,550
1912	6,704,421	4,478,553	71,000	$5,250	1,300	9,100
1913	9,485,362	6,867,402	192,240	9,612	2,100	14,000
1914	12,758,678	8,612,108	1,867,336	112,040	1,333	19,300
1915	12,715,457	6,510,314	1,243,301	81,753	1,280	16,000
1916	13,198,591	8,750,666	2,278,922	139,281	1,186	8,300
1917	14,680,801	14,724,843	8,171,835	490,511	and tile	11,000
1918	15,730,462	22,211,412	10,420,171	693,169	477	3,869
1919	14,458,722	26,893,223	12,039 355	837,439	[2]	
1920	15,462,741	33,059,340	10,520,483	862,446	[2]	
1921	22,929,466	45,996,509	14,097,639	1,312,704	2,994	47,720
Totals	$168,153,306	$197,566,364	60,902,282	$4,544,205		[2]$290,239

[1]Includes crushed rock, rubble, rip-rap sand, gravel.
[2]See under 'Unapportioned.'

1889-1921.

Pottery clay		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Tons	Value		Amount	Value	Substance
				$6,262	Gold.
				10,943	Gold.
				9,470	Gold.
			1,500 tons	6,000	Coal.
			900 tons	4,000	Coal.
				144	Gold.
			800 tons	3,200	Coal.
			600 tons	2,400	Coal.
			25 tons	250	Gypsum.
			240 cu. ft.	120	Sandstone.
				2,407	Gold.
			500 tons	2,250	Coal.
			300 tons	1,500	Coal.
				4,000	Gold.
				250	Gold.
				150	Gold.
			408 cu. ft.	200	Sandstone.
10,500	$14,581		500 cu. ft.	250	Sandstone.
7,740	12,900				
			964 lbs.	193	Copper.
			24,472 lbs.	1,303	Lead.
			35,546 lbs.	2,000	Zinc.
9,000	18,600	$3,005	14,405 lbs.	534	Lead.
2,617	26,170	23,665		72,586	Unapportioned, 1900-1909.
500	5,000	6,443			
2,000	3,200	855			
2,100	3,400	21,248	459 tons	688	Glass sand.
15,500	20,666	36,815			
		88,315			
		9,027	364 lbs.	17	Lead.
			4 lbs.	1	Copper.
		3,773		3,066	Other minerals.
[2]		2,699		2,573	Pottery clay, copper, lead.
3,649	4,650	1,560			
[2]		1,944		18,499	Clay and clay products.
				97,632	Lead and potash.
			455 lbs.	84	Copper.
				145	Gold.
[2]		80,988	15,932 lbs.	1,275	Lead.
				7,263	Silver.
				96,595	Brick, clay, potash.
		131,301		10,796	Pottery clay, copper, gold, lead, silver.
[3]53,606	$109,167	$412,138		$369,046	

PLACER COUNTY.

Year	Gold, value	Silver, value	Copper		Brick		Pottery clay	
			Pounds	Value	M.	Value	Tons	Value
1880	$838,133	$640						
1881	850,000	6,500						
1882	800,000							
1883	810,000							
1884	887,320	5						
1885	906,301							
1886	1,071,663	1,397						
1887	855,510	556						
1888	850,000	1,000						
1889	1,245,491	1,975						
1890	1,003,602	1,045						
1891	998,495	5,921						
1892	1,159,080	2,120						
1893	1,351,250	616						
1894	1,851,215	694					22,000	$27,500
1895	1,599,635	5,273					15,000	15,000
1896	1,674,844	6,690					10,000	10,000
1897	1,524,941	6,784					7,500	7,500
1898	1,488,022	5,670					12,000	12,000
1899	1,100,081	1,206					15,000	15,000
1900	986,153	12,058					15,000	15,000
1901	900,745	4,828	11,200	$1,764			15,000	15,000
1902	843,366	3,341	3,200	368			15,000	15,000
1903	570,571	1,116	4,000	520			15,000	15,000
1904	778,355	9,320	600,000	76,500			16,100	16,100
1905	597,793	8,041	367,250	57,291			20,000	10,000
1906	[4]	[4]	200,000	38,600			20,000	15,000
1907	482,772	3,338					20,000	20,000
1908	358,096	2,194			13,000	$46,300	13,000	11,500
1909	281,372	1,492			2,083	52,300	45,300	35,250
1910	257,191	1,157			600	23,438	44,000	27,000
1911	251,298	2,585	118,624	14,828	700	18,000	43,120	29,200
1912	367,383	4,791	78,170	12,898	900	21,250	56,000	41,300
1913	220,785	2,972	429	67	1,900	40,000	63,600	47,200
1914	600,000	4,500	453	60	2,000	40,000	63,700	49,000
1915	414,319	24,543	[4]		2,000	40,000	49,126	37,536
1916	428,400	24,928	1,437,441	353,610	2,540	79,000	29,018	36,230
1917	538,686	13,885	710,601	193,994	[4]		44,097	44,097
1918	230,190	22,432	837,527	206,869	and tile	81,408	29,348	29,348
1919	170,609	3,141			[4]		[4]	
1920	151,088	2,178			and tile	149,924	65,560	76,500
1921	132,468	1,068			and tile	144,508	76,665	95,930
Totals	$32,427,225	$201,940	4,368,895	$957,369		[4]$736,128	[4]640,134	$768,191

[1]Includes granite (prior to 1916), crushed rock, rubble, rip-rap, paving blocks, sand, gravel.
[2]Barrels of lime.
[3]Tons of limestone.
[4]See under 'Unapportioned.'

1880–1921.

Lime and limestone		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
	Amount		Amount	Value	Substance
		$67,200			
		56,620	25 tons	$1,000	Asbestos.
		44,216			
		39,412			
		29,833			
		61,525			
		115,669			
		102,847			
		156,402			
[2]1,500	$9,000	198,530		280	Platinum.
[3]4,000	4,000			1,968	Quartz.
		123,448		375	Platinum
[2]15,533	8,737	116,746	2 ozs.	36	Platinum.
[2]11,699	11,950	71,130	0.66 ozs.	12	Platinum.
			50 tons	2,500	Asbestos.
[2]11,430	11,430	118,722	70 tons	3,500	Asbestos.
[3]38,869	79,768				
[2]1,727	1,710	178,460	50 tons	5,000	Asbestos.
[2]24,322	25,864	203,783		862,362	Unapportioned, 1901-1902.
			60 tons	6,000	Asbestos.
[2]10,000	12,100	242,773	200 tons	20,000	Asbestos.
			125 tons	500	Asbestos.
		218,951	300 tons	3,300	Magnesite.
			90 tons	584	Mineral paint.
[2]222,595	200,000	231,415	50 tons	500	Magnesite.
			1,000 tons	2,000	Glass sand.
		205,749	805 lbs.	35	Lead.
			2,000 tons	4,000	Quartz
[2]202,575	202,575	203,593	385 lbs.	15	Lead.
[2]1,236	2,432	98,187	711 lbs.	33	Lead
				346,810	Asbestos and copper
			744 tons	11,956	Chromite.
[4]		17,026		80,931	Granite.
				10,548	Lead, limestone magnesite
			4,287 tons	105,384	Chromite.
		10,727		30,392	Granite.
				92,624	Asbestos, brick, platinum, tile, gems, magnestie.
			4,963 tons	276,765	Chromite.
		4,266		30,882	Granite.
				21,360	Manganese and silica.
			1,018 tons	24,000	Chromite.
		4,330		98,513	Clay and clay products
				36,233	Granite.
				1,055	Other minerals.
			300 tons	7,985	Chromite.
		6,688		212,625	Granite.
				5,825	Other minerals.
		21,490		48,328	Granite.
				5,278	Chromite, mineral paint, silica
	[4]$569,566	$2,949,747		$2,361,494	

PLUMAS COUNTY.

Year	Copper		Gold, value	Silver, value
	Pounds	Value		
1880			$857,124	$181
1881			1,350,000	2,600
1882			1,250,000	
1883			950,000	
1884			900,000	
1885			840,308	
1886			834,452	62
1887			698,069	16
1888			650,000	250
1889			796,754	235
1890			490,664	811
1891			482,462	
1892			432,295	11,731
1893			362,488	14
1894			499,359	
1895			602,951	271
1896			462,527	83
1897			339,252	701
1898			369,609	
1899			381,151	15
1900			365,210	4,159
1901			401,287	2,508
1902			380,686	517
1903	1,900	$247	424,112	510
1904			270,439	464
1905	1,006	157	283,810	530
1906			229,350	1,055
1907			219,355	948
1908			254,737	3,560
1909			157,491	587
1910			187,207	1,038
1911			225,785	1,125
1912	6,963	1,149	193,237	957
1913	[2]19,533	3,028	138,368	705
1914	[2]169,089	22,489	140,000	2,900
1915	3,164,496	553,787	167,440	19,025
1916	4,932,928	1,213,500	133,385	46,542
1917	7,462,870	2,037,364	131,955	74,461
1918	11,098,016	2,741,210	125,207	156,750
1919	10,193,951	1,896,075	83,600	175,846
1920	9,583,834	1,763,425	102,097	153,373
1921	11,584,216	1,494,364	127,148	171,090
Totals	58,218,802	$11,726,795	$18,294,371	$835,020

[1]Includes crushed rock, rubble, rip-rap, sand, gravel.
[2]See under 'Unapportioned.'
[2]Includes copper erroneously credited to Lassen County in those years, on account of shipping point being Doyle, though the mines were located in Plumas County.

1880-1921.

Manganese		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Tons	Value		Amount	Value	Substance
1	$10				
2	40				
1	25				
1	30			$25	Platinum.
1	25	$5,000			
1	25				
3	75	2,000		75,575	Unapportioned, 1900-1909.
5	75	12,500	1,115 lbs.	50	Lead.
2	40		1,329 lbs.	60	Lead.
2	40	1,350	5,856 lbs.	264	Lead.
		1,700	5,621 lbs.	247	Lead.
		1,879	2,058 lbs.	80	Lead.
		5,431		32	Other minerals.
		1,988		3,920	Chromite, granite, molybdenum.
1,540	39,680	1,322	473 tons	9,800	Chromite.
				304	Gems, granite, silica.
1,544	61,754	7,750		23	Other minerals.
[2]		850		1,825	Limestone, manganese.
		62,109		2,658	Granite, lead, lime, platinum.
			2,961 lbs.	133	Lead.
		[2]	18 fine oz.	1,615	Platinum.
				4,111	Granite and miscellaneous stone.
[2]2,103	$101,819	[2]$103,879		$100,722	

RIVERSIDE COUNTY
(See page 689)

SACRAMENTO

Year	Gold, value	Silver, value	Platinum		Brick	
			Ounces	Value	M.	Value
1880	$342,514					
1881	425,000	$1,000				
1882	400,000					
1883	480,000					
1884	270,000					
1885	353,522					
1886	280,000					
1887	158,526	176				
1888	150,000					
1889	210,075					
1890	193,585					
1891	142,830	4				
1892	121,900					
1893	90,091					
1894	70,326				11,250	$56,250
1895	145,873				13,125	65,625
1896	133,050				8,700	44,200
1897	93,050				3,100	16,700
1898	57,301				11,000	44,000
1899	115,906				15,600	93,600
1900	176,007	[4]473			8,900	53,400
1901	229,034	[2]253			12,236	62,180
1902	425,894	330			10,492	78,198
1903	335,646	234			15,000	120,000
1904	419,287	75			4,500	20,000
1905	668,382	206	40	$700	18,000	130,000
1906	986,624	3,640	11	200	12,000	108,000
1907	790,973	2,034			16,078	128,624
1908	1,166,055	1,621			7,936	63,491
1909	1,669,814	2,856				
1910	1,396,874	4,606				
1911	1,812,826	3,047			13,017	76,571
1912	1,712,587	3,544			26,073	161,535
1913	2,503,633	3,406			22,535	144,191
1914	2,164,491	3,481	223	7,108	22,862	160,923
1915	2,151,813	3,151	196	6,217	9,920	82,973
1916	1,833,855	3,578	195	8,892	8,924	91,615
1917	1,919,581	4,487	157	12,453	and tile	122,886
1918	1,694,724	4,637	[3]		[3]	79,312
1919	1,714,193	5,276	[3]		[3]	
1920	1,575,033	4,534	[3]			248,433
1921	1,690,662	5,254	[3]			216,402
Totals	$33,251,537	$61,903	[2]822	$35,570		[1]$2,474,109

[1]Includes crushed rock, rubble, rip-rap, sand, gravel, paving blocks.
[2]Recalculated to 'commercial' from 'coining value' as originally published.
[3]See under 'Unapportioned.'
[4]State Prison use, value estimated, as none reported.

COUNTY, 1880-1921.

Granite		Natural gas		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Cubic feet	Value	M. Cubic feet	Value		Amount	Value	Substance
75,000	[2]$35,000						
85,000	[2]45,000						
				$12,018			
207,845	62,339			28,074		$1,500	Pottery clay.
4,840	4,000	15,000	$12,000	14,137			
1,524	1,145	12,000	10,000	13,105			
2,137	3,139	11,750	11,750	14,157			
2,635	2,882			7,926		316	Copper.
288	136	38,550	31,200	19,380			
20,471	2,222	31,680	30,518	18,176			
5,164	4,458	39,200	39,200	22,103			
4,327	1,614	43,564	43,564	32,386			
10,905	1,779	60,225	52,874	18,141			
26,105	4,625	60,225	52,874	13,936			
44,151	44,151	55,000	55,000	151,477			
31,660	23,745	60,000	60,000	235,210		314,438	Unapportioned, 1900-1909
68,654	59,947	49,203	49,203	164,592			
45,630	2,307	90,000	83,890	131,037			
		100,000	96,000	197,733			
		72,000	36,000	238,476			
		80,000	40,000	253,235			
		108,000	54,000	284,127			
		[3]		194,718	227 lbs.	16	Lead.
						46,000	Pottery clay, natural gas.
		[3]		199,839		27,000	Other minerals.
					310 tons	410	Pottery clay.
		[3]		262,689		61,235	Natural gas, platinum, potash
		[3]		276,732		113,000	Clay and clay products.
						61,395	Natural gas and platinum.
		[3]		180,563		57,591	Natural gas, platinum.
	39,469	[3]		386,911		56,196	Natural gas, platinum.
636,366	$337,958	[4]926,397	$758,073	$3,370,878		$739,097	

SAN BENITO

Year	Quicksilver		Lime		Gypsum	
	Flasks	Value	Barrels	Value	Tons	Value
1865	[2]17,455	$943,617				
1866	6,525	346,673				
1867	11,493	527,529				
1868	12,180	559,062				
1869	10,315	473,459				
1870	9,888	567,373				
1871	8,180	516,158				
1872	8,171	538,714				
1873	7,735	621,353				
1874	6,911	720,899				
1875	8,432	709,553				
1876	7,272	319,968				
	[2]2,000	139,000				
1877	6,316	235,587				
1878	5,138	169,040				
1879	4,425	132,048				
1880	3,209	99,479				
1881	2,775	82,778				
1882	1,953	55,123				
1883	1,606	46,173				
1884	1,025	31,263				
1885	1,144	35,178				
1886	1,406	40,913				
1887	1,890	80,088				
1888	1,320	56,100				
1889	980	44,100				
1890	977	51,293				
1891	792	35,838				
1892	848	34,523				
1893	865	31,936				
1894	1,005	30,861	40,000	$44,000	762	$9,144
1895	1,100	36,000	41,000	41,000	750	8,250
1896	1,335	46,725	40,000	35,000	300	3,000
1897	3,605	135,185	25,000	18,500	300	2,000
1898	5,000	190,000			500	4,500
1899	4,780	245,000	16,600	18,675	100	700
1900	3,990	180,000	7,300	8,800		
1901	4,800	242,300				
1902	7,291	306,081				
1903	8,180	344,251				
1904	[3]8,480	314,000				
1905	7,764	279,651	15,000	15,000		
1906	7,203	262,909				
1907	7,675	292,878	8,453	8,453		
1908	9,000	405,792			2,000	8,000
1909	8,900	440,241			6,000	34,576
1910	10,800	488,700			12,000	50,000
1911	9,775	449,748			10,000	30,625
1912	9,743	409,596			8,000	32,000
1913	9,719	390,995			11,000	35,000
1914	6,633	325,349			7,000	21,000
1915	6,291	[4]75,370				
1916	11,110	1,032,156				
1917	11,150	1,057,770				
1918	10,715	1,234,027				
1919	7,409	668,989				
1920	3,887	296,942				
1921	[5]					
Totals	[1]341,170	$18,841,334	193,353	$189,428	58,712	$238,795

[1]Includes crushed rock, rubble, rip-rap, sand, gravel
[2]Production of New Idria Mine from 1858-1866; yearly details not obtainable, though New Idira began operation in 1850.
[3]Estimated output of Cerro Bonito, Monterey and Stayton mines, 1870-1877; yearly details concealed under heading of "various mines" in early reports.
[4]Includes bituminous rock.
[5]Flasks of 75 pounds since June, 1904; 76½ pounds previously
[6]See under 'Unapportioned.'

COUNTY, 1865-1921.

Mineral water		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Gallons	Value		Amount	Value	Substance
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----------	----------	----------	58 tons	$2,280	Antimony.
----------	----------	$19,000	----------	----------	
5,000	$300	6,000	2 tons	70	Antimony.
500	100	2,638	----------	----------	
900	450	[4]17,500	45 tons	135	Coal.
1,000	500	[4]25,240	19 tons	380	Asphalt.
10,000	3,750	13,000	100 tons	100	Limestone.
500	125	[4]12,794	----------	----------	
600	150	22,000	----------	----------	
10,000	400	23,200	----------	----------	
----------	----------	16,500	206 tons	2,472	Asphalt.
500	500	64,994	----------	----------	
2,600	3,120	23,000	----------	----------	
26,000	2,600	48,661	----------	----------	
26,000	2,600	63,220	----------	16,500	Gems.
3,120	1,560	83,709	----------	130,000	Unapportioned, 1900-1909.
3,500	1,400	94,243	----------	----------	
3,600	1,540	107,558	----------	----------	
26,000	1,240	83,232	----------	----------	
7,000	4,500	119,500	----------	----------	
700	280	110,630	----------	----------	
1,200	300	155,000	260 M.	1,560	Brick.
			2,500 tons	9,500	Dolomite.
			----------	335	Other minerals.
[6]	----------	155,250	8,100 tons	25,515	Dolomite.
			----------	526	Antimony and mineral water.
[6]	----------	101,148	----------	59,245	Antimony, chromite, magnesite, mineral water.
			7,000 tons	15,000	Dolomite.
			130 tons	7,000	Chromite.
[6]	----------	103,295	5,000 tons	20,625	Dolomite.
			5,340 tons	48,060	Magnesite.
			----------	124,456	Cement, manganese, mineral water.
[6]	----------	164,300	7,000 tons	24,500	Dolomite.
			----------	418,687	Cement, magnesite, mineral water.
[6]	----------	207,250	18,000 tons	57,750	Dolomite.
			----------	921,082	Cement, magnesite, mineral water.
[6]	----------	269,334	----------	1,116,759	Asbestos, cement, dolomite, magnesite, mineral water, quicksilver.
[6]128,720	$25,415	$2,112,196	----------	$3,002,537	

SAN BERNARDINO COUNTY

(See Page 689)

SAN DIEGO

Year	Gold, value	Silver, value	Brick		Gems, value	Granite, value	Mineral water	
			M.	Value			Gallons	Value
1880	$81,558							
1881	60,000							
1882	100,000							
1883	50,000	5,000						
1884	65,000	5,000						
1885	95,125	2,000						
1886	140,450	78,758						
1887	66,900	198,537						
1888	160,000	192,000						
1889	275,440	25,740						
1890	453,800	100						
1891	467,000							
1892	396,518	2,051						
1893	105,860							
1894	266,409	190						
1895	344,308	600					48,000	11,500
1896	560,578	40					45,000	35,000
1897	592,328						25,000	5,000
1898	673,196	300	672	2,688		4,875	4,320	3,000
1899	333,650		860	4,300		8,150	12,000	6,000
1900	335,937	[2]9,500	734	3,261	500	9,900	6,500	3,250
1901	413,320	[2]2,800	1,158	5,791	20,000	22,400	6,000	3,000
1902	338,877	1,994	688	3,440	150,000	13,175	5,158	1,289
1903	461,516	1,444	2,150	11,150	100,000	16,308	6,000	3,000
1904	334,097	100	3,824	23,700	136,000	7,851		
1905	109,712	100	3,190	23,350	66,000	10,250		
1906	[3]		3,950	34,900	284,500	10,250		
1907	7,455	35	4,474	36,430	206,336	23,650	2,000	2,000
1908	6,920	86	2,112	16,719	121,500	10,000	9,810	11,772
1909	12,812	1,721	5,844	38,946	125,000		10,210	12,022
1910	[4]		8,813	62,647	110,300		40,550	30,110
1911	[4]		9,500	68,000	25,000		60,090	87,020
1912			10,500	80,000	12,500		52,060	17,218
1913			9,384	68,400	7,465		41,500	15,225
1914			5,457	56,392	1,150		8,865	911
1915	1,364	9	1,260	21,025	2,465		10,350	1,035
1916			4,001	36,842	2,710	[3]	[3]	
			and tile					
1917		[3]		21,423	[3]	[3]	[3]	
1918				29,080		[3]	[3]	
1919	1,470	12		[3]	[3]	15,215	[3]	
1920				87,612	2,100	7,838		
1921	[3]	[3]		[3]	1,405	22,444	70,924	9,161
Totals	[2]$7,312,200	[2]$528,117		[2]$741,096	[2]$1,374,931	[2]$182,306	[2]604,337	$257,513

[1]Includes crushed rock, rubble, rip-rap, sand, gravel, paving blocks, grinding-mill pebbles.
[2]Recalculated to 'commercial' from 'coining value' as originally published.
[3]See under 'Unapportioned.'
[4]Included under Imperial County production.

COUNTY, 1880-1921.

Salt		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Tons	Value		Amount	Value	Substance
700	$5,000	$49,374	50 tons	$2,250	Asbestos.
700	5,000	25,000			
600	4,800	3,573			
650	5,850	23,390			
600	5,000	5,359			
600	5,000	18,198	31,000 lbs.	1,317	Lead.
			124 tons	4,600	Lithia mica.
600	4,000	14,403	440 tons	11,000	Lithia mica.
1,060	9,620	6,887	1,100 tons	27,500	Lithia mica.
7,900	7,900	14,175	822 tons	31,880	Lithia mica.
		42,597	700 tons	27,300	Lithia mica.
		200,192	641 tons	25,000	Lithia mica.
		16,507	4,808 lbs.	750	Copper.
			25 tons	276	Lithia mica.
6,000	5,000	49,738			
			13,246 lbs.	2,659	Copper.
7,000	55,000	28,500	971 lbs.	52	Lead.
			4,000 cu. ft.	12,000	Marble.
7,000	60,000	37,122			
15,000	60,000	33,510		214,634	Unapportioned, 1900-1909.
8,000	24,000	147,817			
13,000	37,500	201,488			
12,450	31,330	164,115	403 tons	500	Pottery clay.
20,500	51,750	170,014	838 tons	2,840	Pottery clay.
15,300	46,200	210,250	30 lbs.	4	Copper.
				1,365	Other minerals.
17,616	19,616	163,723	3,008 lbs.	526	Copper.
			23 lbs.	1	Lead.
			2,150 tons	175,804	Potash.
[2]		163,925	16,806 lbs.	4,134	Copper.
				13,140	Granite, lithia, mineral water, salt.
			283 tons	613	Pottery clay.
			153,349 lbs.	43,502	Copper.
4,500	9,750	125,855	5,252 tons	1,492,123	Potash.
				21,055	Pottery clay, gems, granite, lithia, mineral water, molybdenum, silica, silver.
			4,143 lbs.	1,023	Copper.
10,631	61,717	184,158	700 tons	3,600	Feldspar.
			10,392 tons	1,578,874	Potash.
				83,698	Granite, lithia, mineral water.
12,400	52,800	141,996		62,929	Clay and clay products.
				68,790	Copper, gems, lithia, mineral water, potash, silica.
			5,852 tons	57,522	Pottery clay.
15,300	77,100	333,847	2,953 tons	17,715	Feldspar.
			7,557 tons	18,893	Silica (glass sand).
				191,602	Lithia, magnesium salts, mineral water, tantalum ore (columbite).
				92,600	Clay and clay products.
[2]		187,922	370 tons	725	Glass sand.
			1,850 tons	11,100	Feldspar.
				176,036	Gold, lithia, magnesium salts, marble, salt, silver.
[3]178,107	$643,953	$2,763,635		$4,481,932	

SAN FRANCISCO COUNTY, 1894-1921.

Year	Brick		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
	M.	Value		Amount	Value	Substance
1894			$296,864	20 tons	$25	Limestone.
1895			379,696			
1896	5,000	$37,500	285,167			
1897	4,500	28,500	86,217			
1898			129,595			
1899			275,604			
1900			58,400			
1901			156,947			
1902	25,800	238,800	156,300			
1903	33,403	294,326	508,460			
1904	39,509	367,911	332,220			
1905	32,585	310,685	114,357			
1906	7,208	58,289	106,250	8,500 tons	10,500	Glass sand.
1907	44,578	434,140	97,273	4,000 tons	60,000	Asphalt.
1908	41,837	345,155	95,259	1,500 tons	15,000	Asphalt.
1909	31,430	221,332	150,382	850 tons	9,800	Asphalt.
					30,000	Unapportioned, 1900-1909.
1910			108,126	1,000 tons	12,000	Asphaltum.
1911			119,636			
1912			151,147			
1913			110,551			
1914			119,889			
1915			128,270			
1916			76,437			
1917			107,957			
1918			16,463			
1919			65,541			
1920			77,553		2,800	Other minerals.
1921			41,562			
Totals	265,850	$2,336,638	$4,352,213		$140,100	

[1]Includes crushed rock, rubble, sand, gravel.

Year	Gold, value	Silver, value	Coal		Salt		Magnesite		Brick		Pottery clay		Lime and limestone		Miscellaneous stone, value	Mineral water		Miscellaneous and unapportioned		
			Tons	Value	Tons	Value	Tons	Value	M.	Value	Tons	Value	Barrels	Value		Gallons	Value	Amount	Value	Substance
1891																		125,289 lbs.	$27,564	Tin.
1892																		126,000 lbs.	32,400	Tin.
1893	$42,412																			
1894	93,222		7,891	$16,142	1,981	$3,962					3,700	$4,230	24,000	$19,200	$24,000			50 tons	100	Gypsum.
1895	283,106	$2,559	7,950	15,000	4,000	8,000					7,700	9,400	†10,000	10,000	27,953			18 tons	144	Gypsum.
													20,000	20,000						
1896	262,800	13,450	4,962	9,964	4,317	8,634					22,019	22,750	†6,000	6,000	17,000					
													15,000	15,000						
1897	147,227	4,000	6,282	15,705	4,840	9,680					11,700	11,250						6 tons	160	Mineral paint.
1898	189,188	1,334	6,200	15,000	5,000	10,000			580	$5,800	9,000	10,450	8,000	7,000	8,000			10 tons	200	Asbestos.
1899	183,010	2,000	7,905	19,762	3,600	7,200			4,780	39,500	14,900	16,800	13,476	13,476	8,850			20 tons	750	Asbestos.
																		1,000 tons	1,500	Glass sand.
1900	149,292	6,848	6,000	15,000	4,000	8,000			1,967	28,542	24,560	18,089			57,600			50 tons	1,250	Asbestos.
																		200 tons	200	Glass sand.
1901	109,747	2,150	2,800	7,000	4,000	12,000			3,201	$9,787	30,489	16,624	18,000	18,000	53,400			110 tons	4,400	Asbestos.
																		500 tons	500	Glass sand.
																		300 tons	3,000	Gypsum.
1902	47,947	94	1,200	3,000	20,000	20,000			4,153	114,165	34,320	38,920	20,000	17,000	92,995			100 tons	500	Gypsum.
1903	13,453	136			10,000	20,000			3,817	104,020	53,857	65,332	†9,000	8,500	152,253‖			12,000 cu. ft.	1,500	Marble.
													25,000	21,250				5,000 cu. ft.	2,500	Marble.
1904	7,488	80			15,000	15,000			4,712	71,380	41,966	49,232	20,000	20,000	415,306			20 tons	2,400	Bismuth.
1905	35,000	346							2,638	69,195	49,720	97,970	20,000	20,000	360,168			2,500 cu. ft.	2,500	Marble.
																			2,500	Gems.
1906	4,432	251							4,667	92,140	60,123	57,712	14,000	20,000	171,628				2,500	Gems.
1907	3,836	26					75	$1,750	3,800	102,000	87,260	174,713	6,000	6,500	571,052			3,000 cu. ft.	9,000	Marble.
																		50 tons	50	Gems.
																		3,206 lbs.	170	Lead.
																		502 lbs.	100	Copper.
1908	5,884	112					2,000	4,000	4,803	74,686	71,231	89,752	†8,000	8,000	448,478			10 tons	100	Asbestos.
													8,300	8,300				22,665 lbs.	2,816	Copper.
																		3 tons	500	Asbestos.
1909	189	24					324	3,888	22,037	265,550	86,028	97,971	3,000	3,000	121,827	30,000	$3,000	400 tons	2,000	Gypsum.
																		9,000 lbs.	1,016	Copper.
																			877,102	Unapportioned, 1900-1909.
1910	5,585	28					500	4,000	10,287	91,543	101,411	156,844	†141,722	120,859	116,357	90,000	9,000	150 tons	1,500	Mineral paint.
																			250	Gems.
1911	†20,623	2,121					575	4,600	3,675	58,572	67,295	79,961			474,018	90,350	11,400		250	Gems.
																		6,753 lbs.	844	Copper.
																		800 tons	3,000	Glass sand.
																			800	Gems.
1912	20,202	254					378	8,780	2,509	30,000	72,046	93,418	†90,831	63,582	567,309	44,316	4,750	929 lbs.	42	Lead.
																		6,000 lbs.	980	Copper.
																			3,532,587	Other minerals, 1910-1912.
																		1,000 tons	3,000	Gypsum.
1913	12,501	104					569	4,552	3,530	30,306	88,936	89,963			530,544	200,000	20,000		1,000	Gems.
																		9,971 lbs.	1,491	Copper.
																			1,372,314	Other Minerals.
1914	10,000	100							1,010	36,713	70,136	59,620			206,802	100,000	2,000	36,102 lbs.	4,862	Copper.
																		6,350 tons	7,925	Gypsum.
																			1,241,924	Other minerals.
1915	10,709	1,522							1,055	16,880	59,514	54,840			213,440	200,000	10,000	3,450 tons	13,650	Gypsum.
																			1,022,514	Cement, potash, silica.
																		22,072 lbs.	1,507	Lead.
																		23,825 lbs.	4,169	Copper.
																		58,617 lbs.	14,420	Copper.
																		8,660 cu. ft.	4,330	Granite.
1916	7,855	338					"		1,831	28,393	56,228	56,090			159,555	"		4,220 tons	8,340	Gypsum.
																		350 lbs.	24	Lead.
																		991 tons	1,624	Silica.
									and tile										952,505	Cement, feldspar, magnesite, manganese, mineral water, potash.
																		28,838 lbs.	7,573	Copper.
																		11,097 tons	422,500	Feldspar.
																			3,461	Granite.
1917	"	"					"		165,892	70,798	55,491				72,364	"		1,923 tons	3,001	Gypsum.
																		1,157 lbs.	100	Lead.
																		770 tons	2,400	Silica.
																			1,227,073	Cement, fluorspar, gems, magnesite, manganese, mineral water, potash, silver.
																		19,485 lbs.	3,515	Copper.
1918	392	1,541					"		296,540	48,195	80,454				127,962	"		2,288 tons	11,733	Feldspar.
																			3,320	Granite.
																		3,791 tons	152,603	Manganese.
																		1,400 tons	4,800	Silica.
																			1,004,787	Cement, fluorspar, gems, gypsum, lead, magnesite, mineral water, potash.
																		10,590 lbs.	1,970	Copper.
1919	213	415	"				"		224,370	42,207	61,906				102,399	"			17,875	Granite.
																		200 tons	425	Gypsum.
																		1,808 tons	49,324	Manganese ore.
																		3,034 tons	15,112	Silica.
																			2,165,760	Cement, coal, feldspar, fuller's earth, lead, magnesite, mineral water, potash.
																		1,094 tons	6,108	Feldspar.
1920			"						489,209	76,317	126,313				296,499	"			26,408	Granite.
																		3,195 tons	12,581	Silica.
																			4,171,020	Cement, coal, gems, gypsum, mineral water, potash.
																		2,094 tons	14,808	Feldspar.
1921			"						376,553	84,234	111,219				431,671	56,400	2,945		12,852	Granite.
																		1,625 tons	6,357	Silica.
																			3,927,403	Cement, coal, gems, potash.
Totals	$1,649,109	†$30,874	†51,210	$116,573	76,738	$122,476	†4,921	$31,570		$2,921,639	1,440,380	$1,786,214		$423,697	$5,830,748	†811,236	$62,695		$22,012,696	

*Riverside County was created March 11, 1893, from portions of San Bernardino and San Diego counties.
†Includes granite, crushed rock, gravel, sand, paving blocks.
‡Includes part of Los Angeles County.
§Tons of limestone.
‖See under 'Unapportioned'.

Year	Gold, value	Silver, value	Copper		Lead		Borax, value	Gypsum		Salt		Cement		Lime		Limestone		Brick		Marble		Miscellaneous stone†, value	Gems, value	Miscellaneous and unapportioned		
			Pounds	Value	Pounds	Value		Tons	Value	Tons	Value	Barrels	Value	Barrels	Value	Tons	Value	M.	Value	Cubic feet	Value			Amount	Value	Substance
1880	$2,000	$100,000																								
1881	30,000	150,000																								
1882	30,000	1,050,000																								
1883	32,000	2,350,000																								
1884	23,000	2,362,436																								
1885	54,484	1,204,749																								
1886	27,830	1,133,288																								
1887	28,000	1,200,000																								
1888	16,737	621,820																								
1889	17,335	785,465																								
1890	52,979	711,157																								
1891	47,037	87,072																								
1892	115,000	447,029																								
1893	130,420	148,243					$726,509			1,000	$3,000	8,000	$21,600	40,000	$32,000	5,000	$6,250					$31,622				
1894	131,360	219,410					555,900			3,841	20,101	10,253	32,556	87,864	87,674	30,000	30,000					37,672				
1895	86,723	130,714					450,500			3,000	15,000	9,000	27,000	37,427	34,977	17,500	17,500			500	$3,000	28,178				
1896	100,373	54,407					1,040,000					18,000	63,000	12,000	12,000											
1897	261,512	52,000					1,120,000					50,000	150,000	30,000	30,000	6,600	6,600	2,000	$16,880	1,200	3,000	15,040				
1898	164,599	125,004	1,369,878	$232,339			1,106,000					60,000	180,000	16,000	16,160	10,440	14,810	1,000	8,000	4,500	625	11,275				
1899	247,049	72,752	1,220,000	207,000	10,000	$400	990,340					52,000	121,000	26,241	33,281	7,067	7,067					65,757	$30,000			
1901	309,633	67,164	50,000	7,875	500	20	838,130					71,500	159,942	28,783	43,025	51,210	76,710					166,777	20,000			
1902	394,936	58,977	338,480	41,002	35,340	2,676	2,193,600					90,000	273,600	76,582	63,832	48,396	51,578	50	1,500	5,005	15,600	192,400	11,600			
1903	381,197	59,102	60,400	7,252	14,000	504	480,000					100,000	157,000	39,023	28,892	52,813	64,613	100	8,000	30,000	41,000	260,764	10,000			
1904	595,828	13,025	169,477	17,270										25,000	21,500	38,421	42,275	2,500	17,500	31,116	53,400	158,886		4,000 cu. ft.	$2,000	Sandstone.
1905	473,993	10,565	52,003	8,206										17,024	14,740	47,387	51,375			46,100	40,000	147,167	65,000			
1906	354,839	32,765	514,031	99,207										29,916	17,146	19,837	33,990	1,800	13,500	7,203	25,000	38,476		10 tons	5,500	Tungsten.
1907	135,076	81,330	514,287	102,856	34,211	1,822						8,000	8,000	5,000	3,000	74,709	126,186	1,665	15,555	6,482	29,946	187,982				
1908	189,511	35,794	516,949	71,079	402,570	17,218		20,000	$70,000	90	650					101,236	97,466	1,650	7,250	150	500	231,242	200			
1909	40,071	12,570	316,300	40,418	340,200	19,554		12,500	43,000	3,500	14,000					22,197	41,395	1,709	11,965	50,000	125,000	173,777	200			
																								300 tons	3,000	Pottery clay.
																									4,055,855	Unapportioned, 1900 1909.
																								430 tons	4,300	Pottery clay.
1910	55,093	10,164	5,412	689	134,312	5,972		31,519	70,357	3,000	9,000					224,610	157,715	1,910	11,460			95,126	1,120	168,000 gals.	22,000	Mineral water.
																								60 tons	849	Barytes.
																								100 tons	1,000	Soapstone.
1911	127,367	25,542	666,489	83,311	161,338	7,260		20,584	66,505	2,680	13,800					243,102	177,080			135	405	167,213		920 tons	4,060	Pottery clay.
1912	293,990	40,962	1,937,185	319,636	94,832	4,268		21,000	67,000	3,669	12,600	2,301,000	2,990,200			80,180	97,887	1,340	8,040			380,824	450	350 tons	1,750	Pottery clay.
																								300 tons	1,200	Mineral paint.
																								50 tons	550	Barytes.
1913	356,534	44,413	497,852	77,167	279,241	12,387		25,000	74,000	3,049	10,573	»				121,544	113,859	25,896	35,464	350	2,100			364,312	550	4,500 gals.	25,000	Mineral water.
																									1,291,304	Other minerals.
																								44,100 gals.	2,100	Mineral water.
1914	205,000	40,000	10,069	2,536	45,110	1,759		17,332	49,450	482	2,892	»				84,637	93,100	23,006	20,880	25	1,250			131,978		80 tons	561	Mineral paint.
																								140 tons	490	Glass sand.
																									1,240,575	Other minerals.
																								37,480 gals.	7,350	Mineral water.
1915	410,957	64,165	209,440	36,652	169,183	7,952		»		542	3,324	915,000	980,000	»		68,500	68,500	400	2,400	»		178,528		364 tons	840,917	Tungsten concentrates.
																								39,848 lbs.	4,941	Zinc.
																									82,316	Dolomite, gypsum, lime, manganese, marble, min eral paint, soapstone and talc.
																										Granite.
																								7,500 cu. ft.	2,500	
																								40,500 gals.	6,500	Mineral water.
1916	270,813	67,146	1,577,001	358,164	673,891	46,492		»		2,355	13,830	1,036,000	1,246,000	151,670	54,317	65,174	63,486	»				172,454	1,000	1,921 tons	3,913,414	Tungsten concentrates.
																								707,062 lbs.	98,746	Zinc.
																									217,265	Brick, dolomite, feldspar, gypsum, manganese, min eral paint, pumice, potash, talc, strontium.
																										Granite.
																									2,350	
																									157,571	Lime and limestone.
																								235 tons	6,050	Manganese.
																								11,300 gals.	1,620	Mineral water.
1917	154,976	88,030	1,220,356	333,157	2,293,541	197,345		»		»		1,323,931	1,672,654	»		»		»				111,158	»	14,370 tons	2,049,120	Potash.
																								3,650 tons	37,000	Strontium.
																								1,342 tons	2,447,226	Tungsten concentrates.
																								38,735 lbs.	3,951	Zinc.
																									114,834	Brick, pottery clay, dolomite, feldspar, gems, gyp sum, iron ore, mineral paint, salt, soda, talc.
																										Granite.
																								270 tons	$10	Dolomite.
																								601,000 gals.	60,150	Mineral water.
1918	20,225	88,712	1,680,098	390,607	667,078	47,426		»				1,027,035	1,433,962	»		10,852	13,323			»		48,451	»	27,545 tons	3,425,443	Potash.
																								420 tons	4,200	Talc.
																								2,900 tons	33,000	Strontium.
																								1,347 tons	1,911,966	Tungsten concentrates.
																								2,524 lbs.	257	Zinc.
																									122,348	Gems, granite, gypsum, iron ore, lime, magnesite manganese, marble, mineral paint, salt.
																										Granite.
																								880,000 gals.	32,000	Mineral water
1919	39,769	427,717	256,933	47,700	165,796	5,607	»	19,613	50,154			1,678,943	1,717,998	»		»		»		»		183,388	»	21,171 tons	1,670,919	Potash.
																								3,891 tons	19,845	Talc.
																									443,492	Borax, pottery clay, dolomite, gems, lime, tungsten.
																									800	Pottery clay.
1920	78,195	1,212,987	5,388	991	115,876	9,270	440,411	»		202	1,220	1,681,283	3,051,079	»		»		»		»		169,991	»	95 tons	136,726	Potash.
																								1,110,100 gals.	1,082,937	Mineral water.
																								13,435 tons	336,551	Dolomite, gems, granite, gypsum, iron ore, lime. limestone, soda, talc.
																										Granite.
																								683 tons	22,980	Calcium chloride.
1921	217,568	3,210,706	17,054	2,200	22,812	1,027	338,095	»		13,279	67,782	1,964,926	4,633,437	»		21,862	100,195					145,572	»	7,292 tons	211,067	Potash.
																								2,750 tons	43,375	Talc.
																									374,726	Pottery clay, dolomite, feldspar, gems, granite, gyp sum, iron ore, lime, mineral water, pumice, soda.
Totals	$6,887,361	$18,988,901	13,516,466	$2,308,510	5,601,661	$381,859	*$10,609,295	*167,548	$490,166	*41,540	$187,772	11,869,801	$18,939,328	*854,225	$711,823	$1,280,591	$1,423,647	*15,009	$125,721	*185,388	$343,076	$4,062,295	130,129		$26,682,615	

†Includes crushed rock, rubble, rip rap, sand, gravel.
*Combined annual production 1910, 1911, 1912.
§See under "Unapportioned."

SAN JOAQUIN

Year	Brick		Natural gas	
	M.	Value	M. Cubic feet	Value
1885				
1886				
1894				$75,000
1895				100,000
1896	7,000	$35,000		85,157
1897	5,500	22,000		57,411
1898	6,500	34,000		57,289
1899	5,500	27,000	102,960	84,880
1900	2,000	20,000	27,612	19,862
1901	2,000	20,000		60,456
1902	[2]3,000	[2]18,000	81,481	67,868
1903	[2]4,000	[2]24,000	88,134	44,399
1904	7,500	45,000	106,437	47,635
1905	11,400	68,000	100,950	53,915
1906	7,500	49,500	103,450	55,115
1907	12,250	81,000	101,000	52,723
1908	28,412	189,560	60,903	49,194
1909	8,088	242,634	71,883	149,063
1910	8,744	212,538	313,392	159,451
1911	5,275	49,650		114,433
1912	6,128	64,874		145,166
1913	6,314	73,768	142,730	67,967
1914	5,793	82,890	154,872	25,900
1915	3,000	75,000	161,923	143,974
1916	10,189	158,722	182,441	141,605
1917	also tile	185,060	348,146	72,585
1918		305,475	202,453	60,405
1919		231,478	200,943	76,200
1920		[4]	200,443	74,957
1921		294,712	204,057	79,571
Totals		[3]$2,609,861		$2,222,181

[1]Production of manganese ore in California began at the Ladd Mine, San Joaquin County, in the Tesla District in 1867. When shipments of this ore to England ceased late in 1874, upwards of 5,000 tons had been produced by that property. Annual amounts earlier than 1894 not separable.

[2]Estimated.

[3]See under 'Unapportioned'.

[4]Includes crushed rock, rubble, rip-rap, sand, gravel.

COUNTY, 1885-1921.

Manganese		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Tons	Value		Amount	Value	Substance
[2]				$2,500	Gold.
55	$550		275 tons	343	Pottery clay.
280	2,800				
			273 tons	2,730	Asphalt.
			3 tons	90	Infusorial earth.
		25,000			
60	1,080		2,000 tons	13,000	Clay.
				214,835	Unapportioned, 1900-1909.
260	4,160				
			25,510 tons	25,510	Clay.
		900	1,494 tons	18,522	Clay.
			3,000 tons	4,000	Glass sand.
150	1,500	19,440		200	Other minerals.
460	7,400	21,620		400	Other minerals.
6,493	115,460	53,075			
6,320	157,500	55,003		72	Other minerals.
4,281	117,709	47,085		71,299	Gold, platinum, silver.
343	10,274	59,510		71,538	Gold, platinum, silver.
[3]		63,077		333,068	Brick, gold, manganese, platinum, silver
425	3,750	72,815		23,530	Other minerals.
[2]19,127	$422,183	$417,525	29,835 tons	$781,637	

SAN LUIS OBISPO

Year	Bituminous rock		Brick		Chromite		Gold, value	Mineral water	
	Tons	Value	M.	Value	Tons*	Value		Gallons	Value
1876[3]									
1877									
1878									
1879									
1880					[2]17,030	$184,704			
1881					1,790	24,000			
1882							$5,000		
1883					5,558	99,200			
1884									
1885					670	8,880			
1886					980	13,140	9,164		
1887	36,000	$180,000			600	7,980	1,740		
1888	43,000	215,000			300	2,550	3,000		
1889					4,300	60,865	6,260		
1890					687	5,496	8,800		
1891					74	592	1,785		
1892							1,097		
1893							600		
1894	9,432	32,263			[4]800	10,500	1,200		
1895	6,354	17,600	750	$3,750	[4]700	6,650	3,000		
1896	5,113	11,464			[4]200	2,000	3,000		
1897	2,291	5,117					2,500	7,800	$1,960
1898	4,788	18,927	830	5,280			1,000	800	400
1899	10,818	40,288	650	3,500					
1900	3,346	12,905	500	4,000					
1901	9,472	33,070	650	5,200			300	24,000	6,000
1902	1,790	2,327	900	7,650			2,399	4,500	800
1903	3,365	7,572	750	6,000			1,840		
1904							630	4,000	1,000
1905	2,533	6,348	400	3,200			300		
1906	2,533	6,644	300	2,400					
1907	2,167	8,128	2,000	16,000			316	4,800	1,000
1908	5,077	21,875	1,440	12,900				4,800	1,056
1909	2,731	6,369	2,245	19,605				4,000	1,000
1910	1,982	4,016	900	8,000				6,000	1,600
1911	2,710	5,230	2,000	18,000				2,000	1,000
1912	807	1,472						2,500	625
1913	609	1,149	1,750	17,500			124	1,500	600
1914	579	1,118						1,000	250
1915	[5]				[5]			4,500	675
1916	[5]		4,150	45,500	1,855	27,733		2,500	475
1917	[5]		[6]		4,109	92,846		1,500	300
1918	[5]				10,443	539,423	[6]	[6]	
1919	[6]				1,158	26,431			
1920					399	10,440			
1921					[6]			[6]	
Totals	[1]157,497	$638,882	[2]20,215	$178,485	[2]51,653	$1,129,430	[2]$54,055	[2]76,200	$18,741

*Copper was weighed in tons of 2,360 pounds and chromite in tons of 2,240 pounds, but here converted to 2,000 pounds.

[1]The total production of asphaltum up to 1894 was reported as 800 barrels. This production reduced to tons is shown under 1894.

[2]Although a great deal of chromic iron ore was mined and marketed during the '70's, there are no records of yearly production. The above figure for 1880 represents the total shipments from San Luis Obispo up to August, 1880.

[3]There are no records of annual mineral production for the period of 1865-1876, but there was a small annual gold production from shallow placers before this, and these placers have no doubt yielded considerable gold never reported. The same observation applies to a number of small quicksilver properties worked in the '70's.

[4]Concentrates.

[5]Includes crushed rock, rubble, sand, gravel; also granite and sandstone prior to 1915

[6]See under 'Unapportioned'.

COUNTY, 1876-1921.

Petroleum		Quicksilver		Miscellaneous stone[5], value	Miscellaneous and unapportioned		
Barrels	Value	Flasks	Value		Amount	Value	Substance
----------	----------	6,428	$282,832	----------	[2]236,000 lbs.	$7,287	Copper.
----------	----------	3,310	123,463	----------	----------	----------	
----------	----------	2,151	70,768	----------	----------	----------	
----------	----------	779	2,358	----------	----------	----------	
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----------	----------	----------	----------	$8,772	[1]220 tons	4,400	Asphaltum (rock).
					500 cu. ft.	20,000	Cal. onyx.
----------	----------	20	800	45,520	400 cu. ft.	4,000	Cal. onyx.
----------	----------	101	3,400	17,407	----------	----------	
----------	----------	101	3,939	13,500	238 cu. ft.	1,000	Cal. onyx.
----------	----------	384	11,660	47,000	----------	----------	
----------	----------	394	17,700	6,740	16 tons	320	Asphaltum (rock).
----------	----------	515	23,886	44,835	----------	----------	
----------	----------	840	41,513	----------	2,000 tons	30,000	Asphaltum (rock).
----------	----------	3,312	147,215	----------	4,000 tons	40,000	Asphaltum (rock).
----------	----------	4,577	183,530	58,374	100 bbls.	100	Lime.
----------	----------	4,746	176,616	81,000	----------	----------	
----------	----------	3,733	133,748	46,000	----------	----------	
----------	----------	3,511	128,152	35,500	----------	----------	
48,127	$16,845	2,509	95,743	3,000	6,000 tons	90,000	Asphaltum (rock).
					300 bbls.	600	Lime.
10,000	5,000	867	36,648	900	----------	----------	
30,000	15,000	317	15,510	400	4,500 tons	55,000	Asphaltum (rock).
					----------	218,205	Unapportioned, 1900-1909.
22,310	11,155	563	25,476	75	13,000 tons	165,000	Asphaltum (rock).
38,092	25,146	569	26,180	----------	----------	----------	
2,129	1,469	666	27,998	----------	----------	----------	
----------	----------	1,160	46,667	134	----------	----------	
----------	----------	1,266	62,097	----------	----------	----------	
----------	----------	1,473	125,542	99,475	----------	1,940	Bituminous rock, chromite.
11,670	5,252	1,227	114,724	49,318	356 lbs.	88	Copper.
					----------	2,717	Bituminous rock, pottery clay, sandstone.
74,143	68,656	1,565	151,034	8,422	----------	16,886	Bituminous rock, brick, manganese, soda.
62,744	56,783	[6]	----------	6,100	1,907 tons	81,926	Manganese ore.
					----------	174,447	Bituminous rock, copper, gold, mineral water, quicksilver, silver, soda.
31,656	32,922	[6]	----------	20,300	----------	132,777	Bituminous rock, manganese, quicksilver, sandstone, soda.
42,511	59,515	1,224	89,186	[6]	----------	246,463	Copper, granite, manganese, soda, miscellaneous stone.
30,725	43,691	----------	----------	80,000	----------	6,100	Chromite, diatomaceous earth, mineral water.
368,107	$341,434	[6]48,308	$2,168,385	[6]$672,772	----------	$1,299,316	

SAN MATEO

	Salt		Brick	
	Tons	Value	M.	Value
1895				
1896				
1897				
1898			1,140	$7,000
1899			2,870	24,225
1900			225	9,000
1901	40	$400	500	9,070
1902	6,500	16,000	200	8,000
1903	7,700	25,000	3,100	77,500
1904	12,000	62,500	3,902	56,436
1905	16,000	67,500	5,902	61,436
1906	14,900	44,920	6,613	67,000
1907	14,000	56,000	8,078	86,285
1908	23,800	60,900	4,494	63,231
1909	22,100	95,400	1,346	38,405
1910	26,000	64,750	1,350	37,250
1911	27,500	55,600	1,350	43,000
1912	33,000	80,000	1,400	40,500
1913	28,000	72,250	1,418	44,680
1914	27,500	76,750	950	24,074
1915	25,500	63,750	715	19,550
1916	28,540	70,807	986	38,121
1917	36,483	114,689		
1918	26,434	144,604		
1919	30,238	136,190		
1920	37,409	206,897		
1921	32,587	167,022	[3]	
Totals	476,231	$1,651,329	[2]46,539	$754,763

[1]The limestone produced in San Mateo County is used as crushed rock and is included under Stone Industry. Previous to 1915 it was erroneously classified as industrial limestone and tabulated under that heading.
[2]Includes crushed rock, rubble, sand, gravel.
[3]See under 'Unapportioned.'

SANTA BARBARA COUNTY
(See page 699)

COUNTY, 1895-1921.

Limestone		Miscellaneous stone[2], value	Miscellaneous and unapportioned		
Tons	Value		Amount	Value	Substance
			5,000 tons	$5,000	Clay.
			1,000 bbls.	1,250	Petroleum.
			500 bbls.	1,250	Cement.
		$40,000			
		70,000			
		34,000			
		7,500			
		6,000	17 tons	255	Asphalt.
		301,120	5,000 tons	5,625	Clay.
		150,000			
		113,866	3,000 bbls.	6,000	Petroleum.
		75,000			
		111,823			
		2,111			
37,687	$17,451	89,142			
120,306	96,245	90,221		500	Gems.
111,382	89,106	88,766			
93,500	74,800	61,185			
102,300	66,495	29,587			
138,544	78,506	18,635		300	Gems.
			81,000 tons	34,120	Sandstone.
153,329	75,941	34,648	6,581 bbls.	845	Lime.
				200	Gems.
[1]		93,391		100	Gems.
				1,100	Other minerals.
		25,663	593 tons	732	Pottery clay.
				85	Gems.
		71,668		150	Gems.
				20,656	Brick and tile, magnesium chloride, potash.
		34,164		15,044	Magnesium chloride, potash.
		42,235		63,246	Other minerals.
		46,040	322 bbls.	966	Petroleum.
				39,200	Magnesium salts, potash.
		61,697	322 bbls.	966	Petroleum.
				27,407	Brick, magnesium chloride, potash.
757,048	$498,544	$1,698,462		$224,897	

SANTA CLARA COUNTY

(See page 699)

SANTA CRUZ

Year	Lime		Limestone	
	Barrels	Value	Tons	Value
1894	167,000	$138,200	4,000	$5,000
1895	145,000	133,750	12,055	12,655
1896	116,000	95,500	27,827	28,663
1897	149,600	111,800	10,688	8,005
1898	151,000	151,000	7,912	5,738
1899	161,893	176,893	4,135	3,730
1900	163,985	131,288	1,669	1,213
1901	161,500	161,500	3,845	3,595
1902	185,223	161,302	1,850	1,850
1903	220,835	185,442	3,000	2,725
1904	293,207	306,775	[2]	
1905	218,084	199,974	7,325	52,125
1906	255,469	347,490	11,431	55,242
1907	213,599	241,179	6,370	6,000
1908	119,996	119,996	1,178	2,167
1909	228,875	296,785	3,457	5,273
1910	214,137	230,513	4,361	6,770
1911	216,508	206,225	22,622	44,591
1912	169,646	159,505	7,307	7,553
1913	75,000	60,000	39,494	30,994
1914	173,282	157,011	14,666	25,082
1915	191,643	177,873	2,047	4,873
1916	176,263	225,485	4,318	9,820
1917	213,104	173,778	6,527	11,378
1918	182,083	285,316	7,132	15,313
1919	150,271	254,039	5,527	12,690
1920	141,633	202,908	5,062	20,101
1921	122,907	242,869	[2]	
Totals	4,977,743	$5,080,437	[1]225,805	$579,785

[1]Includes crushed rock, rubble, sand, gravel.
[2]See under 'Unapportioned.'

COUNTY, 1894-1921.

Bituminous rock		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Tons	Value		Amount	Value	Substance
20,782	$79,980				
32,067	102,486	$4,000	75 M.	$375	Brick.
43,843	109,536	4,000	497 M.	2,485	Brick.
43,179	123,056		300 M.	1,500	Brick.
40,598	113,898				
27,503	70,569	200			
21,960	58,590				
13,580	30,654		10 tons	30	Clay.
31,700	41,084		106 tons	1,060	Asphalt.
18,426	45,190	20,750	700 cu. ft.	140	Granite.
[2]		2,925			
17,583	42,500	1,750			
13,544	38,860	3,500			
21,955	64,707	14,800			
		19,736	450 cu. ft.	336	Granite.
25,041	85,123		28,400 tons	28,400	Clay.
		20,717	63,541 tons	13,800	Clay.
31,392	110,067			1,794,294	Unapportioned, 1900-1909.
		23,425	52,970 tons	15,981	Clay.
35,565	124,195			2,096,031	Unapportioned.
24,815	80,371	7,627		2,448,339	Unapportioned.
32,146	80,439	22,710		879,437	Other Minerals.
26,932	67,330	10,511		1,647,970	Unapportioned.
40,540	115,500	4,276		1,341,089	Unapportioned.
17,399	60,728	6,794		1,331,263	Unapportioned.
[2]		2,815		1,440,991	Cement, marble, bituminous rock.
[2]		2,368		1,480,800	Cement, potash, bituminous rock.
[2]		9,107		2,599,717	Cement, potash, bituminous rock.
[2]		17,074		1,981,253	Other minerals.
[2]		23,379		2,834,750	Bituminous rock, cement, iron ore, mineral paint, potash.
[2]		22,895		3,815,121	Bituminous rock, cement, limestone, mineral paint, potash.
[3]580,550	[3]$2,225,363	$225,359		$25,755,072	

SHASTA COUNTY
(See page 699)

SIERRA COUNTY, 1880-1921.

Year	Gold, value	Silver, value	Miscellaneous and unapportioned		
			Amount	Value	Substance
1880	$974,332	$576			
1881	950,000	6,000			
1882	1,100,000				
1883	1,075,000				
1884	1,177,349	145			
1885	1,433,881	11			
1886	1,967,152	2,414			
1887	1,502,469	202			
1888	1,250,000	1,500			
1889	1,446,486	1,322			
1890	733,528	2,039			
1891	701,702	811			
1892	688,464	26			
1893	839,343	46			
1894	604,722				
1895	694,470	107			
1896	786,175	424			
1897	370,208	46			
1898	399,063	519			
1899	450,115	359			
1900	659,696	3,463			
1901	575,427	755			
1902	326,155	311	24,000 gals.	$6,000	Mineral water.
1903	310,770	476			
1904	374,763	1,222			
1905	517,303	3,687			
1906	409,366	2,518			
1907	483,904	2,621	120,000 gals	12,000	Mineral water.
1908	412 626	1,917			
1909	189,672	957			
1910	312,035	1,330			
1911	461,513	5,604			
1912	732,988	2,777	1,285 lbs.	212	Copper.
			9,919 lbs.	446	Lead.
1913	1,006,573	4,305	2,228 lbs.	98	Lead.
1914	730,000	3,000			
1915	726,362	3,156			
1916	724,256	3,291			
1917	384,428	1,629		1,950	Other minerals.
1918	289,368	2,121	13,031 lbs.	3,558	Copper.
1919	301,172	2,957	807 tons	40,012	Chromite.
1920	442,894	3,967		750	Miscellaneous stone.
1921	612,267	5,236		2,858	Miscellaneous stone.
Totals	$30,127,997	$73,747		$67,884	

Year	Petroleum		Natural gas		Asphalt and bituminous rock		Mineral water		Diatomaceous earth		Brick		Limestone		Sandstone		Miscellaneous[1]	Miscellaneous and unapportioned		
	Barrels	Value	M. Cubic feet	Value	Tons	Value	Gallons	Value	Tons	Value	M.	Value	Tons	Value	Cubic feet	Value	value	Amount	Value	Substance
1891																			$2,000	Gold.
1892																				
1893																		41,423	Gold.	
1894																		10,293	Gold.	
1895																		2,478	Gold.	
1896																		890	Gold.	
1897																				
1898																				
1899	1,800	$1,800			4,550	$91,000														
1900	16,094	12,875			23,950	119,600	22,500	$3,000										4,000	Gold.	
1901	30,702	35,813			18,430	317,910	31,500	20,300							5,000	$500		44	Platinum.	
1902																		8,592	Gold.	
1903	130,136	130,136	500	$300	18,047	318,000	65,000	30,000										3,000	Gold.	
1904	152,217	112,840	465	325	19,755	253,400	15,000	7,000			100	$700						1,000	Gold.	
1905	208,370	191,225	150	120	6,058	121,160	15,000	5,002			120	960								
1906	183,486	165,138	1,203	2,005	5,570	105,800	19,000	10,350			4,620	40,980	7,205	$5,002	224,830	117,260	$82,062			
1907	210,661	151,383	876	438	4,145	55,900	113,780	60,000			1,250	9,825			72,000	27,100	33,000			
1908	239,340	181,352	937	375	1,259	12,580	105,280	60,200	362	$2,172	1,400	12,200	10,00	25,000	74,200	21,300		200	Gold.	
1909	262,276	149,049	320	320	2,974	41,685	88,800	22,200	2,700	15,925	4,900	46,200	20,003	40,000	85,654	34,240	4,385	30,000 bbls.	30,000	Lime.
1910	799,000	465,569	3,000	1,500	9,000	190,000	118,000	18,240	6,950	112,282	1,120	8,820	9,000	12,000	12,000	3,000				
1911	3,314,000	1,413,000			3,000	30,000	118,259	21,450	3,000	15,000	4,025	34,750	5,000	7,500	29,600	18,520	57,792	52 flasks	2,070	Quicksilver.
																			725	Gold.
1906	4,876,000	1,237,250	1,000	500	25,000	250,000	13,750	10,450	2,300	13,800	200	1,600	8,000	16 000	36,195	25,230	9,732		2	Silver.
																			250	Gold.
1907	8,392,633	4,196,681	600	300	19,192	288,540	39,480	24,250	2,531	28,948	1,815	14,650	15,000	30,000	39,740	37,565	4,950	60 flasks	2,289	Quicksilver.
1908	8,847,569	4,423,784	715,612	357,806	7,000	70,000	5,500	4,852	2,050	22,012	750	7,500	16,330	33,160	16,525	6,545	10,930			
1909	8,116,788	4,060,061	708,009	394,621	200	2,488	155,400	22,200			990	9,180	4,949	6,949	31,120	10,948	5,316		89,254	Unapportioned, 1900-1909.
1910	7,682,565	3,850,222	9,198,000	1,393,250			155,000	21,500	1,343	14,117	1,000	16,825	4,028	7,808	39,720	15,888	6,055	70 flasks	3,225	Quicksilver.
1911	6,966,156	3,504,717	[1]1,083,860	160,386			73,640	15,900	1,344	13,720	1,600	13,800	4,239	8,174	58,976	29,507	6,602	50 flasks	2,201	Quicksilver.
1912	6,862,719	3,747,045	[2]3,425,660	253,633	11,120	5,556	105,000	11,550	1,129	18,074	2,615	17,150	5,227	11,668	4,500	1,670	17,430	12,000 tons	10,000	Clay.
																		17,500 bbls.	16,434	Lime.
1913	6,201,076	3,151,725	5,080,300	254,815	10,000	10,000	112,500	108,130	6,895	28,960	3,000	24,000	5,884	19,023	4,500	1,670	11,450	12,000 tons	16,000	Clay.
																		28,512 bbls.	28,919	Lime.
1914	4,325,787	1,989,862	6,313,380	378,802	25,000	50,000	160,400	152,432	"	"	2,100	16,800	6,157	11,263	9,288	1,850	15,390		70,000	Other minerals.
1915	5,534,534	3,182,180	3,193,365	179,077	"	"	180,025	156,175	"	"	1,800	14,400	5,556	10,005	29,900	6,488	13,200		61,500	Other minerals.
1916	4,992,266	3,674,782	3,660,140	724,746	"	"	176,038	119,200	"	"	"	"	"	"	3,520	1,017	12,385		111,919	Bituminous rock, brick, 'granite,' diatomaceous earth, limestone, quicksilver.
1917	5,631,563	4,550,303	3,104,170	227,507			104,991	86,026	"	"	"	"	"	"	28,700	6,150	5,050	97 tons	126,830	Potash.
																			150,315	Brick, diatomaceous earth, limestone, quicksilver.
1918	7,334,104	9,057,618	4,150,316	338,035	"	"	73,117	97,162	"	"	"	"	3,790	18,830	"	"	11,613	1,863 tons	256,780	Potash.
																			271,792	Bituminous rock, chromite, brick, diatomaceous earth, quicksilver, sandstone.
1919	6,080,092	6,850,247	4,684,709	336,092	"	"	82,147	81,041	"	"	"	"	"	"	"	"	29,909	298 tons	30,128	Potash.
																			267,539	Bituminous rock, chromite, brick, diatomaceous earth, limestone.
1920	5,802,583	9,140,643	1,359,065	126,126	"	"	95,843	110,931	"	"	"	"	"	"	"	"	27,436	410 tons	40,000	Potash.
																			1,091,475	Bituminous rock, brick, diatomaceous earth, quicksilver, sandstone.
1921	5,465,942	9,122,057	1,544,892	145,170	"	"	97,847	133,560	"	"	"	"	"	"	"	"	65,090	143 tons	5,720	Potash.
																			718,183	Bituminous rock, diatomaceous earth, sandstone.
Totals	108,355,294	$76,838,867	47,626,103	$5,319,596	$213,030	$2,420,641	2,349,359	$1,404,503	$31,304	$209,010	$34,105	$289,920	$128,015	$261,341	$789,956	$368,759	$432,839		$3,405,810	

[1]Includes crushed rock, rubble, rip-rap, sand, gravel.
[2]See under 'Unapportioned.'
[3]Quicksilver estimated, as only value originally reported

SANTA CLARA COUNTY, 1850-1921.

Year	Quicksilver		Mineral water		Petroleum		Brick		Pottery clay		Sandstone		Limestone		Miscellaneous stone, value	Magnesite		Miscellaneous and unapportioned		
	Flasks	Value	Gallons	Value	Barrels	Value	M.	Value	Tons	Value	Cubic feet	Value	Tons	Value		Tons	Value	Amount	Value	Substance
1850	7,723	$768,052																		
1851	27,779	1,839,248																		
1852	15,901	927,505																		
1853	22,784	1,235,648																		
1854	30,004	1,460,722																		
1855	29,142	1,360,554																		
1856	27,138	1,401,678																		
1857	28,204	1,374,381																		
1858	23,761	1,232,140																		
1859	1,294	81,490																		
1860	7,001	378,117																		
1861	24,129	1,447,739																		
1862	29,671	1,442,041																		
1863	32,805	1,380,350																		
1864	47,189	1,950,245																		
1865	47,194	2,166,295																		
1866	33,159	1,867,349																		
1867	24,481	1,127,760																		
1868	25,028	1,176,325																		
1869	16,808	773,618																		
1870	14,423	827,592																		
1871	18,568	1,171,041																		
1872	18,574	1,234,584																		
1873	11,042	887,004																		
1874	9,084	985,455																		
"	20,000	1,000,000																		
1875	16,930	1,428,867																		
1876	27,800	1,228,529																		
1877	30,237	1,127,849																		
1878	24,924	820,000																		
1879	36,054	1,676,212																		
1880	20,135	934,185																		
1881	21,288	933,321																		
1882	20,208	824,542																		
1883	20,054	836,165																		
1884	20,000	610,000																		
1885	21,400	658,000																		
1886	18,000	630,000																		
1887	20,000	847,600																		
1888	18,800	708,900																		
1889	13,100	389,300																		
1890	12,000	630,000																		
1891	8,200	371,105																		
1892	8,563	226,479																$3,000 cu. ft.	$4,072	Natural gas.
1893	6,611	241,084																		
1894	7,235	222,105	3,000	$1,250	3,500	$8,500	22,725	$111,250			24,000	$8,292						802,030 cu. ft.	12,000	Natural gas.
1895	7,600	253,500	20,000	3,000	4,000	10,000	24,750	131,250												
1896	6,222	211,570	44,000	18,889	900	1,145	15,000	80,000					500	$600	$3,000				1,300	Natural gas.
1897	4,700	164,290	30,500	17,600	4,000	10,000	19,000	105,000												
1898	5,873	235,000	25,863	11,735	3,600	6,000	13,098	65,490	200	$2,560										
1899	4,135	186,250	70,000	19,150	4,500	3,600	30,741	170,455					1,883	3,000	8,000	103	$1,350	32 tons	640	Asphalt.
1900	3,445	141,973	30,000	8,000			20,000	126,000	2,600	6,000	120,000	100,000	8,000	6,000		39	253	5 tons	75	Manganese
1901	3,220	256,688	35,000	8,500			21,800	94,570			60,000	80,000			917	59	300	17 tons	255	Asphalt.
1902	3,809	254,260	21,000	3,500			23,882	128,662			35,000	31,500						2,400 cu. ft.	1,200	Gravel.
1903	3,603	233,130	50,000	12,500	4,695	3,766	28,069	138,284			112,350	225,500	7,000	7,000	100			21 tons	47	Bituminous rock.
																		11 tons	132	Asphalt
1904	3,889	148,105	39,000	12,500	12,000	13,860	24,909	128,584							12,000					
1905	2,893	93,968	5,000	1,250	41,000	14,353	28,186	204,357	700	1,050	100,000	150,000			3,000					
1906	2,982	94,048	5,000	1,250	5,000	2,800	25,097	183,976	1,000	1,500			10,000	15,000						
1907	2,548	96,886	11,574	2,787	22,100	5,525	30,653	255,424			3,500	3,500	9,000	16,974		3,700	33,300			
1908	2,160	112,784	31,653	39,955	33,100	17,700	13,000	65,618					671	1,417	45,142	2,000	24,000	10,017 lbs.	10,017	Lime
1909	3,747	158,490	333,367	40,754	65,740	76,350	6,000	30,000					2,221	4,150	75,946	300	3,000	1,000 bbls.	4,000	Lime
																			82,254	Unapportioned, 1907-1909.
1910	1,918	182,210	182,500	11,200	36,600	36,600	12,000	60,000	12,000	60,000			4,284	3,451	68,765	7,560	51,917			
1911	2,765	316,561	163,224	10,000	15,326	8,255	6,013	30,065					2,417	3,919	62,595					
1912	3,655	348,348	142,500	10,250	14,092	8,295	18,000	105,000					3,574	4,120	48,225	600	6,000	13,598 bbls.	10,154	Lime.
1913	3,709	349,243	101,000	10,750	20,000	12,000	18,000	95,000					3,549	4,300	29,377	70	560	13,107 bbls.	9,783	Lime.
																		5,000 cu. ft.	500	Natural gas.
1914	2,407	118,063	29,000	10,750	10,000	8,300	15,000	79,500							39,093	1,425	14,250			
1915	4,396	376,319	38,000	16,770	16,647	11,067	10,076	57,784							98,342	2,625	74,667		340	Other materials.
1916	4,016	475,496	50,000	11,300	16,368	10,961	13,100	87,800	2,024	2,293					111,974	23,297	232,156		25,028	Chromite, limestone, manganese.
1917	3,923	639,504	10,250	1,922	18,355	20,152	14,000	89,000	6,014	4,929					114,204	9,963	99,787		28,341	Chromite, manganese, talc, limestone.
1918	3,927	478,524	13,975	1,678	20,199	34,848	6,752	67,900							111,809	9,746	121,857		948,786	Chromite, manganese, clay, talc, potash.
1919	3,042	271,762			16,724	24,605	7,250	65,000	2,532	2,232					73,247	10,942	128,924		189,721	Manganese, limestone, mineral water, potash.
1920	2,893	233,499	3,360	189	16,095	23,901	11,880	104,600	1,000	4,600					129,582	26,612	392,580		80,670	Limestone and potash.
1921	"	"	2,500	275	13,904	20,943	7,501	110,904	1,126	2,300					138,544	25,800	280,000		101,945	Limestone, marl, potash, quicksilver.
Totals.	*1,351,176	$54,282,032	*1,934,874	$290,900	445,377	$404,854	487,530	$3,183,342	29,496	$93,404	454,850	$278,292	51,276	$69,530	$1,218,916	118,797	$1,335,472		*$1,880,088	

*Includes crushed rock, rubble, sand, gravel.
See under "Unapportioned."
†Estimated production of Guadalupe Mine previous to 1875
‡Erroneously credited to Alameda County in reports of three years.

Year	Brick		Chromite		Copper		Gold, value	Lime		Limestone		Mineral water		Pyrites		Silver, value	Miscellaneous and unapportioned		
	M.	Value	Tons	Value	Pounds	Value		Barrels	Value	Tons	Value	Gallons	Value	Tons	Value		Amount	Value	Substance
1880							$149,455									$117,907			
1881							350,000									85,000			
1882							300,000									30,000			
1883							210,000									20,000			
1884							220,000									20,000			
1885							417,504									9,223			
1886							699,588									10,647			
1887							527,681									40,204			
1888							600,000									50,000			
1889							415,611									5,395			
1890							429,539									7,279			
1891							556,063									7,412			
1892							574,533									7,977			
1893							500,467									8,577			
1894			1,200	$16,800			517,436					150,000	$75,000			5,032	200 tons	$1,500	Iron ore.
1895			90	1,120			718,096									28,417			
1896	300	$1,584			1,847,087	$181,708	696,209	2,310	$2,541							24,235		1,400	Stone industry.
1897	1,200	7,200			12,592,440	1,335,966	569,071	2,100	2,100	9,000	$13,500					96,899			
1898	1,200	7,200			21,482,020	2,403,830	860,160	2,500	3,750			3,000	2,910			171,765			
1899	2,000	14,000			21,815,863	3,505,923	873,719	8,000	10,000	250	375	5,000	1,850			196,213	100 sq. ft.	800	Slate.
																		375	Stone industry.
1900	2,000	12,000	140	1,400	25,736,473	4,166,735	733,467	17,850	17,850	1,150	1,150	9,640	5,784			635,640			
1901	3,000	12,000	150	1,950	30,930,781	4,881,018	927,975	21,600	12,960			26,205	7,644			891,994		2,000	Stone industry.
1902	2,450	12,250	115	1,275	21,515,887	2,496,744	978,706	18,500	12,500	3,500	3,000	26,205	7,845	3,202	$7,005	896,887			
1903	3,500	17,500	150	2,250	16,453,409	2,171,492	771,242	27,600	10,800	5,400	5,400	40,000	12,000	2,500	5,500	593,991		1,500	Stone industry.
1904	3,000	15,000	98	1,470	26,438,145	3,439,974	1,051,429	18,000	10,500							599,660		47,725	Unapportioned, 1900-1909.
1905	3,850	14,000	29	300	10,830,965	1,668,614	684,952	10,700	8,000	3,000	3,000	80,030	12,000			167,548			
1906	4,400	22,000	80	1,200	22,472,304	4,338,124	819,144	12,960	8,040	37,080	32,000			32,689	89,895	434,483			
1907	4,500	33,000	260	5,200	27,841,304	5,568,875	701,097	29,222	31,000	30,761	30,761			65,788	197,364	370,211	400 tons	400	Iron ore.
1908	2,000	12,000	280	5,040	34,878,677	4,642,976	1,131,852	11,818	9,000	80,000	80,000	100,000	20,000	93,677	539,553	517,596		25,000	Stone industry.
1909	3,500	29,500	205	3,547	58,665,147	7,581,115	1,660,845	8,650	8,000	129,500	134,595	100,000	20,000	449,762	1,349,286	735,460	108 tons	174	Iron ore.
																		4,688	Stone industry.
1910	2,425	17,548	680	9,155	44,947,950	5,725,469	1,533,728	16,616	14,114	117,109	117,083	40,000	10,000	31,483	126,692	648,905		900	Iron ore.
																	570 tons	1,359	Lead.
1911	2,825	20,004	875	13,497	39,339,913	3,692,482	[1]1,050,881	13,271	10,164	67,324	65,233	25,000	6,250	47,885	151,602	330,991	881 lbs.	40	Lead.
1912	1,697	10,195	1,000	8,000	25,240,952	4,166,232	988,103	6,520	3,548	58,023	48,576	23,235	5,046	62,665	174,402	423,382			
																	47 tons	1,175	Asbestos.
1913	969	4,330	280	2,800	27,686,436	4,201,708	1,208,870	8,595	7,039	41,346	35,616	30,000	6,850	72,071	194,409	448,031	19,070 lbs.	820	Lead.
																		10,686	Other minerals.
1914	1,594	10,223	867	4,884	25,122,766	3,341,328	1,101,202	8,057	5,163	36,997	30,026	30,000	6,850	69,438	195,362	346,706	1,436 tons	5,128	Iron ore.
																	21,565 lbs.	861	Lead.
																		125	Miscellaneous stone.
																	150,036 lbs.	8,004	Lead.
																		1,448	Miscellaneous stone.
1915	1,846	11,550	1,757	17,570	39,828,017	5,395,060	1,120,848	"		44,953	40,945	12,000	1,800	"		450,566	8,378,401 lbs.	1,038,922	Zinc.
																		253,950	Iron ore, pyrites, lime.
																	478,360 lbs.	33,021	Lead.
																		57,303	Lime and limestone.
1916	"		12,425	181,225	39,437,196	9,701,550	936,885	"		"		"		"		1,115,471	9,484,800 lbs.	1,270,963	Zinc
																		800	Miscellaneous stone.
																		342,290	Asbestos, brick, iron ore, manganese, mineral water, platinum, pyrites, silica.
																	8,725 lbs.	750	Lead.
1917	"		3,110	68,479	28,009,990	7,646,727	775,125	"		"		"		"		520,703		78,101	Lime and limestone.
																	14 ozs.	1,100	Platinum.
																		800	Miscellaneous stone.
																	8,581,516 lbs.	844,716	Zinc.
																		308,369	Cadmium, brick, iron ore, mineral water, molybdenum, pyrites, silica.
																	492,585 lbs.	34,972	Lead.
1918	"		1,423	70,214	25,294,590	6,247,764	543,599	"		45,671	[2] 72,410			"		420,410	25 ozs.	2,709	Platinum.
																		7,000	Miscellaneous stone.
																	3,045,692 lbs.	277,188	Zinc.
																		422,325	Cadmium, brick, iron ore, lime, mineral water molybdenum, pyrites.
1919	"				8,673,342	1,613,242	378,283	"		"		"		138,046	497,308	165,802	121 fine ozs.	29,100	Lime and limestone.
																		21,675	Platinum.
																		31,720	Miscellaneous stone.
																		40,153	Barytes, brick, iron ore, lead, mineral water, zinc
																	64,400 lbs.	8,152	Lead.
1920	"				810,843	149,105	312,991							135,399	475,330	36,583	188 fine ozs.	27,004	Platinum.
																		37,650	Miscellaneous stone.
																		60,743	Asbestos, brick, iron ore, lime, limestone, zinc.
																	219 fine ozs.	26,847	Platinum.
1921					437,593	56,440	267,681	"		"				"		5,581		31,945	Miscellaneous stone.
																		452,589	Asbestos, barytes, iron ore, lead, pyrites, zinc
Totals	47,287	$277,000	25,301	$421,106	$20,888,340	$103,754,424	$20,965,372	[3]244,778	$188,060	[3]656,572	$640,439	[3]700,455	$201,319	[3]1,205,645	$4,003,798	$10,945,755		$5,858,725	

[1]Dredge production included under Stanislaus County.
[2]See under "Unapportioned".

SISKIYOU

Year	Gold, value	Silver, value	Chromite		Mineral water	
			Tons	Value	Tons	Value
1880	$440,735	$95,340				
1881	850,000	1,500				
1882	720,000					
1883	400,000					
1884	475,000					
1885	338,659					
1886	342,677	64				
1887	606,859	177				
1888	625,000					
1889	915,294	370				
1890	860,303	23				
1891	957,220	120				
1892	1,013,332	56				
1893	799,108					
1894	760,782					
1895	950,006	177			200,000	$80,800
1896	1,091,265	653			[3]	
1897	842,123	34			[3]	
1898	768,804	321			[3]	
1899	991,771	100			[3]	
1900	951,397	[2]6,700			700,000	45,000
1901	886,043	[2]2,980			700,000	175,000
1902	906,989	233			750,000	187,500
1903	613,576	22			750,000	50,000
1904	892,685	1,230			750,000	50,000
1905	803,035	2,499			[3]	
1906	[3]	[3]			[3]	
1907	398,017	3,037			725,000	36,250
1908	504,156	6,125			700,000	80,000
1909	416,160	2,145			500,000	10,000
1910	437,376	2,322			500,000	60,000
1911	422,297	2,561			700,000	120,000
1912	472,314	2,980	220	$2,310	700,000	120,000
1913	[4]180,125	[4]1,228			700 000	120,000
1914	312,842	1,026			650,000	65,000
1915	426,716	2,081	[1]		626,680	62,990
1916	441,307	2,312	2,251	28,731	502,650	50,530
1917	325,550	16,883	2,046	49,797	503,000	50,600
1918	294,227	14,501	6,612	336,588	501,750	50,175
1919	226,525	17,049	510	13,379	451,500	90,375
1920	80,707	5,218	215	5,732	300,150	60,015
1921	42,635	294	[3]		250,150	5,015
Totals	$4,783,617	$192,361	[2]11,854	$436,537	[2]12,160,880	$1,569,250

[1]Includes crushed rock, rubble, rip-rap, sand, gravel.
[2]Recalculated to 'commercial,' from 'coining value' as originally published.
[3]See under 'Unapportioned.'
[4]Production from dredging operations included in Stanislaus County production.

COUNTY, 1880-1921.

Platinum		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Ounces	Value		Amount	Value	Substance
100	$600				
				$1,202,742	Unapportioned, 1900-1909.
			200 lbs.	23	Copper.
1.6	21				
5.3	93		2,500 cu. ft.	1,250	Sandstone.
			2,500 cu. ft.	1,500	Sandstone.
			193 lbs.	39	Copper.
			2,643 lbs.	140	Lead.
		$39,000	11,433 cu. ft.	12,897	Sandstone.
			1,000 bbls.	1,000	Lime
			220 tons	300	Limestone.
			4,949 lbs.	1,183	Lead.
			1,800 cu. ft.	1,485	Sandstone.
			1,090 lbs.	1,680	Lime.
			3,360 lbs.	144	Lead.
			50 tons	500	Pumice.
		5,028	1,050 cu. ft.	1,750	Sandstone.
			100 bbls.	300	Lime.
			2,225 tons	2,200	Limestone.
				14,745	Gems.
			1,204 cu. ft.	2,000	Sandstone.
		9,475	335 bbls.	735	Lime.
			35 tons	525	Limestone.
				1,000	Gems.
			150 bbls.	120	Lime.
		6,580	24 tons	24	Limestone.
			650 cu. ft.	455	Sandstone.
			250 cu. ft.	250	Sandstone.
		609		250	Gems.
				250	Gems.
		4,883	90 tons	2,000	Pumice.
				1,500	Other minerals.
			100 tons	500	Coal.
9	304	5,371	58 lbs.	2	Lead.
			677 bbls.	629	Lime.
			250 cu. ft.	150	Sandstone.
			188 lbs.	9	Lead.
		4,630	745 bbls.	745	Lime.
				16,923	Chromite, copper, marble, sandstone.
[2]		45,407		12,609	Copper, building stone, lime, platinum, sandstone.
				500	Granite.
15	709	134,382	888,043 lbs.	242,436	Copper.
			192 lbs.	17	Lead.
				8,535	Lime, sandstone, soda.
1	58	24,588	573,393 lbs.	141,677	Copper.
				15,473	Lead and pumice.
7	1,015	26,405		111,294	Copper, limestone, pumice, quicksilver.
		30,322		47,121	Copper, lime, limestone, potash, pumice, quicksilver.
[3]		44,343		1,060	Asbestos, brick, chromite, lime, platinum.
[3]138.9	$2,800	$381,023		$1,852,667	

SOLANO COUNTY.

Year	Quicksilver		Mineral water		Lime and limestone	
	Flasks	Value	Gallons	Value	Tons	Value
1873	1,800	$144,594				
1874	1,900	199,842				
1875	2,100	176,715				
1876	1,683	74,052				
1877	1,463	54,570				
1878	802	26,386				
1879	1,290	38,307				
1880	492	15,252				
1881						
1882						
1883						
1884						
1885						
1886						
1887						
1888						
1889						
1890						
1891						
1892						
1893					6,400	$8,000
1894					4,300	4,635
1895			3,094	$1,547	5,477	5,989
1896					9,608	9,801
1897					6,125	5,570
1898			20,000	4,000		356
1899			20,000	4,000	1,800	1,800
1900			17,800	4,450		5,950
1901	42	1,890	10,000	4,000		
1902	100	4,100	10,000	4,000		
1903	[2]377	15,080	10,000	4,000		
1904	542	18,518	10,000	4,000	100,000	100,000
1905	528	19,272	4,000	4,000		
1906	640	24,422	40,000	4,000		
1907	764	33,294	140,000	11,600		
1908			32,650	5,490		
1909			32,400	3,960		
1910			30,000	4,000		
1911			285,050	44,000		
1912			23,600	3,440		
1913	320	15,696	43,020	5,208	86,128	86,128
1914			64,200	8,000		
1915	660	61,710	11,200	3,750		
1916	554	52,765	10,960	2,580		
1917	593	59,122	11,440	2,722		
1918	[3]		[3]			
1919	[3]		[3]		[3]	
1920						
1921			[3]			
Totals	[2]16,650	$1,035,787	[3]829,324	$132,747	[2]219,838	$228,229

[1]Includes crushed rock, rubble, paving blocks, sand, gravel.
[2]Flasks of 75 pounds since June, 1904; 76½ pounds previously.
[3]See under "Unapportioned."

1873-1921.

Miscellaneous stone[1], value	Natural gas, value	Miscellaneous and unapportioned		
		Amount	Value	Substance
$225				
19,650				
15,752		75 tons	$125	Pottery Clay.
20,975		400 tons	500	Pottery Clay
15,065				
12,181				
18 900				
2,200				
14,250		75,000 bbls.	150 000	Cement.
21,514		250,000 bbls.	375,000	Cement.
11,113				
78,573				
143,487				
202,146	$6,584	125 tons	600	Salt.
		3,000 M.	25,000	Brick.
527,319	8,053	400 tons	2,800	Salt.
		1,000 M.	7 000	Brick.
		100 tons	200	Salt.
176,813	7,538	1,600 M.	20,000	Brick.
		5,600 tons	11,200	Clay.
241,949	9,100	50 tons	150	Salt.
181,952	8,596	100 tons	300	Salt.
		500 M.	4,000	Brick.
130,445	8,528	50 tons	100	Salt.
		2,200 M.	20,000	Brick.
28,915	7,366		13,570,019	Unapportioned, 1900-1913, inclusive.
71,288	5,546		1,500,000	Other minerals.
37,576	[2]		1,290,347	Cement, fuller's earth, natural gas, quicksilver, salt.
49,711	[2]		1,090,164	Cement, natural gas, salt.
39,826	[2]		1,804,060	Cement, fuller's earth, natural gas, salt.
30,124	[2]		1,378,758	Cement, fuller's earth, natural gas, onyx, salt.
44,156	[2]		1,627,928	Cement, fuller's earth, mineral water, natural gas, quicksilver
[2]	[2]		2,930,614	Cement, limestone, onyx, mineral water, natural gas, quicksilver, miscellaneous stone.
60,604			2,969,594	Cement, mineral water, onyx.
[3]$2,197,109	[3]$61,311		$28,778,459	

SONOMA COUNTY

Year	Quicksilver		Mineral paint		Brick	
	Flasks	Value	Tons	Value	M.	Value
1873	50	$4,017				
1874	1,700	178,806				
1875	1,218	102,495				
1876	3,897	171,468				
1877	3,609	134,616				
1878	3,255	106,890				
1879	2,977	88,923				
1880	1,445	44,795				
1881	1,273	37,974				
1882	2,124	59,960				
1883	1,669	47,984				
1884	332	10,126				
1885	446	13,715				
1886	735	26,093				
1887	689	29,196			1,000	$5,000
1888	1,151	48,918			1,000	5,000
1889	1,345	60,525				
1890	1,046	54,915				
1891	1,660	75,115				
1892	1,630	66,357				
1893	1,445	53,104				
1894	1,368	41,998	100	$3,500	375	1,875
1895	1,813	70,707	225	3,375	350	1,750
1896	1,126	37,150	220	3,740	250	1,250
1897	1,538	59,982	270	3,780	[3]300	1,500
1898	1,704	63,048			350	2,800
1899	2,119	105,950			200	1,800
1900	2,209	99,500			280	2,360
1901	2,130	95,850			150	1,200
1902	1,440	64,685	30	105	150	1,200
1903	2,404	98,676	800	320	160	1,440
1904	[4]2,700	102,829			175	1,750
1905	2,504	97,041			500	4,000
1906	2,070	75,555			6,800	115,000
1907	560	21,369			11,600	133,479
1908	590	24,939			11,000	83,000
1909	344	14,226			6,500	29,000
1910	260	11,765				
1911	94	4,325				
1912	646	27,158				
1913	12	483				
1914	13	638				
1915	159	21,793				
1916	1,039	97,146				
1917	2,592	244,810				
1918	2,417	280,333				
1919	1,418	119,142				
1920	[5]					
1921	[5]					
Totals	[6]69,045	$3,297,090	1,645	$ 14,820	41,140	$393,404

[1]Includes crushed rock, rubble, rip-rap, paving blocks, sand, gravel.
[2]Eleventh Census Report, Vol. X, Part 3, p. 605.
[3]Estimated.
[4]Flasks of 75 pounds since June, 1904. Previously 76½ pounds.
[5]See under 'Unapportioned.'
[6]There was a considerable production of paving blocks in Sonoma County in the 70's and '80s, but no available record of annual amounts or values.

1873-1921.

Mineral water		Miscellaneous stone[3], value	Magnesite		Miscellaneous and unapportioned		
Gallons	Value		Tons	Value	Amount	Value	Substance
		[5]					
		$350,000					
		367,500					
		[2]297,236					
		[2]245,000					
		[2]150,000					
		96,000					
		92,800					
		57,381					
8,000	$32,500	69,508					
14,400	19,287	73,719					
236,000	24,000	33,035					
246,680	23,490	43,371					
21,000	18,500	16,830					
575,000	35,000	20,275					
60,900	17,691	52,701	175	$1,225	64 tons	$4,460	Graphite.
30,000	9,100	121,578	130	455	42 tons	1,680	Graphite.
10,000	4,000	90,933					
11,000	4,400	75,947			1,500 bbls.	2,250	Lime.
10,000	4,000	213,830					
10,000	4,000	158,218				300	Gems.
					1,500 bbls.	2,600	Lime.
12,000	4,200	132,946	250	1,250		50	Gems.
					10,500 tons	10,700	Clay.
10,000	1,000	307,695	15	180	2,600 tons	3,000	Clay.
104,000	21,350	319,716			500 tons	5,500	Clay.
						15,000	Unapportioned, 1900-1909.
235,000	50,350	220,998					
202,500	50,250	184,035				1,000	Unapportioned.
62,500	20,950	295,198	300	3,000			
96,240	46,910	191,436					
80,015	46,160	276,516	213	2,130		700	Other minerals.
258,600	41,231	177,917	3,624	34,788		375	Other minerals.
121,366	28,031	232,113	11,653	98,280	243 tons	2,478	Chromite.
						14,000	Building stone, manganese.
					226 tons	6,200	Chromite.
121,290	35,031	146,621	5,636	61,335	362 tons	12,689	Manganese.
						64	Other minerals.
					1,540 tons	73,906	Chromite.
83,220	36,050	148,347	4,110	40,010	173 tons	7,645	Manganese
						100	Other minerals.
96,800	22,820	144,014				62	Building stone, curbing
29,928	6,578	217,667	[4]			63,000	Magnesite, quicksilver.
37,641	9,891	151,300	[4]			14,360	Gems, magnesite, quicksilver
2,784,080	$616,770	$5,772,381	[5]25,236	$242,653		$242,119	

STANISLAUS

Year	Gold, value	Silver, value	Brick		Magnesite		Manganese	
			M.	Value	Tons	Value	Tons	Value
1880	$73,271							
1881	63,000	$31,000						
1882	80,000	15,000						
1883	40,000	5,000						
1884	40,000	5,000						
1885	18,660							
1886	47,175							
1887	53,297							
1888	75,000							
1889	20,410							
1890	5,335							
1891	3,000							
1892	14,191							
1893	150							
1894	26,359							
1895	26,482							
1896	16,635							
1897	37,392							
1898	19,400							
1899	10,000							
1900	[1]21,212							
1901	[1]15,700				100	$600		
1902								
1903	[1]52,869	256						
1904	[1]50,000	265						
1905	[1]50,000	240						
1906	[3]	[3]						
1907	3,364	28						
1908	[2]	[2]	750	$7,000				
1909	[2]	[2]	5,000	50,000				
1910	[2]214,187	[2]604	1,500	8,000				
1911	[4]307,538	[4]1,131	850	5,950				
1912	[2]226,163	[4]1,974	250	2,000				
1913	[5]253,166	[2]671	300	2,400				
1914	[2]	[2]	250	2,500				
1915	[3]	[3]						
1916	[3]	[3]	[3]				160	$2,400
1917	[3]	[3]			3,196	44,350	775	26,925
1918	14,196	592			2,024	18,038	5,753	222,422
1919	[3]	[3]			2,031	20,831	8,921	374,584
1920	142,467	775			4,064	39,435	893	12,973
1921	18,439	136			3,378	33,158	[3]	
Totals	[6]$2,139,068	[6]$62,672	[6]8,900	$77,850	14,693	$155,812	[6]16,502	$639,304

[1]Includes Merced County.
[2]See Merced County.
[3]See under 'Unapportioned.'
[4]Includes Merced County production; also dredge yield of Shasta and Trinity Counties.
[5]Includes dredge production of Merced and Siskiyou Counties.

COUNTY 1880-1921.

Mineral paint		Miscellaneous stone, value	Miscellaneous and unapportioned		
Tons	Value		Amount	Value	Substance
105	$2,310				
375	2,800		20 flasks	$800	Quicksilver
17	1,800				
152	1,825				
283	2,898				
204	1,769				
129	193				
200	375		79,330 lbs.	12,494	Copper.
200	350		162,400 lbs.	18,676	Copper.
1,370	2,400		116,000 lbs.	15,080	Copper.
200	1,600		7,300 lbs.	931	Copper.
				20	Platinum.
375	2,125				
250	1,720				
250	1,720				
285	2,000	74,000			
285	2,225	225		82,317	Unapportioned, 1900-1909.
40	270				
96	600				
100	600	63,572			
255	1,530	14,482			
52	286	3,096			
"		2,250		189,521	Gold, mineral paint, silver, platinum, quicksilver.
507	2,200	17,784		230,638	Chromite, brick, gold, platinum, quicksilver, silver.
			1,438 tons	29,240	Chromite.
"		6,240		183,167	Gold, mineral paint, platinum, silver.
498	3,088	38,764	1,352 tons	56,505	Chromite.
				308	Other minerals.
"		28,922		[1]165,989	Gold, mineral paint, platinum, silver.
669	7,062	181,262		1,043	Platinum and quicksilver.
"		180,697		3,777	Manganese, mineral paint, platinum, quicksilver.
[2]6,897	$43,746	$611,294		$990,506	

SUTTER COUNTY, 1880-1921.

Year	Amount	Value	Substance
1908	5,000 tons	$5,000	Macadam.
1909			
1916	5,733 tons	6,450	Crushed rock.
1917	4,500 tons	5,000	Crushed rock.
1918			
1919			
1920		54	Other minerals.
1921		54	Other minerals.
Total value		$16,558	

TEHAMA

Year	Gold, value	Chromite		Brick	
		Tons	Value	M.	Value
1880 1884	$22,000				
1894		1,680*	$12,680		
1895		950	9,025	500	$2,500
1896		56	475		
1897					
1898				200	1,400
1899				300	1,800
1900				325	2,200
1901				300	2,000
1902				500	3,500
1903				600	4,500
1904				500	3,500
1905				650	5,000
1906				700	5,600
1907				400	3,200
1908				400	3,000
1909					
1910				600	3,600
1911					
1912				225	1,300
1913				300	1,800
1914					
1915		[1]		400	2,700
1916		1,896	39,702	[1]	
1917		2,053	41,646		
1918		3,261	152,291		
1919		[1]			
1920					
1921					
Totals	$22,000	*9,896	$255,819	*6,800	$47,600

[1]Includes crushed rock, rubble, sand, gravel.
*See under 'Unapportioned.'

COUNTY, 1880-1921.

Mineral water		Salt, value	Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Gallons	Value			Amount	Value	Substance
10,000	$2,400					
54,000	8,000					
10,000	18,000					
20,000	4,000					
5,000	2,500					
8,000	4,000					
8,000	4,000					
550,000	55,000					
20,000	2,000	300				
5,000	500	300				
5,000	500	300				
5,000	500					
75	42		$600			
100	100	200				
1,000	500	[2]	750		$752	Chromite and salt.
[2]			11,076		3,575	Brick, granite, mineral water, natural gas.
			2,373			
			2,500		2,800	Other minerals.
			7,500		1,500	Other minerals.
			[2]		26,400	Unapportioned.
			30,520		300	Other animals.
[3]701,175	$102,042	[3]$1,100	[3]$55,319		$35,327	

TRINITY

Year	Gold, value	Silver, value	Quicksilver	
			Flasks	Value
Altoona Mine, before 1875 (est.)*	[5]	[5]	1,000	$88,000
1875			1,500	126,425
1876			1,979	87,076
1877			1,317	49,129
1878			1,534	50,469
1879			1,919	57,282
1880	$326,693	$142	245	7,595
1881	550,000	1,500		
1882	600,000			
1883	400,000			
1884	529,150	[3]334		
1885	338,148	10		
1886	464,726	219		
1887	553,051	924		
1888	589,000	500		
1889	811,632	640		
1890	1,192,790	259	240	12,600
1891	1,327,787	2,249		
1892	1,446,603	168		
1893	1,122,995			
1894	1,012,666	325		
1895	1,166,745	1,257	3,926	137,410
1896	1,296,330		4,205	139,035
1897	1,073,372	259	838	29,330
1898	859,255	314	4,032	151,200
1899	590,510	1,086	3,076	123,624
1900	571,605	[3]7,935	2,294	105,982
1901	684,683	[3]1,240	1,302	58,668
1902	719,992	550	240	10,251
1903	607,728	2,085	266	11,156
1904	574,814	135	102	3,864
1905	690,544	3,044	389	13,917
1906	560,843	2,981	166	6,059
1907	535,316	2,399	98	3,739
1908	602,944	4,269	90	3,808
1909	520,046	2,302	197	7,915
1910	500,851	1,960	133	5,622
1911	612,149	6,777	44	2,024
1912	723,503	7,494	18	758
1913	431,862	2,119	4	161
1914	743,512	3,374		
1915	441,846	3,470	[4]	
1916	435,493	7,591	[4]	
1917	602,048	10,021	[4]	
1918	444,729	6,912	[4]	
1919	538,494	3,872	[4]	
1920	541,387	3,469	[4]	
1921	437,993	1,390		
Totals	$28,779,135	$95,575	[3]31,154	$1,293,099

*Bradley, W. W., Quicksilver resources of California; Cal. State Min. Bur., Bull. 78, p. 200, 1918.
[1]Includes crushed rock, rubble, sand, gravel.
[2]Lawver, A. M., in 'Production of Precious Metals in U. S.'; Report of Director of Mint, 1884, p. 175, 1885.
[3]Recalculated to 'commercial' from 'coining value' as originally published.
[4]See under 'Unapportioned.'
[5]The metal contained in the 1919 product was 38% iridium and 62% platinum.
[6]No county segregated figures for gold and silver available for years earlier than 1880.

COUNTY, 1875-1921.

Platinum		Miscellaneous stone[1] value	Miscellaneous and unapportioned		
Ounces	Value		Amount	Value	Substance
			3,620 cu. ft.	$5,000	Granite.
			500 cu. ft.	375	Granite.
			5,750 cu. ft.	4,535	Granite.
			4,838 lbs.	761	Copper.
			6,870 cu. ft.	5,500	Granite.
39	$468				
13	200		100 cu. ft.	75	Granite.
11	275				
26	450				
7	130				
"					
"					
"				111,307	Unapportioned, 1900-1909.
"					
"					
"		$2,000			
"		1,000			
5	151			245	Mineral water.
13	435	900	120 gals.	360	Mineral water.
				52,500	Other minerals.
113	5,161	1,000		397,316	Chromite, copper, manganese, mineral water, quicksilver.
50	3,283	7,718	242 tons	6,325	Chromite.
				353,447	Copper, manganese, mineral water, quicksilver.
41	3,136	1,513	1,814 tons	75,660	Chromite.
				175,574	Copper, mineral water, quicksilver.
" "		11,839		17,444	Copper, mineral water, platinum, quicksilver.
fine ounces					
37	6,612	8,799		1,838	Other minerals.
27	3,260	"		14,239	Quicksilver, miscellaneous stone.
[3]382	$23,561	[3]$34,769		$1,232,501	

TULARE

Year	Gold, value	Silver, value	Brick		Gems, value	Granite	
			M.	Value		Cubic feet	Value
1880	$1,125	$526					
1881	8,181	36					
1882	5,000	2,000					
1883	4,000	1,000					
1884	70,000						
1885	7,500						
1886	6,900	50					
1887	15,640	167					
1888	25,000						
1889	39,340	250					
1890	43,019						
1891	15,095						
1892	24,355	11					
1893	12,818						
1894						4,668	$10,000
1895	16,320					3,000	2,500
1896	20,092					2,800	4,700
1897	12,830	214				3,600	8,000
1898	12,400		300	$2,000		700	1,500
1899	13,610		600	4,200		1,200	3000
1900	10,445	433	650	6,100		1,500	3,000
1901	14,616	100	1,600	8,600		9,000	18,000
1902	11,648		4,500	27,000	$500	1,790	4,000
1903	9,215		1,500	9,500	500	3,000	2,260
1904	1,100		1,250	10,000		7,000	16,000
1905	2,300	13	2,000	16,000	5,000	7,000	9,000
1906	20		1,500	12,000	209,790	7,000	9,000
1907			2,500	20,000	26,206		
1908			2,250	18,000	62,250		
1909			6,620	42,400	58,000		
1910			8,195	64,000	104,000	700	1,500
1911			10,225	81,000	20,000		
1912			10,900	70,500	5,350		
1913			6,000	45,000	1,500		
1914			6,838	47,507			
1915			5,520	33,364			
1916			6,330	48,500			[2]
1917			6,771	112,938			[2]
1918			[2]		[2]		[2]
1919			and tile	34,978			[2]
1920			[2]				[2]
1921			[2]				[2]
Totals	$402,569	$4,800		[2]$713,587	[2]$493,096		[2]$92,460

[1]Includes crushed rock, rubble, sand, gravel.
[2]See under 'Unapportioned.'

COUNTY, 1880-1921.

Magnesite		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Tons	Value		Amount	Value	Substance
			80 tons	$960	Limestone.
			1,000 bbls.	1,500	Lime.
200	$1,500		22 tons	88	Gypsum.
3,511	28,210				
2,450	19,250				
1,300	19,600	$100			
2,800	9,100			50,108	Unapportioned, 1900-1909.
2,380	21,420		400 tons	2,200	Gypsum.
6,567	52,642				
6,468	47,200		2,803 lbs.	360	Copper
				185	Natural gas.
7,110	35,550		2,000 M.cu.ft	1,000	Natural gas.
7,763	57,335				
6,684	66,840		100 cu. ft.	200	Marble.
			80 tons	200	Quartz.
7,858	62,864	4,350	392 cu. ft.	796	Marble.
			1,429 tons	5,050	Feldspar.
			1,250 tons	2,400	Quartz.
9,650	96,500	1,750	2,830 tons	13,065	Feldspar.
			6 cu. ft.	30	Marble.
			1,349 tons	1,888	Limestone.
11,574	104,166	36,851	1,800 tons	6,500	Feldspar.
				1,830	Chromite and silica.
			3,435 tons	42,555	Chromite.
87,606	737,130	82,255	1,422 lbs.	350	Copper.
				36,410	Feldspar, granite, limestone, marble, silica.
			450 tons	11,000	Chromite.
136,562	1,238,853	75,594	240 tons	1,580	Feldspar.
				60,023	Building, tile, copper, graphite, limestone, talc.
			600 tons	24,000	Chromite.
			444 tons	2,928	Feldspar.
28,826	269,748	125,407	8,400 tons	32,400	Limestone.
			204 tons	1,143	Silica.
				71,782	Brick, gems, granite, soapstone, talc, tile.
			10,347 tons	46,388	Limestone.
18,765	186,601	10,811	700M. cu. ft.	295	Natural gas.
				51,928	Chromite, feldspar, granite.
35,305	394,169	8,465	400M. cu. ft.	195	Natural gas.
				190,467	Brick, feldspar, granite, limestone.
			10,030 tons	40,090	Limestone.
11,454	125,594	284,122	380M. cu. ft.	190	Natural gas.
				102,238	Brick and granite.
394,833	$3,574,272	$629,705		$804,322	

TUOLUMNE

Year	Gold, value	Silver, value	Lime		Limestone	
			Barrels	Value	Tons	Value
1880	$461,861	$1,071				
1881	500,000	1,000				
1882	400,000					
1883	320,000					
1884	310,000					
1885	320,903	1,473				
1886	432,438	1,551				
1887	504,662	3,166				
1888	475,000	3,500				
1889	446,300	543				
1890	1,500,629	13,062				
1891	1,384,950	139				
1892	1,092,549	911				
1893	354,734	1,329				
1894	547,448	1,072				
1895	666,754	313				
1896	1,070,141	328				
1897	1,809,572	1,696				
1898	1,734,953	15,582				
1899	1,635,769	15,111				
1900	1,596,891	62,367				
1901	1,670,368	39,787				
1902	1,791,829	6,580				
1903	1,732,572	13,989	1,600	$1,600		
1904	1,563,907	12,963				
1905	1,291,726	21,348	500	1,000		
1906	1,039,675	8,476	500	1,000		
1907	806,875	6,453	110,000	125,000		
1908	798,752	11,732	60,000	69,500	1,233	$6,500
1909	925,703	4,384	60,000	60,000	15,057	28,942
1910	615,626	5,754	78,300	78,300	3,600	10,400
1911	1,093,484	13,243	75,000	70,000	4,319	13,609
1912	1,113,291	25,146	117,450	121,250	11,554	20,099
1913	974,409	24,381	75,000	85,000	12 446	20,676
1914	940,793	12,017	63,331	38,000	16,707	21,907
1915	1,058,103	13,480	[2]		8,859	11 349
1916	868,237	17,039	[2]		3,137	5,132
1917	321,085	7,808	[2]		3,287	6,481
1918	274,328	21,425	[2]		3,064	5,600
1919	471,021	11,076	[2]		[2]	
1920	254,569	6,007	[2]		7,494	15,288
1921	96,026	2,505	[2]		3,650	9,475
Totals	$37,267,933	$409,807	[3]641,681	$650,650	[3]94,407	$185,458

COUNTY, 1880-1921.

Marble		Copper		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Cubic feet	Value	Pounds	Value		Amount	Value	Substance
					800 M.	$2,288	Brick.
						1,301	Unapportioned, 1900-1909.
					400 lbs.	16	Lead.
7,000	$14,000	155,826	$17,920				
11,550	28,875				10,367 cu. ft.	14,020	Granite.
11,500	28,750				9,700 cu. ft.	9,700	Granite.
11,000	66,000				9,700 cu. ft.	9,700	Granite.
23,000	46 000				9,700 cu. ft.	9,700	Granite.
					197 tons	1,379	Chromite.
22,030	60,120						
18,503	47,165						
27,600	107,400	9,086	1,154		30 tons	180	Chromite.
17,360	45,400				2,502 lbs.	111	Lead
18,966	50,398						
27,720	73,920						
37,312	93,726	893	138		893 lbs.	53	Lead.
21,830	38,202	45	6		89 lbs.	3	Lead.
					352 tons	2,352	Chromite.
[2]		27,667	4,842	$1,900	1,779 lbs.	84	Lead.
						79,328	Dolomite, lime, marble.
					285 tons	4,556	Chromite.
[2]		1,797	442	1,500	873 lbs.	60	Lead.
						107,296	Dolomite, lime, magnesite, marble.
					2,680 tons	54,290	Chromite.
[2]		32,840	8,960	3,800	997 lbs.	86	Lead.
						108,758	Dolomite, lime, magnesite, marble.
[2]		35,127	8,676	1,700	4,269 tons	168,693	Chromite.
						121,806	Lime, manganese, marble.
[2]		[2]		2,700		110,746	Lime and limestone.
						78,950	Chromite, copper, granite, marble.
[2]				28,696		209,354	Dolomite, lime, marble, platinum.
[2]				229,185		217,292	Dolomite, granite, lime, marble.
[3]255,371	$699,756	[3]263,281	$42,143	$269,481		$1,312,152	

Year	Gold, value	Petroleum		Natural gas		Asphalt and bituminous brick		Brick	
		Barrels	Value	M. cu. ft.	Value	Tons	Value	M	Value
1880	$354	[2]							
1881	600								
1882									
1883									
1884									
1885									
1886									
1887									
1888									
1889									
1890	2,468								
1891	1,715								
1892									
1893									
1894		290,913	$367,822			248	$4,800		
1895		244,624	244,624			175	3,500		
1896		248,000	272 800						
1897		368,282	368,282						
1898		427,000	571,000			4,105	80,775	286	$2,228
1899	3,990	496,200	496,200			5,188	103,760	375	3,000
1900	2,562	443,000	398,700			1,466	31,670	230	1,700
1901	4,183	472,057	236,028			2,073	30,945		
1902	2,012	475,000	455,000			37	370		
1903	1,087	542,902	517,611			1,114	13,368	1,380	12,900
1904	2,700	518,000	465,682	1,800	$2,700	3,169	38,028		
1905	1,200	375,522	236,578	3,831	5,000	3,000	30,000	1,300	10,400
1906	[1]	311,000	155,500	3,500	1,000	3,700	37,000	1,675	11,650
1907		352,224	211,334	1,825	2,278			1,600	12,800
1908		289,625	217,219	3,625	4,531			200	1,500
1909		344,419	223,872	1,721	2,151			1,275	7,625
1910		492,147	319,898	545	681			1,190	36,945
1911		499,082	349,777	[4]29,580	2,958			900	5,100
1912		662,300	584,811	[4]55,068	4,163			550	3,575
1913		899,007	907,997	62,200	6,220			1,023	6,085
1914		943,929	991,125	100,000	6,000			449	3,102
1915		1,017,220	869,723	491,879	29,670			200	2,500
1916		943,499	985,956	806,540	133,867			[3]	
1917		996,501	1,313,388	1,033,564	152,550			[3]	
1918		1,339,342	1,982,226	858,457	150,885				
1919		1,685,073	2,755,094	1,038,574	252,240			[3]	
1920		1,989,681	4,988,130	1,521,448	214,280				
1921		2,167,326	5,869,119	2,127,476	360,443			[3]	
Totals	[3]$22,871	19,833,875	$27,355,496	8,141,633	$1,331,617	24,275	$374,216	[3]12,643	$121.170

[1]Includes crushed rock, rubble, sand, gravel.

[2]Commercial production of petroleum in Ventura County began at least as early as 1874, in the Sulphur Mountain district, but detailed county segregations are not available for the early years.

[3]See under 'Unapportioned.'

[4]Quantity estimated, as only values given in reports of those years.

COUNTY, 1880-1921.

Pottery clay		Sandstone		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
Tons	Value	Cubic feet	Value		Amount	Value	Substance
		16,200	$16,500				
		33,200	20,000				
					250 tons	$6,500	Borax.
		12,500	6,250	$35,279			
		4,200	2,650	16,764	3,000 tons	60,000	Borax.
						4	Silver.
		3,200	1,600	22,500	50 tons	2,500	Mica.
		1,750	900	25,100	3,500 tons	140,000	Borax.
					50 tons	3,800	Mica.
		6,000	3,500	31,227	50 tons	3,000	Mica.
30	$45	2,300	1,380	60,490			
		1,320	792				
				20,880			
560	1,680			15,406			
				144,226		830,853	Unappropriated, 1900-1909.
		900	450	35,000			
1,900	1,900	4,658	2,325	750			
1,000	1,000	4,600	1,850				
3,000	2,990	300	150			1,530	Unapportioned.
		1,195	502				
				2,674		200	Other minerals.
[3]		[3]		14,200		1,407	Brick, clay, sandstone.
[3]		[3]		30,000		2,072	Brick and sandstone.
		[3]		52,900		300	Other minerals.
[3]		[3]		5,000		4,500	Clay and clay products.
						190	Other minerals.
[3]		[3]		26,265		500	Mineral paint and sandstone.
				11,250		3,985	Clay and clay products.
						472	Mineral paint and sandstone.
[2]6,490	$7,615	[2]92,343	$58,849	$549,911		$1,061,813	

YOLO COUNTY, 1873-1921.

Year	Quicksilver		Sandstone		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
	Flasks	Value	Cubic feet	Value		Amount	Value	Substance
1873	[2]995	$79,928						
1874	3,000	315,540						
1875								
1876	965	42,460						
1877	1,516	56,547						
1878	1,640	53,956						
1879	1,110	33,134						
1880	422	13,082						
1881								
1894			2,500	$1,000				
1895			542	1,873				
1896			252	378				
1897								
1898			264	384				
1899			264	384				
1900			908	1,760				
1901			1,540	2,300				
1902			328	450				
1903			280	144				
1904			180	720				
1905			175	200				
1906			160	204				
1907			250	350				
1908			140	1,150				
1909								
1910								
1911								
1912								
1913								
1914	15	736						
1915	[3]				$1,200		$840	Other minerals.
1916					300			
1917	[3]				4,300		1,261	Other minerals.
1918	[3]				17,915		3,300	Other minerals.
1919	[3]				5,600		19,866	Other minerals.
1920					9,472			
1921					14,829			
Totals	[2]9,663	$595,383	7,783	$11,297	$53,616		$25,267	

[1]Includes crushed rock, sand, gravel.
[2]Flasks of 76½ pounds, previous to June, 1904; of 75 pounds since.
[3]See under 'Unapportioned.'

YUBA COUNTY, 1880-1921.

Year	Gold, value	Silver, value	Platinum		Miscellaneous stone[1], value	Miscellaneous and unapportioned		
			Ounces	Value		Amount	Value	Substance
1880	$943,860	$438						
1881	800,000	1,300						
1882	750,000							
1883	455,000							
1884	250,000							
1885	207,449							
1886	149,203							
1887	162,426							
1888	150,000							
1889	112,053	115						
1890	141,781							
1891	37,576							
1892	44,218							
1893	30,839							
1894	107,480							
1895	111,482							
1896	171,688							
1897	141,638							
1898	166,885							
1899	189,927	12						
1900	280,366	[2]2,041						
1901	188,908	[2]393						
1902	155,630	2						
1903	125,830	41						
1904	139,528					400 M.	$3,000	Brick.
						375 tons	750	Pottery clay.
1905	324,135	369				400 tons	80	Pottery clay.
						2,000 gals.	800	Mineral water
1906	[3]	[3]				2,000 gals.	800	Mineral water.
1907	1,766,770	6,167				1,800 gals.	720	Mineral water
1908	2,034,486	9,997			$5,750	1,000 M.	10,000	Brick.
1909	2,469,865	4,156			5,650	550 M.	6,600	Brick.
							568,564	Unapportioned 1900-1909
1910	3 204,273	5,372						
1911	2,997,072	5,299			9,318			
1912	2,753,408	6,198			15,526			
1913	2,491,505	7,571			8,063			
1914	2,800,713	5,295	74	2,377	14,895			
1915	2,703,710	5,254	132	4,174	149,292			
1916	3,167,723	5,934	314	14,301	42,685	4,817 lbs.	1,185	Copper.
							6,000	Other minerals
1917	3,667,673	6,591	149	8,869	28,863			
1918	3,767,933	13,796	189	12,930	43,338		6,888	Other minerals.
1919	4,195,732	12,276	[4]125	13,098	40,439			
1920	3,467,769	16,502	113	14,395	74,943		40	Other minerals.
1921	4,738,248	26,135	179	14,396	73,387		100	Other minerals.
Totals	$52,564,762	$141,254	1,275	$84,540	$512 149		$605,527	

[1]Includes crushed rock, sand, gravel.
[2]Recalculated to 'commercial' from 'coining value' as originally published.
[3]See under 'Unapportioned.'
[4]Includes some palladium.

MUSEUM.

The Museum of the State Mining Bureau possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the first five of such collections located in North America; and contains not only one or more samples of most of the known minerals found in California, but many specimens from other states and foreign countries as well.

Aside from its purely educational features, the Museum daily attracts throngs of tourists and travelers, and furnishes visual evidence of the immense mineral resources of California. The State Mining Bureau supplies a collection of forty typical minerals and ores, appropriately labeled, to any public school in the state upon request.

Mineral specimens suitable for exhibit purposes are solicited and their donation will be appreciated by the State Mining Bureau, as well as by those who utilize the facilities of the collection.

During the month a total of 497 visitors signed their names to the Museum register, and in addition there are many others daily who fail to take note of our request for their signatures. During the eleven months of 1922 to date, a total of 5207 visitors have thus registered their presence in the Museum.

LABORATORY.

FRANK SANBORN, Petrologist.

In a mineralogical, as well as a possible commercial way, one of the most interesting samples received this year at the laboratory of the State Mining Bureau was of anapaite. Anapaite is a greenish-white phosphate of calcium and iron found previously only in Russia, and named after the seaport of Anapa. A sample of rock received last June from Tulare County proved to be anapaite, being the first reported occurrence of the mineral in the United States. This mineral could be commercially valuable as a phosphate rock if found in sufficient quantity.

Between January first and November 15, 1922, approximately 2813 samples were received and determined. Of this number 316 were reported as having a commercial value or a possible one. Many high-grade gold, silver, copper and lead ores were received; also good grades of platinum-bearing sand, salines, etc. Radio-activity was reported in two instances. The occurrence of the rare-earth metals and vanadium was also reported.

A few of the hundreds of samples received each year tend to show the observing and highly optimistic nature of the senders. Metal-bearing samples have been received from well-drillers with an explanation that at a certain depth a peculiar metal was encountered. The metal usually proved to be a metallic part of the equipment that had become, through some mishap, ground to a dust. A too-generous application of lubricating oil to the pumps has caused films of oil to form on well water, and incidentally an oil excitement in some households. Likewise the man who disposed of the cleanings from his crank-case by pouring it in his neighbor's basement was the cause of a temporary thrill.

Prospecting and exploitation of the state's mineral wealth increases as the state becomes more thickly populated. The number of deter-

minations made annually by this laboratory has doubled during the past five years. Each year new occurrences of some mineral for the state are reported and occasionally a new mineral species is found and named. Frequently a new use for a mineral is found and the value of the particular mineral will advance in price. Cobalt is one such mineral that had a sudden increase in value. In studying the wonderful properties of such minerals as tungsten and vanadium, one would expect to hear of new uses for these metals, causing the state to be thoroughly searched for more of these valuable ores.

Samples are received from every county in the state. However, some of the counties, such as Alpine and Mono, are seldom heard from and it is reasonable to suppose that valuable minerals other than gold and silver will be unearthed in those rugged and sparsely settled counties.

A total of 231 samples was received and determined during the thirty-day period ending November 15. From this number those having a possible commercial value, judged from the sample submitted only, are appended.

The bureau will supply upon request the name and address of the party who sent in any sample listed if the reference number is given.

05–313 Vanadinite (lead vanadate).
05–314 Chromite.
05–315 Gypsum.
05–316 Copper-silver-lead ore.
05–317 Copper ore.
05–318 Quartz containing copper, silver, and gold.
05–319 Chrysoprase.
05–320 Gypsum.
05–321 Gold ore.
05–322 Montmorillonite.
05–323 Limestone marl.
05–324 Amphibole (asbestiform).
05–325 Copper ore, contains some gold.
05–326 Hydrous fluo-silicate of magnesium.
05–327 Mineral paint.

LIBRARY.

E. Cooney, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received during the month, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the state are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geological Survey:

Water-Supply Paper No. 482—Surface Water Supply of the United States, 1918. Part XII. North Pacific Slope Drainage Basins. A. Pacific Basins in Washington and Upper Columbia River Basin. By Nathan C. Grover, Chief Hydraulic Engineer; G. L. Parker and W. A. Lamb, District Engineers.

Water-Supply Paper No. 484—Surface Water Supply of the United States, 1918. Part XII. North Pacific Slope Drainage Basins. C. Lower Columbia River Basin and Pacific Slope Drainage Basins in Oregon. By Nathan C. Grover, Chief Hydraulic Engineer; F. F. Henshaw and G. L. Parker, District Engineers.

Water-Supply Paper No. 490-C—Routes to Desert Watering Places in the Lower Gila Region, Arizona. By Clyde P. Ross.

Bulletin No. 735-F. General Features of the Brown Hematite Ores of Western North Carolina. By W. S. Bayley.

Secondary Metals in 1921. By J. P. Dunlop.

Mineral Resources of the United States, 1919, Part 1, Metals.

Coke and By-products in 1919-1920.

U. S. Bureau of Mines Reports of Investigations:

Serial No. 2392—A New Instrument for Sampling Aerial Dust. By Leonard Greenburg (Asst. Sanitary Engineer (R.), U. S. Public Health Service) and George W. Smith (Junior Physical Chemist, U. S. B. M.).

Serial No. 2393—Production of Alumina from Clay Tests on the Miguet Process. By Clyde F. Williams (Metallurgist and Superintendent, Northwest Experiment Station, B. of M.) and Clarence E. Simms (Electrometallurgist, B. of M.).

Serial No. 2394—Gum-Forming Constituents in Gasoline. By N. A. C. Smith (Petroleum Chemist, U. S. B. M.) and M. B. Cooke (Asst. Ref. Engineer, U. S. B. M.).

Serial No. 2395—Explosives Used in July, 1922. By W. W. Adams (Statistician, U. S. B. M.).
Serial No. 2396—Feldspar Mining and Milling, (Near Keene, New Hampshire). By Raymond B. Ladoo (Mineral Technologist, U. S. B. M.).
Serial No. 2397—Gunite in Metal Mines. By Byron O. Pickard (D. M. E., U. S. B. M.).
Serial No. 2398—Explosion-Proof Electrical Equipment. By L. C. Ilsley (E. E., B. M.).
Serial No. 2399—Fatalities at Coal Mines in August, 1922. By W. W. Adams (Statistician, B. M.).
Serial No. 2400—Fire and Explosion Hazards of Petroleums and Petroleum Products. By S. H. Katz (Asst. Physical Chemist, B. M.) and N. A. C. Smith (Petroleum Chemist, B. of M.).
Bulletin No 188—Lessons from the Granite Mountain Shaft Fire, Butte. By Daniel Harrington.
Bulletin 193—Analyses of Mine and Car Samples of Coal Collected in the Fiscal Years 1916–1919. By Arno C. Fieldner, Walter A. Selvig and J. W. Paul.
Bulletin No. 209—Fusibility of Ash from Coals of the United States. By W. A. Selvig and A. C. Fieldner.
Bulletin No. 210—Oil Shale—an Historical and Economic Study. By Martin J. Gavin.
Bureau of Standards Circular 121—Construction and Operation of a Two-Circuit Radio Receiving Equipment with Crystal Detector.
Circular No. 85—United States Government Specifications for Basic Sulphate White Lead, Dry and Paste.
Circular No. 87—Recommended Specifications for Zinc Oxide, Dry and Paste.
State of Colorado, Bureau of Mines—Annual Report for 1921.
Florida Geological Survey—Fourtenth Annual Report.
Michigan Geological Survey—Bulletin No. 32—Production and Value of Mineral Products in Michigan for 1920 and Prior Years.
Bulletin of the Illinois State Museum—The Origin of the Cahokia Mounds. By A. R. Crook.
Geological Survey of Ohio, Fourth Series—Bulletin No. 25—Pottsville Fauna of Ohio. By Helen Morningstar, Ph. D.
Virginia Geological Survey—Bulletin No. XXIII—Manganese Deposits of Western Virginia. By G. W. Stose and H. D. Miser.
New Zealand Mines Department, Geological Survey Branch—Sixteenth Annual Report.
New Zealand Journal of Science and Technology. Vol. V. No. 3—The Genesis of the Puhipuhi Cinnabar Deposits. A working Hypothesis. By W. H. Cropp.
Annals da Bibliotheca Nacional do Rio de Janeiro. Vol. XXXIX. By Dr. Manoel Cicero Peregrino da Silva.
Boletin Bibliographico da Bibliotheca Nacional do Rio Janeiro. Anno III.
Notes on Mining in Siam: Issued by the Royal Dept. of Mines, Bangkok.
Annual Report of the Under Secretary for Mines, Queensland, 1921.

Societies and Educational Institutions.

University of Texas Bulletin No. 2230—Notes on the Oil and Gas Fields of Webb and Zapata Counties. The Underground Position of the Austin Formation in the San Antonio Oil Fields. By E. H. Sellards.
University of Texas Bulletin No. 2232—Well Records in Panola County, Including Structural Contour Map. By E. H. Sellards.
Records of the Australian Museum. Vol. XIII, No. 6.
Smithsonian Institution, United States National Museum Bulletin No. 121—Life Histories of North American Petrels and Pelicans and their Allies. By Arthur Cleveland Bent.
The Science Reports of the Imperial University, Sendai, Japan, Second Series (Geology).
The Science Reports of the Tohoku Imperial University, Sendai. Vol. 1, No. 2. Japan.
Bulletin of the Institution of Mining and Metallurgy, October, 1922.
Journal of the American Peat Society, October, 1922.
The American Mineralogist, October, 1922.

Monthly Bulletin of the Canadian Institute of Mining and Metallurgy, November, 1922.
Economic Geology. November, 1922.
Proceedings of the Engineers' Society of Western Pennsylvania, May, 1922.

Maps.

Irrigation Map of California. By U. S. Dept. of Agri., Bureau of Public Roads.
U. S. Geol. Survey—Map Showing Oil and Gas Fields of the United States.
U. S. Geol. Survey—Topograph Sheet—San Ardo, Monterey County.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

American Petroleum Institute, New York.
Architect and Engineer, San Francisco.
Arizona Mining Journal, Phoenix, Arizona.
Asbestos, Philadelphia, Pennsylvania.
Brick and Clay Record, Chicago.
Cement, Mill and Quarry, Chicago, Illinois.
Chemical Engineering and Mining Review, London, England.
Engineering and Mining Journal-Press, New York.
Financial Insurance News, Los Angeles, California.
Journal of Electricity and Western Industry, San Francisco.
Metallurgical and Chemical Engineering, New York.
Mining and Engineering Record, Vancouver, B. C.
Mining and Oil Bulletin, Los Angeles.
Oil Age, Los Angeles.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil News, Galesburg, Illinois.
Oildom, New York.
Oil, Paint and Drug Reporter, New York.
Oil Trade Journal, New York.
Oil Weekly, Houston, Texas.
Petroleum Age, New York.
Petroleum Record, Los Angeles.
Petroleum Refiner, Kansas City, Missouri.
Petroleum World, Los Angeles.
Queensland Government Mining Journal, Brisbane, Australia.
Rock Products, Chicago, Illinois.
Safety News, Industrial Accident Commission, San Francisco.
Salt Lake Mining Review, Salt Lake City, Utah.
Southwest Builder and Contractor, Los Angeles.
Standard Oil Bulletin, San Francisco.
Stone, New York.
The Record, Associated Oil Company, San Francisco.

Newspapers.

The following papers are received and kept on file in the library:

Amador Dispatch, Jackson, Cal.
Arkansas Oil and Mineral News, Hot Springs National Park (Arkansas).
Bakersfield Morning Echo, Bakersfield, Cal.
Blythe Herald, Blythe, Cal.
Bridgeport-Chronicle-Union, Bridgeport, Mono Co., Cal.
California Oil World, Los Angeles, Cal.
Colusa Daily Sun, Colusa, Cal.
Daily Midway Driller, Taft, Cal.
Del Norte Triplicate, Crescent City, Cal.
Exeter Sun, Exeter, Cal.
Gateway Gazette, Beaumont, Cal.
Georgetown Gazette, Georgetown, Cal.
Gilroy Gazette, Gilroy, Cal.
Goldfield News, Goldfield, Nevada.

Guerneville Times, Guerneville, Cal.
Healdsburg Enterprise, Healdsburg, Cal.
Humboldt Standard, Eureka, Cal.
Inyo Independent, Independence, Cal.
Inyo Register, Bishop, Cal.
Lake County Bee, Lakeport, Cal.
Mariposa Gazette, Mariposa, Cal.
Mining and Financial Record, Denver, Colo.
Mountain Democrat, Placerville, Cal.
Mountain Messenger, Downieville, Cal.
Nevada Mining Press, Reno, Nevada.
Oatman Mining Press, Oatman, Arizona.
Oregon Observer, Grants Pass, Oregon.
Oroville Daily Register, Oroville, Cal.
Petroleum Reporter, Etna Mills, Cal
Placer Herald, Auburn, Cal.
Plumas Independent, Quincy, Cal.
Plumas National Bulletin, Quincy, Cal.
Sacramento Union, Sacramento, Cal.
San Diego News, San Diego, Cal.
Santa Barbara Daily News, Santa Barbara, Cal.
Shasta Courier, Redding, Cal.
Siskiyou News, Yreka, Cal.
Siskiyou Standard, Fort Jones, Cal.
Stockton Record, Stockton, Cal.
Sunset Journal, Sunset District, San Francisco, Cal
Tuolumne Prospector, Tuolumne, Cal.
Ventura Daily Post, Ventura, Cal.
Weekly Trinity Journal, Weaverville, Cal.
Western Sentinel, Etna Mills, Cal.

PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of consumers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them have been made known to those looking for raw mineral products.

Sufficient publicity has not heretofore been given to this feature of the Bureau's work, but in 'Mining in California' a suitable medium is provided for current inquiries of this nature, and, therefore, written or verbal inquiries that come to the attention of the Bureau are summarized in each issue.

The name of the product wanted or offered, only, is published; the name of the owner of the deposit, or buyer, and other details being supplied upon request.

In writing, the reference number of the item should be given.

Mineral Products or Deposits for Sale.

02-137 Good copper prospect; San Benito County.
02-138 Soapstone and asbestos; deposit or tonnage.
02-139 Magnesite mine; 100 tons on dump and large tonnage in sight; reasonable price.
02-140 Property with high-grade gold vein in amphibolite schist; 20 acres.
02-141 Property with porphyry vein 10 to 75 feet wide; 12,000 feet in length. Heavy deposit of sulphides.
02-142 Drift mine near Nimshew; or partner to help work.
02-143 Barite deposit. Five miles from railroad; three miles from water transportation; good road to the deposit.
02-144 Diatomaceous earth deposit; will lease.
02-145 Gypsum in car or train lots, or deposit.

Mineral Products or Deposits Wanted.

03-121 Feldspar; tonnage.
03-122 Volcanic cinders; prefer near Los Angeles.
03-123 Coal deposit within reasonable distance of highway or railroad; two-foot vein or over.
03-124 Concentrates from quartz ores; no objection to arsenic content.
03-125 Block pumice; tonnage.
03-126 Gypsum deposit suitably located.
03-127 Second-hand gold dredge; 10 to 15-cubic-foot buckets.
03-128 Fluorspar, magnesite, and dolomite; tonnage.

EMPLOYMENT SERVICE.

Following the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and address of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

The Bureau registers technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

A list of applicants for positions and 'positions open,' received by the Bureau during each 30-day period preceding the date of publication of the Monthly Chapter is carried in each issue.

Each notice is designated by a key number, and communications sent to the Bureau in reply to any notice will be forwarded to the proper party without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau, to avoid possible loss.

Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

01–41 Geologist or mining engineer. Two years experience, including mining, highway construction, geology and surveying. Age 25; married. References. Salary wanted, $175.

01–42 Mining engineer. Over fifteen years experience, covering general mining and mine management. Speaks Spanish; can handle any kind of labor. Prefer position on desert. Details of experience on file. Married. References. Salary open.

01–43 Engineer, draftsman, etc. Technical graduate. Experience as mill-man, engineer, petrographer, and general engineering. Age 29; married. References. Salary wanted, minimum, $150.

01–44 Draftsman-Surveyor. Fifteen years experience as surveyor, draftsman, inspector, etc., in mining, mechanical, railroad, and structural lines. Age 35; single. References. Salary wanted, $150.

DECEMBER, 1922

REPORT XVIII OF THE STATE MINERALOGIST

DISTRICT REPORTS OF MINING ENGINEERS.

In 1919–1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each division working out from a local branch office.

This move brought the Bureau into close personal contact with operators, but did not materially shorten the time between the gathering of data in the field and their publication in the Report of the State Mineralogist at the end of an annual or biennial period.

Mining activities and development noted by district engineers in their respective fields are now embodied in monthly reports published in each issue of 'Mining in California,' thus making these data available within a maximum period of thirty days, and the Monthly Chapter as far as possible a compendium of current mining progress throughout the State.

The counties included in each field division and the location of the local offices are shown on the accompanying outline map of the State. (Frontispiece.)

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the State's oil fields is included under this heading.

REDDING FIELD DIVISION.

W. Burling Tucker, Mining Engineer.

Shasta County.

Climax Mine is situated three miles northwest of Igo, on the South Fork of Clear Creek, in sections 16 and 21, T. 31 N., R. 6 W., elevation 1200 feet.

This property was briefly mentioned in the July Chapter of Report XVIII of the State Mineralogist, page 320, as at the time the property was visited the shaft was full of water, but since that date the workings have been unwatered, thus enabling a more detailed report to be made on the mine.

Holdings consist of three claims, known as Climax, South Climax, and West Climax, totaling 60 acres. The occurrence of the veins on the Climax group of mines is somewhat different than the main northeast and southwest fissures that occur in the granite batholith in the South Fork mining district, as the principal vein developed on the Climax group of claims occurs on the contact of the granite and meta-andesite. The granite is the footwall and meta-andesite the hanging wall of the vein. The general strike of the contact is N. 10° E., dip 50 degrees east. No prospecting or development work has been attempted to date to determine the possibility of finding ore on the intersection of the northeast and southwest veins with the contact and this point is worthy of investigation. The vein which occurs on the contact is a black carbonized slate cut by numerous stringers of quartz, and in places this carbonized vein material is replaced by quartz.

The enclosed vein material is mineralized with pyrite, chalcopyrite, small amounts of galena, and some sphalerite. About eighty feet west of the contact, a vein of quartz occurs in the granite, having the same

general strike and dip as the vein on the contact. Two hundred feet west of the Climax shaft is another system of quartz veins in the granite. One strikes N. 40° E., and dips 80 degrees east, the other strikes N. 20° E. and dips 70 degrees east. Average widths of veins is 4 feet.

These two veins intersect the contact north of the Climax shaft. The vein quartz shows the presence of silver chlorides and some galena. On the Climax claim, a shaft has been sunk to depth of 150 feet on a vein in the granite running parallel to the main contact vein. On the 100-foot level, a drift has been driven south 50 feet and north 40 feet on the vein, developing a lenticular shoot of ore fifty feet in length, width of ore being from 12 inches to 2 feet. The vein pinched below this level, and the shaft was sunk in the granite footwall to the 150-foot level. On this level a crossent has been driven east 75 feet cutting the contact vein which has a width of 10 feet.

Vein material is black carbonized slate, containing numerous stringers of quartz. South of the Climax shaft about 150 feet, there is an incline shaft, 75 feet deep on the contact vein, which has been stoped to the surface north and south of this shaft for a distance of 100 feet.

The Black Prince shaft is 150 feet south of these workings, and was sunk to a vertical depth of 110 feet. The shaft started on the contact vein, but a short distance below the collar cut through the vein and passed into the granite footwall.

On the 100-foot level a crossent was driven east to the vein on the contact, where it is reported to have a width of 10 to 20 feet. The average value of the ore extracted from this vein is reported to have been $10 per ton in gold and silver.

On the South Climax claim there is a shaft 33 feet deep, which cut the vein on the contact. The vein quartz carries native silver, tetrahedrite, sphalerite, chalcopyrite, pyrite, and some gold mostly associated with the pyrite. A shipment of ore from the Climax shaft was made to the Selby Smelter in 1922, amounting to 4210 pounds, which assayed 0.08 ounces gold, 214.9 ounces silver, 6.6 per cent lead, and 25.2 per cent zinc.

Mine equipment consists of 9-h.p. gasoline hoist, 6″ x 4½″ Gardner compressor, driven by 15-h.p. Fairbanks-Morse gas engine, blacksmith shop, air drills, and assay office.

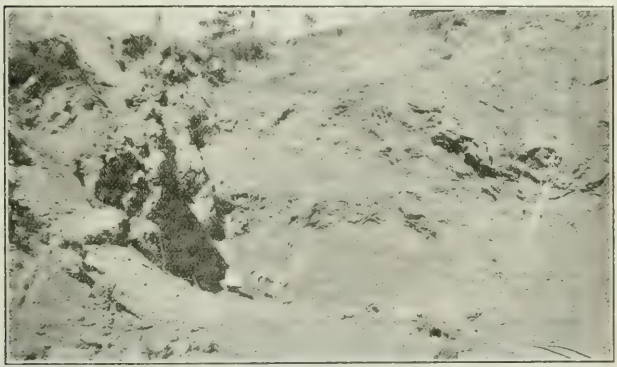
Two men are employed. Owner: W. W. Robinson of Redding; Louis Davidson, superintendent.

Ganim Mine is situated in sections 5 and 8, T. 32 N., R. 6 W., two and one-half miles northwest of Whiskeytown. Elevation is 1400 feet. Holdings consist of 14 claims, owned by the Ganim Mining Company, San Francisco. J. S. Ganim, president, and A. Farris, secretary.

The country rock is meta-andesite with intrusions of alaskite porphyry. Two vein systems have been developed on the property. One showing pyrite ore, occurring in a shear zone which strikes northwest and southeast and dips 25 degrees north. The country rock at a distance from the ore is a much sheared and epidotized meta-andesite in places slightly pyritized along joint planes. The lower workings on the property are not far from a contact of meta-andesite, quartz-diorite and dikes of alaskite porphyry which cut the meta-andesite in the

vicinity of the tunnels. The ore where exposed near these workings is entirely pyrite. Besides the pyrite, the only other metallic minerals are rare specks of chalcopyrite, distributed irregularly throughout the ore. Other specimens of ore consist of meta-andesite in part replaced by pyrite. Developments consist of a number of crosscut tunnels which cut this shear zone at different places. These tunnels are from 50 to 400 feet in length. The ore developed has a width of 12 to 15 feet and is reported to carry values in silver. At higher elevation, a vein of quartz 4 feet in width has been developed. Strike of vein is N. 35° W., dip vertical.

At an elevation of 1800 feet, a crosscut tunnel has been driven N. 40° E., 120 feet to the vein, with a drift northwest 100 feet on the vein. The ore is white quartz carrying copper sulphides, bornite and chalcopyrite. Reported to carry $15 per ton in gold. This vein is developed by three other tunnels, and two shallow shafts. The company is driving a crosscut tunnel at a lower elevation to develop the veins exposed in upper workings.



Upper Quarry on Magnetite Deposit, Shasta Iron Company, Heroult, Shasta County.

Equipment: 9″ x 14″ Simplate Valve Chicago Pneumatic compressor, Lyner drill sharpener, air drills and blacksmith shop.

Four men are employed; J. S. Ganim, manager.

Blue Gravel Mine (formerly *Brush Placer Mine*) is located one mile southwest of Redding in section 2, T. 31 N., R. 5 W.; owned by *St. Adel Mining Company*, V. L. Thornberry, agent, Bush street, San Francisco.

Holdings consist of 80 acres. Elevation is 700 feet. Course of blue gravel channel is northeast and southwest. Depth of gravel 80 to 100 feet. Bedrock is meta-andesite. An incline shaft has been sunk 50 feet to bedrock with a drift driven west on the channel 30 feet.

Equipment consists of 2-inch centrifugal pump, and gasoline hoist. Under lease of J. A. Burger and L. V. Stowe of Redding, California.

Four men are employed on development work.

IRON.

Shasta Iron Mine is situated one mile north of Heroult, in section 26, T. 34 N., R. 3 W., at an elevation of 1700 feet. Holdings consist of 200 acres of patented land. Under lease to the *Noble Electric Steel Company*; H. H. Noble, president; E. E. Mead, secretary; E. Y. Dougherty, superintendent; offices 384 Mills Building, San Francisco.

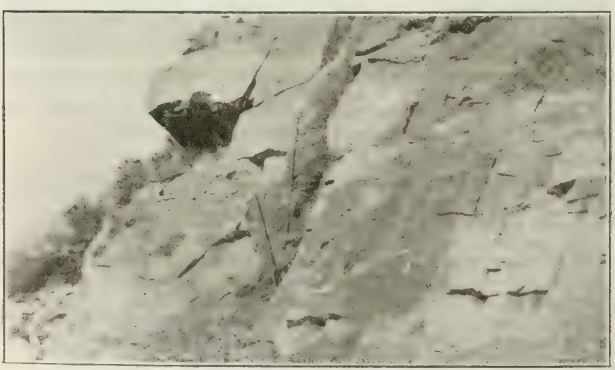
The iron ore occurs on contact between McCloud limestone and quartz-augite-diorite. The ore is chiefly magnetite, with abundant limonite on the surface. The body of magnetite is large, but follows the contact of the limestone and diorite with great irregularity. A massive deposit of magnetite is exposed by two opencuts near the top of the ridge, and at an elevation of 1850 feet, the upper opencut or quarry shows an exposure of ore 150 feet in width and 70 feet in height from the floor of the quarry to the surface outcrop.

On the north slope of the ridge a tunnel has been driven 300 feet southwest intersecting this ore body 300 feet below the outcrop. To the southwest at 140 feet below the floor of the upper quarry, the ore body is exposed by another quarry; here the width of the deposit is 150 feet. On the south slope of the ridge, about 300 feet below the floor of the lower quarry, a tunnel has been driven 300 feet north, which cut the deposit.

The general strike of the deposit is northeast and southwest. The ore body exposed in these workings is 1000 feet in length by 150 feet in width. Estimated tonnage of commercial ore developed is reported to be 1,000,000 tons.

The ore mined and shipped runs 65 per cent iron, 3.4 per cent silica, .02 per cent sulphur and .012 per cent phosphorus.

The ore is trammed from the lower quarry level, a distance of 1½ miles to bunkers at the head of an incline tram line. It is then delivered over the tram line 1600 feet in length to bunkers at Heroult, on the Sacramento Valley and Eastern Railroad. Shipping 12 to 15 cars of iron ore per month to Los Angeles, Oakland, and San Francisco.



Limestone Quarry of the Shasta Iron Company, Heroult, Shasta County.

LIMESTONE.

This company also owns an extensive deposit of limestone which lies west of the iron deposit. On the same elevation as the lower quarry on the iron deposit, a large quarry has been opened up on this belt of limestone.

The quarry face is 200 feet in length with a height of about 100 feet above the floor of the quarry. The limestone is trammed over the same tram line as the iron ore. At the time that the Shasta Zinc and Copper Company's smelter was operating the company was shipping 12 cars per month of lime rock to Winthrop, over the Sacramento Valley and Eastern Railroad.

The following is an analysis of the limestone: SiO_2, 1.02%; Al_2O_3, 0.61%; MgO, 1.12%; CaO, 53.80%; FeO, 0.20%; CO_2, 43.25%.

Twelve to fifteen men are employed.

The *Summit Copper Company* has deeded to the *Stauffer Chemical Company* of San Francisco, the Summit group of copper claims in the vicinity of the Mammoth copper mine, near Kennett. The group includes fifteen patented claims.

Lawrence Gardella of Oroville, who is operating two gold dredges on Clear Creek, four miles below Redding, has recently acquired additional dredging ground by bonding the ranch of W. N. Hoskin, which lies directly west of his present holdings. He has also secured a bond on the property owned by the J. P. Jones estate.

The *Shasta Zinc and Copper Company*, whose property is located at Winthrop, have shut down the Bully Hill mine and smelter. It is reported that the company, after making some changes in the present plant, will resume operations in the spring.

Siskiyou County.

Placer mining is now active at Happy Camp, Sawyer's Bar and in the Humbug district.

The *Shadows Creek Hydraulic Mine*, situated near Cecilville, is being operated by E. M. Robertson, Albert Brown and D. O. George. A derrick and Pelton wheel have been recently installed on the property.

Rainbow Mine is situated one and one-half miles northwest of Hawkinsville. In recent development work on the property, a ledge was cut about 50 feet below the surface in a tunnel 90 feet in length. The vein quartz shows free gold, some galena and pyrite. T. C. Quin, of Hawkinsville, owner.

The asbestos deposit owned by M. S. Russel of Edgewood was recently purchased by the *National Cement Company* of Modesto. It is reported that this company expects to develop the deposit in the spring.

In 1921, asbestos rock with estimated content of 25 per cent of short fibre, was shipped from the property.

Trinity County.

Lewiston Gold Dredging Company. Buckley Wells, president; A. D. Snodgrass, secretary; Gerald H. Hutton, manager; Milan A. Senger, superintendent. Offices 582 Market street, San Francisco.

The holdings of the company are located in sections 22, 28 and 33, T. 34 N., R. 8 W., 7 miles north of Lewiston on the Trinity River.

The distance along the river to be dredged is about 3½ miles. The depth of ground varies from 12 to 30 feet, the gravel being loose river wash, with some cemented gravel and large boulders. The bedrock is meta-andesite and slate and is hard in places along the river. The dredge was originally constructed by the Union Iron Works of San Francisco, and prior to 1922 was operated by the Valdor Dredging Company on the Trinity River below Junction City. During the year the dredge was dismantled and transported to its present location, the boat being rebuilt and heavier equipment installed. The dredge was launched on October 31st, and it is expected to be placed in operation on January 1, 1923. The dredging ladder is of plate-girder construction, carrying sixty-nine 7-cubic-foot buckets. The electric power equipment installed on the dredge has a rated capacity of 350 horsepower. A revolving type of screen is used. The gold saving tables have a total area of 1550 square feet on a single deck and are equipped with steel-lined Hungarian riffles. The monthly capacity of this dredge is 150,000 cubic yards.

Electric power is furnished by the Pacific Gas and Electric Company. The receiving line voltage will be 2200 and this will be reduced to 440 volts by transformers on the dredge. The company is now examining the Paddon property adjacent to the Foster Ranch on the Trinity River, in T. 36 N., R. 7 W.

Two Keystone drills are being operated under the supervision of M. A. Senger, field engineer for the company.

Gardella Dredge, owned by Louis Gardella of Oroville, was placed in operation in October, 1922, on the Paulson Ranch, 1½ miles southwest of Lewiston. It is being operated upon a gravel bar at a bend in the Trinity River opposite Rush Creek, section 3, T. 33 N., R. 9 W.

The depth of ground varies from 10 to 20 feet. The character of the gravel is course, overlain by clay and loam, with some cemented gravel and large boulders. The bedrock is hard diorite and slate.

The dredge is a wooden hull, bucket elevator and electrically driven. The digging ladder carries sixty 7-cubic-foot close connected buckets. The tailings stacker is a Robbins belt conveyor, approximately 96 feet long, carrying 30-inch belt. The electric motor equipment installed on the dredge has a rated capacity of approximately 300 horsepower. A revolving type of screen is used, 6½ feet diameter with length of 30 feet. Gold saving tables have a total area of 1500 square feet and are equipped with steel Hungarian riffles.

Electric power is furnished by the Pacific Gas and Electric Company. Nine men are employed; Claude V. Enslow, superintendent.

Trinity Gold Dredging Company commenced operations in 1913 and the dredge has been operated almost continuously to date. Holdings of the company comprise 900 acres on the Trinity River, in sections 5, 6, 7, 8, 32, and 33, T. 33 and 34 N., R. 8 W., four miles north of Lewiston.

The average depth of the ground is about 30 feet. The character of the gravel is loose with large boulders and some cemented gravel. Bedrock is slate, hard and tilted, with some meta-andesite.

The dredge is an 11-cubic-foot wooden hull boat. It is an open-link-bucket elevator dredge, equipped with tail sluices. The digging ladder

is of steel construction, 83 feet long and carries thirty-nine 11-cubic-foot buckets. The buckets are triangular in section, flaring upward from the bottom. The revolving screen is of manganese steel construction, 12 feet long, 6 feet in diameter and unlike most screens is provided with perforations from 6 to 10 inches in diameter. The screen discharges into two chutes, which discharge on either side of the boat. Thus all the large gravel and boulders fall on either side of the hull back of the center line. The undersize is discharged into a sluice box 200 feet long, which is 4 feet wide by 2 feet deep. The gold is saved on longitudinal manganese steel riffles; the tailing being washed to the discharge point by a heavy current of water. The tailing forms a level pile only a few feet above the level of the water in the pond. Due to difficult digging ground the bucket speed of the dredge is low.

Electric motor equipment installed on the dredge is rated at 375 horsepower. Twelve men are employed. Owner: Trinity Gold Dredging Company; E. L. Smith, president; H. E. Chesboro, secretary and manager; E. O. Smith, superintendent; offices Chico, California.



Estabrook Gold Dredge Near Trinity Center, Trinity County.

Estabrook Gold Dredging Company. This company began operations on the Trinity River in June, 1919, and operated until 1920, when operations were suspended, but the dredge was again placed in commission on November 28, 1922. The holdings of the company consist of 2000 acres along Trinity River, north of Trinity Center, in T. 36 and 37 N., R. 7 W.

The depth of ground is from 25 to 50 feet, the average depth being about 40 feet. The placer channel is up to one-half a mile wide. The gravel is coarse and loose, with large boulders. In places cemented gravel has been encountered but as a rule the gravel is loose and free, lying on a bedrock of serpentine, slate and granodiorite, which is hard.

The dredge is of wooden hull construction, equipped with 20 cubic-foot close connected buckets. Revolving type of screen is used, diameter 6½ feet, with a length of 33 feet. The gold saving tables have

a total area of about 2000 square feet on a single deck and are equipped with steel-lined Hungarian riffles.

The rated daily capacity of the dredge is 12,000 yards. Electric power is furnished by the Pacific Gas and Electric Company. Eighteen men are employed. Owner: Estabrook Gold Dredging Company, W. H. Estabrook, president; Charles Stetson, secretary; W. H. Estabrook, superintendent; offices 53 State street, Brockton, Massachusetts.

AUBURN FIELD DIVISION.

C. A. Logan, Mining Engineer.

I. Condition of Metal Mining in the Auburn District, 1922.

The close of the year is a good time for a general brief summary of the progress made during 1922 in this branch of the industry and for speculation as to what may be reasonably hoped for in the near future.

Beginning in Plumas County, we find that little has been done in the way of quartz mining during the year. The *Philadelphia Exploration Company* spent several years in reopening the *Green Mountain* and *Crescent Mines* at Crescent Mills and in extensive exploration below the deepest old levels. This work the company's manager reported as disappointing. Early in 1922 they gave up both properties and pulled out after expending several hundred thousand dollars. Some work has been done during the year near Greenville on the *New York* and *Arcadia* claims under the direction of Walter Parsons. A small hoist and some buildings were put on the old *Emigrant Hill Mine* two miles north of Quincy, by Judson Coats. After reopening the old shaft and working a few weeks the property was closed down.

The reports of good gravel coming from the *Feather Forks* and *Maxine Mines* in Little Grass Valley have led to investigation of other claims in the same district. In October W. D. Stone and other claim owners gave leases and options on nearly three sections of placer claims which the lessee proposes to drill. The *Wood Estate Company* has been prospecting with a Keystone drill off and on for several seasons just west of the Maxine Mine but has not had any definite results yet. One of the sensational pocket discoveries of the season was reported early in August, when James Burroughs, hunting pockets near Onion Valley, was said to have taken between 30 and 35 pounds of gold from a small hole near the surface. There was no opportunity to see Burroughs or to substantiate the story.

Besides the activities mentioned in the last monthly bulletin, there was the usual seasonal work on small placers in the Seneca-Long Valley region, which has not been visited this year. The metal production for the year has been almost entirely from the *Engels* and *Walker Copper Mines*. The production of these two mines will place Plumas County first in the state in copper production, second in silver and a close contender for fourth place as a metal producer, possibly displacing Amador County.

Sierra County has experienced a healthy revival of quartz mining during the year, there having been great activity in the Alleghany district. The mines there were described in considerable detail in the October chapter. The ore found in this district is apt to be of such high grade that operators have been justified in resuming work and in starting new operations in spite of sustained high costs. Underground

men received $3 a shift in 1915 in this camp. Muckers are now paid $4.50 and $4.75 and miners $5 and $5.50, but to offset this, board and lodging that formerly cost about $30 a month now costs the men $50 a month, and the quality of food does not compare favorably with that furnished at Mother Lode camps for $35 a month at present.

At the *Young America Mine*, 4 miles north of Sierra City, a Gibson mill was installed late in the summer to regrind tailing of which there is estimated to be 50,000 tons or more. Other projects in the same vicinity include the proposed reopening of the *Bigelow Mine* and the *Keystone Mine*.

The *Bigelow* at Sierra City is being promoted by a stock company known as *Sierra Buttes-Bigelow Consolidated Mines*, incorporated in Delaware and capitalized for $1,500,000. Chas. J. Fox of Philadelphia is president, W. H. Martin of Nevada City, vice president, and E. C. Klinker, engineer for the company. In November it was announced that the equipment of the Monarch Mine nearby would be bought and moved to the Bigelow. A plan has been entertained to develop the mine through No. 9 tunnel of the Sierra Buttes Mine, which adjoins on the west.

The *Keystone Gold Mining Company* has been organized under the laws of Delaware to work the *Keystone Mine*, three miles southwest of Sierra City. James H. Davis and Ernest M. Innes, both of Sierra City are president and vice president and Frederick Gilmour, 1460 Union street, San Francisco, is secretary-treasurer. Early in December Mr. Gilmour reported that by the middle of next summer they hope to have the property in good shape again. They expect to put new rails in the tunnel, reset the mill, build necessary buildings and put in a new compressor.

The operators of the *Oro Mine*, just south of Downieville, laid plans early in summer for a new lower adit to develop the prospect at depth. It was estimated this would have to be driven about 1000 feet.

Small scale operations have been carried on at a great many other mines and prospects during the summer. Among these are the *City of Six, Black Bear, Finney, Mt. Vernon, Snowden Hill, Sierra Highland, San Fernandez, Hilda*, and *Kirkpatrick*.

Brandy City Hydraulic Mine is again being prepared for operation as soon as water is plentiful. H. L. Berkey and Bayley Hipkins have announced plans for hydraulic mining at Scales and Council Hill.

Besides the continued steady operation of the *North Star* and *Empire Mines* at Grass Valley, which keep Nevada county in the lead in quartz gold production, and the persistent prospecting operations of the *Idaho-Maryland Mines Company*, a number of small projects have shown progress during 1922, although there has been little actual gold production in the county besides that of the first two named companies.

New equipment and electric power are being provided for the *Grass Valley Boundary Mines* under the management of M. J. Brock. The property includes several claims just west of Grass Valley. No underground work has been done lately. The deepest of the numerous shallow workings is between 250 and 300 feet.

The shaft at the *Normandie Mine* has been continued, reaching a depth of 350 feet in October. New machinery has been installed here also during the summer to facilitate sinking.

The *Osceola Mining Company* near Rough and Ready has done a little work, including bringing in a water supply for power. The *Alta Combination Company* and the *Alcalde Gold Mines Company* have continued work with small crews.

The *Newtown Mining Company* has been active under the management of Lester M. Dull and a depth of 150 feet has been reached. Some work has been done on the Ross prospect and the Thomas Bath claims.

The reopening of the *Brunswick Mine* was begun in July and has been progressing during the fall. A large hoist has been placed and bailing of the water is under way. The work is being done by the owners under stock assessments.

In the district near Washington, the principal item of interest has been the reopening of the *Eagle Bird Mine*, six miles east of the town. Work has been going on all summer and a new ten-stamp mill has lately been put up. Unwatering is going on. J. H. Harris is superintendent. Frank Sizer has been in charge of work at the *Yuba Mine* on the river about a mile from the Eagle Bird.

Satisfactory progress has been made at the *Gold Lead Placer Mine* at North Bloomfield, where work has been going on for a year and a half. At last account, about a dozen men were employed. A lower tunnel has been driven and upraises are being made to test the overlying gravel.

At the old *Malakoff Mine* at North Bloomfield the *Malakoff Leasing Company* was formed after the original lessees found the opening of the mine too expensive for their unaided resources. When bedrock was reached in the shaft the past spring a flattering prospect was reported. Since then a Cornish pump has been installed and the shaft has been sunk to 283 feet, allowing room for exploiting the gravel by a drift in bedrock under the channel and raises into the gravel.

Quaker Hill Mines Company, under the local management of Henry Schnitzel of Nevada City, has continued prospecting their extensive holdings at Quaker Hill. While a great deal of gravel is reported to have been opened at this property it is believed for the most part to be rather too low grade to pay for drifting.

Liberty Hill Hydraulic Mine was operated last winter and the past spring under an agreement between the owner and a party of local miners. A small production was made.

In Placer County little has been done during the year in the way of new work. Early in the year the *Oro Fina Mine* in the Ophir district was shut down following the death of the manager, Haines Gridley. This mine had been producing at the rate of about $100,000 a year for five years and was the principal quartz mine in operation in the county. With the exception of the *Pioneer Mine*, which mills ore irregularly, there are no other quartz mines actually producing now in the county. The *American Bar Mine*, near Michigan Bluff, showed promising prospects when visited during the summer and may once more become productive. At Succor Flat, near Iowa Hill, J. Starratt has lately been developing the *Adventure* quartz claim and encouraging prospects are reported. Late in the year Loren Corsaut became associated with Starratt and they plan to continue work this winter. Four men are employed. A little work was done at the *Rawhide* and *Walker Mines*.

At Last Chance, Wm. Davis of Auburn and associates resumed exploration of the deep channel in the *Home Ticket Mine*. After crossing the channel from the bottom of the incline Davis quit work and reported that the gravel found was not of sufficiently high grade to drift at a profit under present costs. At Forest Hill George McAulay and Joseph Steiner of Auburn report that they have put a small crew at work during the present month in the old *Baltimore Drift Mine* and have taken options on the adjoining properties. Work will be directed toward finding the possible extension of the old Forest Hill channel west of the region where it was cut off by the Deep Blue Lead. It is planned to put up an inclined raise from the old workings. The *Glen Mine*, in Duncan Canyon, is the only drift mine known to have been productive during the year.

The Garbe and de Maria Mine, near Michigan Bluff, continues from time to time to yield specimen gold in crystallized forms that find ready sale to jewelers. This mine is in a class by itself; the gold occurs in narrow seams with or without quartz, and is recovered by hand, there being no mill on the property.

For the most part, the mines of El Dorado County have been inactive during 1922. Near Georgetown an interesting project is just getting under way. This is called the *Kelliher Mining Company*. J. B. Kelliher of Georgetown, C. and W. Henneuse of Sacramento and others are interested in partnership. They have a lease on 101 acres covering 4000 feet along Canyon Creek just downstream from Georgia Slide. It was formerly called the *Gold Bug Mine*. The deposit consists of the accumulation of hydraulic mining debris and material from erosion of the wide auriferous seam belt which crosses the creek at Georgia Slide, and was worked extensively many years ago at that place. The creek and the side gulches yielded a great deal of gold in the early days.

Machinery has been placed during the summer and fall preparatory to operation in the spring. Two drag line scrapers of 18 cubic feet capacity each will be used. These will be operated by a 30-h.p. tractor engine, running a double-drum hoist. The scrapers will be drawn up on an incline built of round timbers, and will dump into a trommel, designed especially by Kelliher and embodying some new ideas. After screening through this trommel, which is 10 feet long by 12½ feet in circumference with 1-inch holes, the gravel will be washed in sluices. A centrifugal pump run by a 20-h.p. engine will pump water for washing. Kelliher estimates this outfit can handle 200 cubic yards in eight hours. It may do so with the loose gravel near the surface, but when the deeper and more valuable ground is reached a good deal of hand work will be needed.

J. G. Lewis of St. Louis, owner of the *Red Hill Mine* near Garden Valley, has recently done some work on the property after winning a suit to quiet title.

After working all summer on the *Jones Mine*, near Placerville, a company of Bakersfield people expected to begin stoping ore at last report early in November.

The mining districts of this county are deserving of much closer investigation than has been given them in late years. Development is held back by reason of the great number of nonresident owners, who

do not know enough about their own properties in many cases to promote a feeling of interest on the part of the possible inquirer. The only operations on the Mother Lode during the year in this county have been the milling of the dumps at the *Havilah Mine* at Nashville, a little work on claims near the old Union Mine, and the usual assessment work. On the East Belt there has been a little done in the Slate Mountain district.

Yuba County will be the leading gold producing county again this year by virtue of the dredging operations on Yuba River near Hammonton and Marigold. Outside of these operations, which have been described in past publications, there has been little metal production in the county. The November chapter contains notes on quartz mining in the county. Besides activity noted there, some work has been going on in Dobbins district. The *Thoroughbred Mining Company* has been lately driving an adit on the *George property*.

The leading event of the year in the county in the way of new development was the beginning of work on the *Yuba Development Company's* dam at Bullard's Bar. The completion of this dam will make available a large space for the storage of hydraulic mining debris. It is reported that three cents a cubic yard will be charged for this use. There is a promise of resumption of hydraulicking when the dam is finished, as it will offer storage for numerous properties dumping into that branch of the river. This is the first of a series of five dams contemplated in the company's plans. Generation of electric current, and storage of water for irrigation are also contemplated. The completed project is expected to unlock gold resources worth several times the cost of construction, and to aid immensely in the development of the lower foothill and valley lands. Plumas, Sierra and Yuba counties will be immediately benefited, and the series of dams will be an effective aid in flood control further down the Sacramento Valley. The contract for hauling 250,000 sacks of cement for the dam was let late in July, and preliminary road building to the dam site began at the same time. The dam is expected to be completed during the coming summer.

(This review of mining in the district visited from the Auburn office will be completed in the January chapter.)

SAN FRANCISCO FIELD DIVISION.

C. McK. Laizure, Mining Engineer.

During the past thirty days the time of the district engineer has been entirely taken up with routine office duties and no field work has been undertaken.

A review of the condition of the industry in the San Francisco district during the year 1922 will appear in the January, 1923, issue.

LOS ANGELES FIELD DIVISION.

Inyo County. M. A. Newman, Mining Engineer.

Argus Sterling Mine. This property is situated 12 miles southeast of Darwin in the Argus Range of mountains. Consists of 12 claims through which run five veins which course northwest and southeast, carrying silver-lead ore. The veins occur in limestone. The oxidized zone carries the lead as a carbonate and sulphate; the unoxidized ore

consists of galena. The veins average 3 to 4 feet in width. Development consists of a vertical shaft 180 feet deep. At the 155-foot level a drift has been run 245 feet, of which 150 feet is in ore. Owners claim to have at least 1000 tons of ore on the dump from this ore body which will run close to 50 per cent in lead and better than 20 ounces of silver per ton. There is also considerable tonnage in the old dumps of low grade silver-lead ore. A contract has been entered into with the Metal Supply Company of Los Angeles, for one 5-ton unit of their patent smelter, which it is claimed will be equivalent to a capacity of 40 tons per day.

It will be interesting to watch the results of this smelter operation, as in the past no commercial results have been obtained in small scale smelting. Crude oil will be used in smelting.

The company is organized under the laws of Arizona, and maintains offices at 511 Security Building, Los Angeles.

President, Hiram Harman; vice president, Conrad Woehr; treasurer, H. M. Kline; secretary, J. G. Dratz; superintendent, Thomas E. Reese.

Los Angeles County.

Los Padres Placer, Inc. This company has taken an option to purchase 230 acres of placer ground, located in T. 5 N., R. 15 W., S. B. M., in the Palomas Mining District, Texas Canyon. It also has two unpatented placer claims adjoining the above. Texas Canyon is 43 miles north of Los Angeles and 9 miles north of Saugus.

While portions of this placer ground have been worked in the past, the company believes that there still exists a large amount of gold-bearing gravel. A sub-lease has been given to other parties who agree to erect a dredge and have same ready for operation by October 4, 1923, paying to Los Padres Placer, Inc., a certain percentage of the gross value of all metals recovered.

Frank E. Rich and Louis M. Timmons are, respectively, president and secretary of the company.

Pacific Coast Borax Company. C. A. Zabriske, president of this company, has definitely confirmed the reports that his company is to build a large chemical plant on the site of the Chandler Shipbuilding Company, at Wilmington. At the present time crude and calcined borax is shipped to the Stauffer Chemical Works at San Francisco and to Bayonne, New Jersey.

The new plant at Wilmington is to refine and manufacture borax into its many products now in commercial use. It will take care of the entire Pacific Coast market, besides shipping to the Orient and Australia. The plant will also engage in the general manufacture of chemicals. Just what chemicals are to be made the company as yet is not ready to announce. The management announces that at least 200 men will be employed to begin with, and that this number will be gradually increased. It might be of interest to note that the parent British company of which the Pacific Coast Borax Company is a subsidiary virtually control the borax industry of the world. The only probable competition is that of the West End Chemical Company, which now owns the Callville borax mines, north of Las Vegas, Nevada.

F. M. Smith, formerly the owner of the Pacific Coast Borax Company, is now the leading spirit in the West End Chemical Company.

San Bernardino County.

American Magnesium Company. This company owns 1400 acres of placer ground, carrying soluble magnesium sulphates, located in T. 25 S., R. 46 E., M. D. M.

At the present time, a monorail line is being built from the deposit to a point six miles south of Trona. The road, when finished, will be about 30 miles long. It is proposed to run trains of 30 to 35 tons capacity over this line.

The monorail line will cost approximately $200,000, and it will be ready for operation some time in March, 1923.

A refinery is to be built at either Los Angeles or San Pedro, where magnesium carbonate and epsom salts are to be manufactured. The refined products are then to be sent direct to New York and there sold by brokers.

It can readily be seen that the company has a large field to expand in.

The company is incorporated under the laws of Nevada. Capital, $1,000,000 of $1 per share par value.

President, T. H. Wright, Los Angeles. Office, Washington Building, Los Angeles.

Arlington Mining Corporation. This company has taken over 8 unpatented mining claims in the Black Hawk Mining District. These claims cover the outcrop of a flat bedded vein. The development, to date, along the outcrop indicates a large tonnage of low grade gold ore said to average around $4 gold per ton.

It is estimated that approximately $50,000 will develop and equip the property for milling operations.

The company is organized under the laws of California. Capital stock, 1,000,000 shares of 25 cents par value. The property is under the control of R. K. Voorhies, formerly of the Chamber of Mines and Oil of Los Angeles, and Algernon Del Mar, a mining engineer of large experience in the United States, British Columbia, and Mexico.

California Rand Silver, Inc. This company has declared regular dividend No. 35 of two cents per share, representing a distribution of $25,600. This makes a total of 84 cents per share paid in dividends during the year 1922, or $1,075,200.

EXTRACTION AND ADVANCEMENT.

In November, there were extracted from shafts Nos. 1 and 2, 8972 tons of rock, as follows:

Milling ore	5,375 tons
Shipping ore	858 tons
Waste	2,739 tons
Total	8,972 tons

The advancement for the month, 1,519 feet, was as follows:

Drifts	1,162 feet
Raises	115 feet
Crosscuts	181 feet
No. 2 shaft	25 feet
No. 6 shaft	36 feet
Total	1,519 feet

Expenditures.

Due to mill construction, increased development, increased mining and preparation for handling the larger tonnage of milling ore that will be required after the mill enlargement is completed, the payroll last month was unusually heavy, reaching a total of $40,923.95.

Mill Operation.

Total ore milled	5373	tons
Daily average (30 days)	179.10	tons
Daily average (running time)	187.32	tons
Average value per ton of ore milled	$18.51	
Average value of tails	2.25	
Recovery, per ton	16.259	
Total recovery on 5373 tons at $16.259	87,359.61	
Average concentrate value per ton	340.00	
Tons of concentrates produced at $340	257.00	tons

Extraction was lower than usual, owing to cold weather, the boiler ordered for heating of solutions being 50 days late on delivery.

Mill Expansion.

The work of enlarging the mill to handle 400 tons of ore daily is proceeding rapidly and satisfactorily. During the month all necessary machinery and motors were purchased and prompt delivery of the same is promised. The addition to the building is nearly completed and it is hoped and expected that the new equipment will be in place and ready for service early in the new year.

Litigation.

The company has instituted suit in the federal court against the Randsburg Silver Mining (Coyote) Company to determine the ownership of certain ore ledges within the surface lines of the latter company. Pending the hearing of this suit, however, the Coyote Company has been advised that it is not the purpose of the California Rand Silver, Inc., to seek to interfere with ore shipments from the Coyote ground, and it is presumed that that company will continue to market any shipping ore it now has or may develop within its lines.

Financial.

During November, net proceeds from the sale of ore and concentrates amounted to $173,750.14. After paying this dividend of $25,600, the company has a balance of $358,237.17.

Massen Silver Mines. This property is located three miles northeast of Barstow and one mile southeast of the old Waterman Mine. It consists of 5 claims, containing two veins which course northwest and southeast. Average width of the vein 4 to 4½ feet. Locations are known as Silver Nos. 1, 2, 3, 4, and 5.

On claim Silver No. 3, an incline shaft has been sunk to a depth of 140 feet. There is also a tunnel 30 feet long on this vien in Silver No. 3, the ore from which runs 4½ to 12 ounces silver and 40 cents to 80 cents gold per ton.

On Silver No. 2, an incline shaft has been started and is now down 10 feet. Vein dips 65 degrees to the northeast. Bottom of the shaft shows 5 feet of ore, assaying from 4 to 8 ounces silver and 40 cents to 80 cents in gold.

J. H. Massen, owner.

Randsburg Silver Mining Co. (Coyote.) Owing to the suit filed by the California Rand Silver, Inc., against the Coyote for shipping ore from the Coyote claim, all shipments have been suspended for the time being. The hearing has been set for December 18th.

All other development in the shafts on the Foster group and in the newly acquired Santa Fe ground is being vigorously pushed.

J. W. Kelly, president; J. A. Carpenter, superintendent. Office, Hibernian Building, Los Angeles, California.

OIL FIELD DEVELOPMENT OPERATIONS.

R. E. Collom, State Oil and Gas Supervisor.

From November 11, 1922, to and including December 9, 1922, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well No.	Field
FRESNO COUNTY:					
Fresno Associated Oil & Gas Co.	23	14	20	1	
KERN COUNTY:					
Union Oil Co.	26	30	24	Elk Hills 8	Elk Hills
Balboa Oil Co.	24	31	23	18	Midway
Balboa Oil Co.	24	31	23	7	Midway
C. C. M. O. Co.	26	31	22	28	Midway
Honolulu Cons. Oil Co.	6	32	24	16	Midway
Honolulu Cons. Oil Co.	6	32	24	18	Midway
Honolulu Cons. Oil Co.	6	32	24	17	Midway
Midland Oilfields Co., Ltd.	24	31	23	3	Midway
North American Oil Cons.	2	32	23	20	Midway
Pacific Oil Co.	35	31	23	10	Midway
Pacific Oil Co.	15	32	24	91	Midway
Pacific Oil Co.	7	32	24	71	Midway
Pacific Oil Co.	5	32	24	36	Midway
Pacific Oil Co.	25	31	23	36	Midway
P. Welch	18	11	23	9-G	Sunset
Big Eight Oil Co.	2	27	18	1	
KINGS COUNTY:					
Sagebrush Oil & Gas Co.	18	22	19	Lakeshore 2	
LOS ANGELES COUNTY:					
Standard Oil Co.	17	3	10	M-C 97	Coyote Hills
Anson & Differding	30	4	12	1	Long Beach
Atlantic Petroleum Syndicate	19	4	12	Maltby 1	Long Beach
Barham Oil Co.	19	4	12	1-A	Long Beach
Bolsa Chica Oil Co.	30	4	12	3	Long Beach
Bush-Voorhis Oil Co.	19	4	12	9	Long Beach
Capitol Oil Co.	19	4	12	2	Long Beach
Cassaday Oil Corp.	19	4	12	1	Long Beach
Crown Syndicate	19	4	12	Clark-King 1	Long Beach
D'Angelo Oil Co.	19	4	12	1	Long Beach
Davis-MacMillan Syndicate	29	4	12	2	Long Beach
Downs-Fleming	19	4	12	1	Long Beach
General Petroleum Corp.	20	4	12	Jasper 1	Long Beach
General Petroleum Corp.	19	4	12	Black & Drake 2	Long Beach
Harmony Dobyns Oil Syndicate	30	4	12	1	Long Beach
Harmony Taylor Oil Syndicate	30	4	12	1	Long Beach
D. D. Huddleston	13	4	12	3	Long Beach
Marine Oil Corp.	20	4	12	9	Long Beach
F. J. Miley	18	4	12	3	Long Beach
Mission Bell Oil Syndicate	19	4	12	1	Long Beach
P. K. Co.	19	4	12	1	Long Beach
Painted Hills Oil Association	19	4	12	2	Long Beach
H. H. Patton	19	4	12	1	Long Beach
Petroleum Midway Co., Ltd.	19	4	12	Davidson 50-50 2	Long Beach
Petroleum Midway Co., Ltd.	19	4	12	Fields 2	Long Beach
Petroleum Midway Co., Ltd.	19	4	12	Harlow 5	Long Beach
Petroleum Midway Co., Ltd.	19	4	12	Davidson 3	Long Beach
Petroleum Midway Co., Ltd.	19	4	12	Harlow 6	Long Beach
Petroleum Midway Co., Ltd.	29	4	12	McDavid 2	Long Beach
Rice Ranch Oil Co.	19	4	12	Hoffman 1	Long Beach
Rice Ranch Oil Co.	19	4	12	Augustine 1	Long Beach
Shell Co.	29	4	12	Andrews 3	Long Beach
Shell Co.	29	4	12	Nesa 3	Long Beach
Shell Co.	29	4	12	Stakemiller 2	Long Beach
Shell Co.	29	4	12	Wilbur Com. 3	Long Beach
Shirley Lease Co.	19	4	12	1	Long Beach
Superior Oil Co.	29	4	12	Crew 1-A	Long Beach
Trojan Oil Co.	19	4	12	1	Long Beach
West Continental Oil Co.	30	4	12	1	Long Beach
Wigle & McBride	19	4	12	Garnett 1	Long Beach
Kenneth R. Woolley	29	4	12	Leonard 4	Long Beach
Kenneth R. Woolley	29	4	12	Leonard 6	Long Beach
Fullerton Oil Co.	8	4	14	Waddell 2	Redondo
Standard Oil Co.	5	4	14	Kirk Com. 2	Redondo
Union Oil Co.	5	4	14	Francis 2	Redondo
Petaluma Midway Co., Ltd.	29	3	9	Yarnell 16	Richfield
Union Oil Co.	28	3	9	Shanklin 3	Richfield
Brady Eight Wells Syndicate	8	3	11	1	Santa Fe Springs
General Petroleum Corp.	6	3	11	Santa Fe 77-A	Santa Fe Springs

OIL FIELD DEVELOPMENT OPERATIONS—Continued.

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Cont'd.:					
General Petroleum Corp.	6	3	11	Springs 5	Santa Fe Springs
General Petroleum Corp.	5	3	11	Santa Fe 10	Santa Fe Springs
General Petroleum Corp.	5	3	11	Santa Fe 8	Santa Fe Springs
General Petroleum Corp.	6	3	11	Springs 3	Santa Fe Springs
General Petroleum Corp.	6	3	11	Springs 6	Santa Fe Springs
General Petroleum Corp.	6	3	11	Springs 7	Santa Fe Springs
General Petroleum Corp.	6	3	11	Springs 8	Santa Fe Springs
General Petroleum Corp.	5	3	11	Santa Fe 9	Santa Fe Springs
General Petroleum Corp.	6	3	11	Santa Fe 79-B	Santa Fe Springs
Globe Petroleum Corp.	6	3	11	3	Santa Fe Springs
Hopkins & Howland	6	3	11	Baker 1	Santa Fe Springs
Oscar R. Howard	5	3	11	Bell 2	Santa Fe Springs
Industrial Oil Syndicate No. 2	7	3	11	1	Santa Fe Springs
A. L. Irish	5	3	11	2	Santa Fe Springs
A. L. Irish	5	3	11	3	Santa Fe Springs
Kirkpatrick Syndicate No. 2	6	3	11	Wilshire Gill 1	Santa Fe Springs
K. Lundeen-M. E. Lee	6	3	11	1	Santa Fe Springs
Pacific States Oil Co.	6	3	11	1	Santa Fe Springs
Petroleum Midway Co., Ltd.	6	3	11	Patterson 4	Santa Fe Springs
Petroleum Midway Co., Ltd.	6	3	11	Patterson 5	Santa Fe Springs
Petroleum Midway Co., Ltd.	6	3	11	Patterson 2	Santa Fe Springs
Petroleum Midway Co., Ltd.	6	3	11	Mattern Three 3	Santa Fe Springs
Petroleum Midway Co., Ltd.	6	3	11	Patterson 3	Santa Fe Springs
Petroleum Midway Co., Ltd.	6	3	11	Patterson 7	Santa Fe Springs
Petroleum Midway Co., Ltd.	6	3	11	Patterson 6	Santa Fe Springs
Petroleum Midway Co., Ltd.	31	2	11	Mattern One 1	Santa Fe Springs
Petroleum Midway Co., Ltd.	31	2	11	Mattern Two 2	Santa Fe Springs
Producers Holding Co.	7	3	11	Tri-Field 1	Santa Fe Springs
Standard Oil Co.	6	3	11	Walker Com. 6	Santa Fe Springs
Standard Oil Co.	6	3	11	Walker Com. 7	Santa Fe Springs
Standard Oil Co.	6	3	11	Walker Com. 5	Santa Fe Springs
Standard Oil Co.	5	3	11	S. Whittier Com. 8	Santa Fe Springs
Standard Oil Co.	5	3	11	S. Whittier Com. 10	Santa Fe Springs
R. L. Hinckley	33	4	23	Sanchez 1-A	Santa Fe Springs
Standard Oil Co.	32	2	11	Johnson 2	Santa Fe Springs
Standard Oil Co.	6	3	11	S Whittier Com. 9	Santa Fe Springs
Standard Oil Co.	5	3	11	Star 2	Santa Fe Springs
Star Petroleum Co.	6	3	11	Bell 17	Santa Fe Springs
Union Oil Co.	6	3	11	2	Santa Fe Springs
White Star Oil Syndicate	6	3	11	3	Santa Fe Springs
White Star Oil Syndicate	6	3	11	Surbeck 1	Santa Fe Springs
Wilshire Oil Co.	7	3	11	Palos Verdes 1	----------
E. G. Lewis	36	4	14	Rossi 1	----------
Oak Ridge Oil Co.	22	2	12	Weston 1	----------
Union Oil Co.	21	1	14		
ORANGE COUNTY:					
Associated Oil Co.	2	6	11	Hunt. Bch. 8	Huntington Bch.
Auburn Oil Co.	35	5	11	1	Huntington Bch.
Holly Oil Co.	35	5	11	4	Huntington Bch.
Huntington Central Oil Co.	2	6	11	3	Huntington Bch.
O'Donnell Syndicate	34	5	11	3	Huntington Bch.
Petroleum Midway Co., Ltd.	35	5	11	Paige 1	Huntington Bch.
Petroleum Midway Co., Ltd.	35	5	11	Towers 5	Huntington Bch.
Petroleum Midway Co., Ltd.	2	6	11	Columbia One 2	Huntington Bch.
The Petroleum Co.	2	6	11	Wilson 2	Huntington Bch.
Standard Oil Co.	34	5	11	Hunt. A. 20	Huntington Bch.
Standard Oil Co.	2	6	11	Hunt. B. 17	Huntington Bch.
Union Oil Co.	34	5	11	Brooks 7	Huntington Bch.
Union Oil Co.	34	5	11	Brooks 6	Huntington Bch.
Union Oil Co.	35	5	11	Copeland 16	Huntington Bch.
White Behr Petroleum Syndicate	35	5	11	Jackie Coogan 2	Huntington Bch.
Portland Petroleum Corporation	5	6	10	Borchard 1	----------
Portland Petroleum Corporation	5	6	10	Adlai 1	----------
SAN LUIS OBISPO COUNTY:					
Alberta Oil Co.	Rausch Ranch, Piedra	enplet ho Cor	Ranch ral de	Alberta 1	Arroyo Grande

OIL FIELD DEVELOPMENT OPERATIONS—Concluded.

Company	Sec.	Twp.	Range	Well No.	Field
SANTA BARBARA COUNTY:					
Shell Co. (U. D.)	32	9	33	Carega 93	Santa Maria
Standard Oil Co.	Rancho de Jo	San C nata	arlos	Buell 1-C	
VENTURA COUNTY:					
Montebello Oil Co.	4	3	19	Shiells 127	Bardsdale
J. N. Bissell	33	2	20	2	Conejo
Schell & Jennings	32	4	18	4	Piru
Dixie National Oil Co.	5	4	19	3	Sespe
R. L. Hinckley	33	4	23	14	Ventura

SPECIAL ARTICLES.

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the Bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff containing much information that will add to the permanent value of the Monthly Chapter are included in each number of 'Mining in California.'

It is anticipated that these special articles will cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations, as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the text of new laws and official regulations and notices affecting the mineral industry.

ORE TREATMENT AT THE BELMONT SHAWMUT MINE, TUOLUMNE COUNTY.

By C. A. Logan.

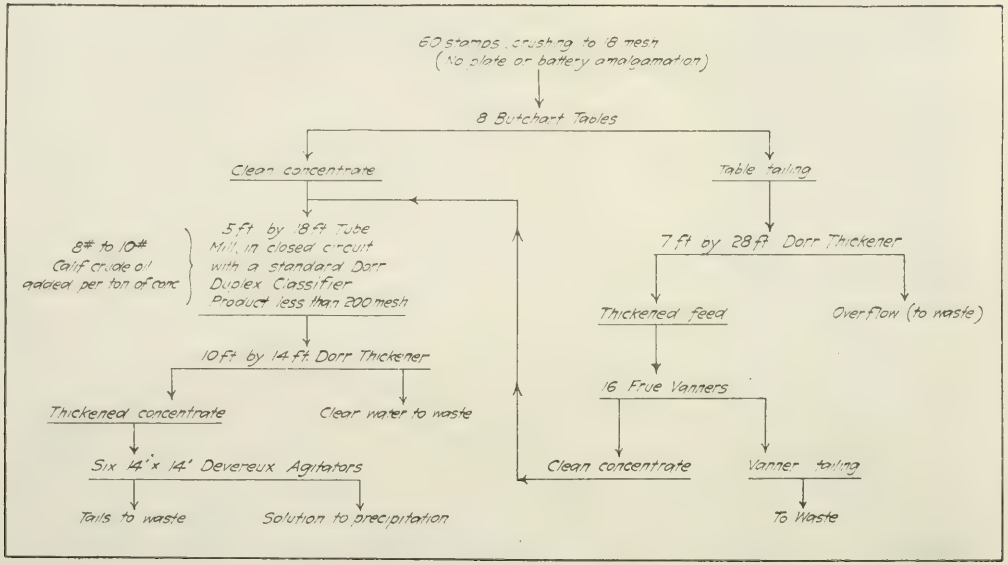
This mine is at present the only producer on the Mother Lode in Tuolumne County. The ore is coming from depths of about 2600 to 2900 feet on the dip of the vein. It is principally sulphide ore, free gold being subordinate. Four types of ore have been mined, known at the mine for convenience as banded quartz, impregnated schist, dark and light sulphide ores. Pyrite is the chief sulphide and the ore is characterized by dolomite and to a less extent by lime. The percentage of pyrite is variable but rather high. The pay in the old upper levels was largely in free gold. The first of the dolomite sulphide was said to have been encountered on the 17th level, and it became important from there down. The immediate footwall is a basic dike, and limestone is prominent in the Mariposa rocks near the periphery of the dike. The geology of the mine will be treated in detail in the Mother Lode report.

Numerous methods of treatment have been tried on the ores from this mine. Originally there was the regulation stamp milling with plate amalgamation. Then a chlorination plant was installed and used until the Belmont Mining Company bought the mine. They installed Jones Belmont flotation cells and made two grades of concentrates, one on the tables and the other with the flotation cells. These concentrates were shipped at first, but the grade of them and the costs of shipment and treatment led to experimenting. In the course of these experiments, it was found that for some reason the oil floated concentrate responded better to cyanide treatment than the straight table concentrate. It was assumed that the oil used was responsible for this. It was also found that while flotation gave satisfactory results from the standpoint of recovery, it was more expensive than results justified. Flotation has therefore been laid aside at present and the flow-sheet outlined below has been put in effect. O. McCreaney, general superintendent, states it is giving good results. Under this plan, eight to ten pounds of California crude oil are added for each ton of concentrate when regrinding

preliminary to cyanide treatment. This gives the hydrocarbon content which is assumed to promote recovery. The concentrators alone are relied upon to recover the free gold.

The experience of this company with flotation confirms the results had some years ago at the Dutch-App Mines by William J. Loring, in treating Mother Lode ore. The average grade of concentrate found along this lode is such as to require as economical treatment as possible. Freight and smelter charges have lately been so high that local recovery of the gold is desirable if possible. On the other hand, Mother Lode ores are generally amenable to simple processes of concentration and treatment. In this connection, it may be of interest to compare the flow-sheet following, with the method of milling a low grade schist sulphide ore as practised at the Treasure Mine on the Mother Lode in Amador County, and described in Report XVII of the State Mineralogist, 1920.

36--17105



Flow-sheet at Belmont Shawmut Mill, Tuolumne County.
By courtesy of the company.

BIBLIOGRAPHY OF LIMESTONE DEPOSITS IN CALIFORNIA.

By C. McK. Laizure.

The following compilation of references to the limestone deposits of California has been prepared with the idea of offering a means of ready reference to the descriptions of deposits reported upon in the various publications of the State Mining Bureau. No attempt has been made to include references in other works, and even in the Bureau publications those merely listing laboratory specimens or describing the manufacture of lime and its uses, or referring to the purely geological phase or mode or origin, are omitted.

References to marble, dolomitic limestone, and dolomite deposits are included, however, and it is believed that practically all deposits of commercial importance, as well as many of unknown extent and value, are mentioned.

The bibliography has been arranged in two parts. The first section gives the volume and page reference by counties, alphabetically arranged so that the limestone deposits in any particular locality may be found readily under the heading of the proper county. In the second section the page reference is given for all limestone deposits described in each particular volume, regardless of where the deposit occurs in the State. The latter will be found more convenient than the regular volume indices in which the references are segregated by counties.

The bibliography is confined to the Bureau publications, all of which may be consulted at the Bureau offices in San Francisco, Los Angeles, Bakersfield, Taft, Coalinga, Santa Maria, Santa Paula, Redding, and Auburn, as well as in many public libraries. Publications not out of print may be purchased at any of the above offices, or may be obtained without charge, if for free distribution, as the case may be.

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- Report VIII, pp. 35, 104.
- Report XIII, p. 627.
- Report XVII, p. 22, 23.
- Bulletin 38, p. 64.

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- Report VIII, p. 39.

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- Report IV, p. 108.
- Report VI, pp. 29, 95, 107.
- Report VIII, p. 104.
- Report XII, p. 391.
- Report XIV, pp. 52, 53.
- Bulletin 38, pp. 64, 96, 97.

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- Report IV, p. 108.
- Report VI, pp. 29, 95, 96.
- Report VIII, p. 116.
- Report XI, p. 157.
- Bulletin 38, pp. 65, 98.

Calaveras County.
- Report IV, p. 109.
- Report VI, pp. 29, 95, 96, 107.
- Report VIII, p. 156.
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- Report XI, p. 188.
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- Report VI, p. 27.
- Report VIII, pp. 161, 162.
- Report IX, p. 310.
- Report XIII, p. 628.
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- Report IV, p. 109.
- Report VI, pp. 96, 97.
- Report VIII, pp. 164, 200.
- Report XII, p. 391.
- Report XIII, p. 628.
- Report XV, p. 304.

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Preliminary Report No. 6, p. 20.
Preliminary Report No. 8, p. 49.

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Report X, p. 185.
Report XIII, p. 628.
Report XIV, p. 452.
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Glenn County.
Report XIV, p. 198.
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Humboldt County.
Report IV, p. 109.
Report VI, pp. 23, 97.
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Imperial County.
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Inyo County.
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Report XIV, pp. 479, 516, 517, 518, 520.
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Preliminary Report No. 8, pp. 52, 60.

Lake County.
Report XII, p. 392.
Report XIV, p. 206.

Lassen County.
Report VI, p. 28, 96.

Los Angeles County.
Report IV, p. 110.
Report VI, pp. 27, 97, 107.
Report VII, pp. 212, 213.
Report VIII, pp. 339, 342.
Report IX, pp. 200, 310.
Report X, p. 282.
Report XIII, p. 629.
Report XV, p. 486.

Madera County.
Report XII, p. 392.
Report XIII, p. 629.

Mariposa County.
Report VI, p. 96.
Report XIII, p. 629.
Report XIV, p. 604.
Report XVIII, p. 9.
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Report VI, pp. 29, 97.
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Report XII, p. 392.
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Report XV, p. 606.
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Report XIII, p. 629.
Report XIV, p. 271.

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Report IV, p. 110.
Report VI, pp. 29, 97.
Report XI, p. 312.
Report XII, p. 393.
Report on Nevada County, p. 59.
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Report XV, p. 520.
Bulletin 38, p. 73, 74.

Placer County.
Report IV, p. 110.
Report VI, pp. 28, 29, 96, 97.
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Report IV, p. 111.
Report VI, pp. 97, 107.
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Report VI, pp. 96, 102, 103, 104, 105, 106.
Report VIII, p. 526.
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Report XIV, pp. 673, 684, 685.
Report XVII, p. 378.
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Report VI, pp. 28, 96.

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Bulletin 38, p. 79.

San Luis Obispo County.
Report IV, p. 112.
Report VI, pp. 27, 28, 97, 107.
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Report X, p. 584.
Report XII, p. 394.
Report XV, p. 689.
Bulletin 38, pp. 79, 80.

San Mateo County.
Report VIII, p. 534.
Report XVII, p. 174.

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Report VIII, p. 538.
Report IX, p. 310.
Report XV, p. 739.
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Report IX, pp. 52, 53.
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Report XV, p. 256.
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Report XIII, p. 633.
Bulletin 38, p. 94.

References by Counties—Concluded.

Tulare County.
Report VIII, pp. 644, 647, 648.
Report XIII, p. 633.
Report XV, p. 918.
Report XVII, p. 259.
Report XVIII, p.———.
Bulletin 38, pp. 94, 95, 108.

Tuolumne County.
Report IV, pp. 112, 113, 114.
Report VI, pp. 29, 98.
Report VIII, p. 675.
Report X, p. 735.
Report XI, p. 506.
Report XII, p. 396.
Report XIII, p. 633.
Report XIV, pp. 132, 168, 169.
Report XVII, p. 487.
Bulletin 38, pp. 95, 108, 110.
Preliminary Report No. 6, p. 20.
Preliminary Report No. 8, p. 49.

Ventura County.
Report XV, p. 761.

Yolo County.
Report XIV, p. 368.

Yuba County.
Bulletin 38, p. 110.

The only counties in which there are no limestone deposits referred to in the Bureau publications are: Del Norte, Kings, Marin, Merced, Modoc, Sacramento, Stanislaus, and Tehama.

However, undeveloped deposits of limestone are known in Merced County.

References by Publications.

Report IV. 1884. Pages 108, 109, 110, 111, 112, 113, 114.
Report VI. 1885–1886. Pages 23, 25, 26, 27, 28, 29, 95, 96, 97, 98, 107.
Report VII. 1886–1887. Pages 212, 213.
Report VIII. 1887–1888. Pages 35, 39, 104, 116, 156, 161, 162, 164, 200, 208, 216, 225–248, 250–285, 310, 311, 316, 318, 323, 339, 342, 410, 488, 504, 526, 532, 534, 538, 543, 544, 554, 555, 572, 631, 633, 644, 647, 648, 675, 680.
Report IX. 1888–1889. Pages 52, 53, 151, 200, 215, 225, 309, 310.
Report X. 1889–1890. Pages 185, 215, 216, 217, 218, 282, 528, 584, 619, 626, 627, 669, 670, 735.
Report XI. 1891–1892. Pages 35, 37, 48, 157, 188, 191, 260, 312, 363, 364, 463, 506.
Report XII. 1893–1894. Pages 391, 392, 393, 394, 395, 396.
Report XIII. 1895–1896. Pages 627, 628, 629, 630, 631, 632, 633.
Report XIV. 1913–1914. Pages 52, 53, 54, 128, 129, 132, 168, 169, 198, 206, 271, 309, 323, 368, 374, 393, 394, 452, 479, 516, 517, 518, 520, 601, 673, 684, 685.
Report XV. 1915–1916. Pages 256, 304, 390, 486, 520, 553, 606, 626, 633, 640, 689, 739, 761, 862, 871, 918.
Report XVII. 1920. Pages 22, 23, 55, 174, 184, 185, 186, 237, 238, 239, 256, 259, 268, 312, 353, 378, 388, 432, 453, 454, 487.
Report XVIII. 1922. Pages 9, 115, 148, 217, 218.
Bulletin No. 38. 1906. Pages 61, 64, 65, 66, 67, 68, 69, 72, 73, 74, 75, 76, 77, 78, 79, 80–102, 107, 108, 110.
Preliminary Report No. 6. 1919. Pages 11, 20, 35.
Preliminary Report No. 8. 1921. Pages 48, 49, 52, 57, 60.

SECRETARY'S OFFICE.

W. W. THAYER, Secretary.

The California State Mining Bureau was created April 16, 1880, by legislative act. In March, 1893, the original act was repealed and an amended act approved and passed by the legislative body. Again on June 16, 1913, a new Mining Bureau Act was approved which became effective August 10, 1913, repealing all former acts, and forming the basic law under which the Bureau now functions.

It is doubtless true that both the mining and lay public have not in the past always recognized the part played by the Bureau in the development of the state's mineral resources. Innumerable inquiries regarding them, originating within and without its borders and in foreign countries, have been answered with ultimate results reflected by a consistent growth in the value of the state's mineral output since the records of production were first compiled by the Bureau in 1887.

It is believed that a better understanding of the economic position occupied by the Bureau will be imparted to the public, whose funds support it, by embodying in the Monthly Chapter a review of the executive activities.

The responsibility for the coordination of effort of each department, to the end that the utmost efficiency may be maintained with the limited and variable appropriations accorded the Bureau by successive legislatures, rests upon the office of secretary.

Activities referable to that office, such as reports of new maps and publications issued, amount of mail handled, changes and enlargements in offices, changes in personnel of the staff, property and equipment, financial statements, etc., are therefore included herein.

New Publications.

During the month the following Bureau Publications have been made available for distribution:

Summary of Operations, California Oil Fields, September, 1922, Vol. 8, No. 3.
Mining in California, September, 1922 (Monthly), Vol. 18, No. 9.
Oil Field Map, No. 20, Long Beach, revised to October 7, 1922.

Distribution of Publications.

The Bureau's publications are constantly in demand, requests for copies coming from all over the United States and foreign countries.

Publications were distributed during the month as follows:

Publications	Number distributed
Report XIV, State Mineralogist	4
Report XV, State Mineralogist	3
Report XVII, State Mineralogist	1
Mines and Mineral Resources of Butte, etc.	1
Mines and Mineral Resources of Del Norte, etc.	15
Mines and Mineral Resources of Fresno, etc.	3
Mines and Mineral Resources of Imperial, etc.	2
Mines and Mineral Resources of Alpine, etc.	7
Mines and Mineral Resources of El Dorado, etc.	2
Mines and Mineral Resources of Los Angeles, etc.	3
Mines and Mineral Resources of Monterey, etc.	1
Mines and Mineral Resources of San Bernardino, etc.	4
Mines and Mineral Resources of Nevada County	6

Publications	Number distributed
Mines and Mineral Resources of Plumas County	6
Mines and Mineral Resources of Sierra County	3
Bulletin No. 6, California Gold Mill Practices	5
Bulletin No. 37, Gems, Jewelers' Materials, Ornamental Stones of California	1
Bulletin No. 50, Copper Resources of California (Revised)	1
Bulletin No. 72, Geologic Formations of California	10
Bulletin No. 75, U. S. and California Mining Laws	50
Bulletin No. 76, Manganese and Chromium in California	2
Bulletin No. 78, Quicksilver Resources of California	3
Bulletin No. 85, Platinum Resources of California	8
Bulletin No. 89, Petroleum Resources of California, with special reference to unproved areas	37
Bulletin No. 90, California Mineral Production for 1920, with County Maps	60
Mining in California (Monthly), Vol. 18, No. 8, August, 1922	150
Mining in California (Monthly), Vol. 18, No. 9, September, 1922	3,000
Summary of Operations, California Oil Fields (Monthly) Vol. 8, No. 2, August, 1922	250
County Maps and Registers of Mines	9
Copper Deposit Map	1
Minaret Map	1
Tuolumne Mineral Map	1
Geological Map of California, mounted	12
Oil Field Maps	254
Maps accompanying Bulletin 89	40

Mails and Files.

The Bureau maintains in addition to its correspondence file a mine report file which includes reports on some 7500 mines and mineral properties in California. Also there is available to the public a file of the permits granted to mining and oil corporations by the State Commissioner of Corporations.

During the month 850 letters were received and answered. They are practically all requests for information and the inquiries cover all phases of prospecting, mining and developing mineral deposits, reduction of crude minerals and marketing of refined products.

Drafting.

The Bureau maintains an up-to-date drafting department, where topographic and geological maps, tracings, oil well logs, and oil field maps are prepared.

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Statistician and Curator.

STATISTICS.

The detailed figures and data relative to the mineral production of California for the calendar year, 1921, are shown in the preceding issues of 'Mining in California,' for the months of April-November (inclusive). At the close of the current year, 1922, preliminary data will be assembled and an estimate made of the approximate output of this year; which estimate will be published in the forthcoming January issue.

MUSEUM.

The Museum of the State Mining Bureau possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the first five of such collections located in North America; and contains not only one or more samples of most of the known minerals found in California, but many specimens from other states and foreign countries as well.

Aside from its purely educational features, the Museum daily attracts throngs of tourists and travelers, and furnishes visual evidence of the immense mineral resources of California. The State Mining Bureau supplies a collection of forty typical minerals and ores, appropriately labeled, to any public school in the state upon request.

Mineral specimens suitable for exhibit purposes are solicited and their donation will be appreciated by the State Mining Bureau, as well as by those who utilize the facilities of the collection.

During the past month a total of 468 visitors signed their names to the Museum register, and in addition there are many others daily who fail to take note of our request for their signatures.

Among the specimens received recently, and catalogued for the Museum, are the following:

19625. Facsimile of *Gold Nugget* found in Sunnyside Mine, McCray Ridge Channel, near Johnsville, Plumas County, Cal. Value approximately $3,200. By Mr. Kelsey, Quincy.

19627. Facsimile of *Gold Bars* (4), representing average monthly yield (1920–1921) of Carson Hill Gold Mines Co., Calaveras County, Cal. Approximate value $25,000 each, or $100,000 per month. By courtesy of the company, Wm. J. Loring, President.

19653. *Pollucite* (hydrous caesium-aluminum silicate). From Andover, Maine, by Merle Randall, Berkeley.

19655. *Halotrichite* (hydrous ferrous aluminum sulphate). From Wallace, Idaho, by R. G. Cotter, Oakland.

19659. *Allanite or Orthite* ('Cerium Epidote,' a complex Ca, Fe, Al silicate with cerium metals, Ce, Di, La). From pegmatite dike on D. F. Gassenberger Ranch, 5½ miles southeast of Lindcove, Cal., by Gordon Surr, Porterville.

19660. *Alexandrolite* (hydrous Al, Cr, Fe, silicate), from alteration of Avalite. A chromiferous 'clay' in green crusts on decomposed serpentine. From 2 miles southeast of Lindsay, Cal. (Not previously reported in U. S.) By Gordon Surr, Porterville.

19661. *Alexandrolite* (hydrous Al, Cr, Fe, silicate), from alteration of *Avalite*. A chromiferous 'clay,' in green crusts on decomposed serpentine. From 2 miles southeast of Lindsay, Cal., by John Melhase, San Francisco.

19662. *Heterogenite* (hydrous cobalt oxide). From Goodsprings, Nevada, by John Melhase, San Francisco.

19663. *Conichalcite* (hydrous Cu, Ca, arsenate), with Malachite (copper carbonate). From Simon Lead mine, near Mina, Nevada, by John Melhase, San Francisco.

19665. Placer *Gold*. From Highland Chief Mine, near Magalia, Butte County, Cal., by Carl A. Phelps and M. H. Ballou, Magalia.

19666. *Andesite*. Lava cap covering Tertiary auriferous gravel channels. From one mile north of Volcano, Amador County, Cal., by Walter W. Bradley, Berkeley.

19670. *Gold*-bearing quartz with pyrite. Stated to assay $20 gold per ton; vein 2½'–3' wide. From Bricktop mine, 2 miles east of Groveland, Tuolumne County, Cal., by W. H. Campbell, San Francisco.

19671. *Celestite* (strontium sulphate). Crystallized and massive specimens, one showing fine example of perfect cleavage. From Bowling Green, Ohio, by E. L. Moseley, Bowling Green.

19672. *Pyrargyrite* (silver antimonial sulphide). 'Dark ruby silver ore.' From Great Eastern R. R. Dist., Nevada, 1868, by E. L. Moseley, Bowling Green, O.

19673. *Stephanite* crystals, and *Pyrargyrite* (silver antimonial sulphides). From Lander Hill, Austin, Nevada (Univ. of Mich., No. 6054), by E. L. Moseley, Bowling Green, O.

19674. *Halite* (sodium chloride), 'Rock Salt'. From 1000 ft. depth in salt shaft at Oakwood, south of Detroit, Michigan, by E. L. Moseley, Bowling Green, O.

19675. Sylvania *Sandstone*; nearly 100 per cent quartz. Friable. From 7 miles northwest of Monroe, Mich. Stated to contain over 40,000 grains per gram. Used by National Silica Co. for making plate glass. By E. L. Moseley, Bowling Green, O.

19676. *Gypsum* (hydrous calcium sulphate). From Grand Rapids, Mich., by E. L. Moseley, Bowling Green, O.

19677. Calcareous *Tufa*, from west of Sandusky, Ohio, by E. L. Moseley, Bowling Green, O.

19678. Placer *Gold*. From Feather Forks placer mine, La Porte, Plumas County, Cal. (shaft and drift; with 12-ft. breast of gravel), by Feather Forks Gold Gravel Co., La Porte.

19679. *Gold*, in cemented gravel. Small gold nugget protects each corner of specimen from further wear. From Elephant Hydraulic mine, Volcano, Amador County, Cal., by J. W. Preston, Jr., San Francisco.

19680, 19681. *Meteorite*, with polished face showing Widmanstätten figures. Weight 46 pounds; *Meteorite*, weight 250 pounds. From Cañon Diablo, near Flagstaff, Ariz. Loaned by California Academy of Sciences, San Francisco.

19682. *Talc-schist*. E. D. Fitzsimons, Reedley, Cal.

19683. *Montmorillonite* (hydrous aluminum silicate, complex). Soap Rock, locally called 'Shoshonite'. Used commercially in soaps, and for filtration purposes similarly to fuller's earth. From Shoshone, Inyo County, Cal., by W. S. Baylis, The Filtrol Co., Los Angeles.

19684, 19685, 19686. *Pumice*, block form in several sizes; small size lumps, up to ¾-inch diameter, constituting 40 per cent of material mined. *Obsidian* gradating into *Pumiceous* phase. From Pumice Mountain, 30 miles east of Mt. Shasta, Siskiyou County, Cal., by W. A. T. Agard, San Francisco.

19687. *Carnotite* (hydrous potassium uranium vanadate). From Colorado, by Victor C. Alderson, Golden, Colorado.

19688. Free *Gold* in Quartz. From Newtown mine, 3½ miles due west from Nevada City, Nevada County, Cal., by Lester M. Dull, Nevada City.

19689. *Smithsonite* (zinc carbonate). Green; with some Calamine (zinc basic metasilicate). (3 pieces.) From Kelly mine, Kelly, New Mexico, by C. T. Brown, Socorro, N. Mex.

19690. *Limestone* in part dolomitic, containing some organic matter, showing concentric structure. An example of chemical deposition. From Mohawk Claim, Red Mountain district, Silver Peak Mountains, Esmeralda County, Nevada, by R. W. MacFarlane, El Paso.

19691. Pottery *Clay*. Used in making red earthenware flower-pots. From Coyote Creek, east of San Jose, Santa Clara County, Cal. By Walter W. Bradley, Berkeley.

19692. *Calcite* (calcium carbonate). Crystalline limestone. From El Abrigo Rancho, Santa Barbara County, Cal., by Marcus Simpson, El Abrigo Rancho, Santa Barbara.

19693, 19694, 19695. *Samarskite* (Fe, Ca, Ce, Y, niobate-tantalate, complex); *Monazite* (cerium group phosphate); *Bismutite* (basic bismuth carbonate). From 2 miles northwest of Petaca, Rio Arriba County, N. Mex., by Geo. M. Nelson, San Francisco.

19696, 19697. *Sillimanite* (aluminum silicate); *Kaolinite* (hydrous aluminum silicate), *Lithomarge* variety. From near Laws, Inyo County, Cal., near Nevada line, by E. S. Boalich, San Francisco.

19698. '*Gilsonite*' (Uintahite) natural asphalt. From American Hydrocarbon Co., Price, Utah, by Geo. M. Nelson, San Francisco.

19699. *Arsenopyrite* (iron sulph-arsenide) with *Scorodite* (hydrous ferric arsenate), an oxidation product of Arsenopyrite. From San Diego County, near Moreno Lake, by L. Hollis Gwyn, El Centro.

19700. Placer *Gold*. From the Highland Chief Mine, Magalia, Cal., by Carl A. Phelps, Magalia.

19701, 19702. *Mica Schist* and *Pyroxenite*. From Cedar Mountain, southeast of Livermore, Alameda County, Cal., by Ernest Mendenhall, Livermore.

19703. *Copper* ore (2 pieces). Sulphide and carbonate. From Pueblo district, Oregon (on Nevada line), by E. D. Farnham, Woodland, Cal.

19704, 19705. *Silver-gold* ore (oxidized), carrying pyrite; *Silver-gold* ore (unoxidized), carrying pyrite in quartz. From Great Sierra Cons. Silver Co. (Tioga Mine), Tioga mining district, Mono County, by Arthur R. Johnson, Oakland.

19706. *Gold* and *Platinum*. From panning in gravel bench, above Russian River. From Howell and Glatt placer mine, 2½ miles east of Hopland, Mendocino County, Cal., by Fred S. Howell, Petaluma.

19707. *Gold* ore with *Pyrite*. From Jessamine contact (formerly Connor) mine, Douglas County, Oregon, south of Roseburg, by Ed. Wells, San Francisco.

19708. *Barite* (barium sulphate). From Sisquoc, Santa Barbara County, Cal., by F. D. Gore, Santa Maria, Cal.

19709. *Scorodite* (hydrous ferric arsenate). From Wide Awake Mine, near Lovelock, Nevada, by Michael McCarthy, Lovelock.

19710. *Coal*. A good grade of *Lignite*. From a bed 7½ feet thick, San Benito Coal Co. mine, near Llanada, San Benito County, Cal., by A. N. Massey, San Francisco.

19711. *Quartz* crystal. Transparent, and sufficiently free of flaws to be suitable for gem purposes, by R. A. Paulsen, Bloomington, Cal.

19712. *Scheelite* (calcium tungstate). Crystals in metamorphic rock. From Upper Laurel Lake, Mono County, Cal., by Joseph Ward, Bishop.

19713. *Gold* in Calcite. From Grit Mine, Spanish Dry Diggings, El Dorado County, Cal., by Mr. Sweezy, Sacramento.

19714. *Aragonite* (calcium carbonate). 'Onyx Marble.' In part altered by paramorphism to *Calcite*. From Kessler Onyx Quarry, near Musick, San Luis Obispo County, Cal., by F. L. Firebaugh, Berkeley.

19715. *Magnesite* (magnesium carbonate). High-grade, showing characteristic conchoidal fracture. From Sierra magnesite group, Tulare County, Cal., by Sierra Magnesite Co., Porterville.

19716. *Limestone Marl*. Suitable for fertilizer purposes. From near Lindsay, Tulare County, Cal., by E. A. Orton, Lindsay.

19717. *Copper* ore (*Malachite* and *Azurite*, copper carbonates), silver bearing. From Deer Creek Silver Mining Co., 11 miles southeast of Porterville, Tulare County, Cal., by C. McK. Laizure, San Francisco.

19718. *Feldspar*–Orthoclase (potassium aluminum silicate). One mile from Springville, Tulare County, Cal., by W. P. Harman, Porterville.

19719. *Copper* ore (2 pieces). Sulphides (Chalcopyrite and Bornite); also Chrysocolla (silicate) and Malachite (carbonate). From Cuag Mine, Baltimore group, Merrimac district, Lone Mountain, 28 miles from Elko, Elko County, Nevada, by E. G. Weston, Oakland.

19720. *Limestone Marl* (calcium carbonate). Utilized for fertilizer purpurposes. From near Irvington, Alameda County, by Mission Lime Marl Co., Irvington.

19721. *Troilite*, iron mono-sulphide. The first recorded terrestrial occurrence of this mineral, previously known only in meteorites. From Del Norte County, by M. Vonsen, Petaluma. (Exchange.)

19722. *Magnesite* (magnesium carbonate). From 2 miles southeast of Chinese Camp, Tuolumne County, Cal., by Geo. M. Nelson, San Francisco.

19723. *Serpentine*, showing veinlets of *Chrysotile Asbestos*. From Moccasin Creek, 6 miles south of Jacksonville, Tuolumne County, Cal., by Geo. M. Nelson, San Francisco.

19724. *Thenardite* (sodium sulphate). A good grade of sodium sulphate. From San Bernardino County, Cal., by O. A. Cox, Needles, Cal.

19725. *Cinnabar* and *Metacinnabarite*, mercury sulphides. From Hastings Mine, Solano County, Cal., by Mr. Andrews.

19726. *Chalcedony* and *Quartz Geodes*. Silicon dioxide. From 5 miles northwest of San Luis Obispo, Cal., by Dr. B. F. Rogers, Kansas City, Mo. (Exchange.)

19727. *Silver Ore*. From Mt. St. Helena Mine, north of Calistoga, Napa County, Cal., by Walter W. Bradley, Berkeley.

19728 to 19732. *Sandstone* (Eocene-Tertiary), from state highway cut, near Chatsworth, Los Angeles County, Cal.: Biotite *Gneiss;* 'Silver-Gray' *Granite* from Lakeside (old 'Foster') Quarry; 'Santee Granite' (*Granodiorite*), Santee Quarry of Simpson-Pirnie Co. at Santee; 'Black Granite' (Hornblende *Diorite*). From quarry near Lakeside. The above four specimens from San Diego County, by Walter W. Bradley, Berkeley.

19733. Cemented *Conglomerate*. From Nuner Gravel Mine, Stockton Hill at Mokelumne Hill, by J. J. Riley.

19734. Black *Tourmaline* (boron-aluminum silicate, complex). From Temecula Minerals Co. mine near Winchester, Riverside County, Cal., by M. Machado, Temecula.

19735. *Pyrite*, iron di-sulphide. Used extensively for making sulphuric acid. From Tharsis Mine, Spain. Said to have 100,000,000 tons blocked out. By Geo. M. Nelson, San Francisco.

19736. *Gold-Silver* ore. From Goodshaw Mine, Bodie, Mono County, Cal. Outcrop of new strike August, 1922, by J. S. Cain, Bodie, Cal.

19737. *Gold* ore. High-grade, shipping ore, showing free gold. From Coso Mine, Beveridge district, Inyo Mountains, Cal., by Fred H. Spear, Olancha, Cal.

19738. *Asbolite*. Cobalt-bearing *Wad* (manganese oxide). From near Mokelumne Hill, Calaveras County, Cal., by Bert Hammel, Mokelumne Hill.

19739 and 19740. *Chalcopyrite*, copper-iron sulphide, with black coating of oxide, in sericite. High-temperature, replacement deposit in limestone; *Malachite*, basic copper carbonate. In sericite. From oxidized zone. From Atlas Mines, Silverbell, Arizona, by J. F. O'Reilly, Silverbell, Ariz.

19741. *Fluorite* (calcium fluoride). Crystals on Quartz. From Fluorspar deposit near Mt. Montgomery Station, Mineral County, Nev. Precious *Opal*, in opalized wood. From Virgin Valley, Elko County, Nev. Precious *Opal* (silicon dioxide). In matrix. From Virgin Valley, Elko Company, Nevada. By John Melhase, San Francisco.

19744. Nephelite (?) *Syenite*. From 6 miles northeast of Lindsay, Tulare County, Cal., by John Melhase, San Francisco.

19745 to 19747. *Salt* (sodium chloride), crude. First crystallization, after 2 months' evaporation of bay water, showing thickness of layer 4" to 6". Specimen cut during harvesting, Oct. 28, 1922; also specimen three years old; also specimen re-washed. From Moss Landing, Monterey County, Cal., by Monterey Bay Salt Co., Vierra Bros., Moss Landing, Cal.

19748. *Cuprodescloizite* (lead, zinc, copper vanadate, hydrous). From Goodsprings, Nevada, by John Melhase, San Francisco.

19749. *Hyalite* (silicon dioxide). Deposited in fracture in basalt. From Spokane, Washington, by Ernest Schernikow, San Francisco.

LABORATORY.

FRANK SANBORN, Petrologist.

A total of 330 samples were received and determined during the thirty-day period covered by this report. This number is above the average for a winter month and is probably in part due to the new tariff on certain minerals.

A list of samples of possible commercial value, judged from the sample submitted only, is appended.

The Bureau will supply the name and address of the party who sent in any sample listed, upon request, if the reference number is given.

05–328 Gypsum.
05–329 Barite.
05–330 Arsenopyrite.
05–331 Opal.
05–332 Sepiolite (meerschaum).
05–333 Pyromorphite (a phosphate of lead).
05–334 Gypsum.
05–335 Arsenopyrite; also gypsum.
05–336 Diatomaceous earth.
05–337 Gypsum.
05–338 Hematite (red ochre).
05–339 Malachite, with a very little silver.
05–340 Arsenopyrite.
05–341 Garnet.
05–342 Cerargyrite (silver chloride).
05–343 Limonite (yellow ochre).
05–344 Galena, contains over 10 ozs. silver per ton.
05–345 Copper ore; contains some silver.
05–346 Pyrite concentrate; contains gold.
05–347 Barite.

LIBRARY.

E. Cooney, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received during the month, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the State are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geological Survey.

Bulletin No. 709-L—Primary Traverse in Virginia, 1916-1918. By C. H. Birdseye, Chief Topographical Engineer.

Bulletin 731—Bibliography of North American Geology for 1919-1920. By John M. Nickels.

Bulletin 736-D—The Osage Oil Field, Weston County, Wyoming. By A. J. Collier.

Bulletin 739-A—The Alaskan Mining Industry in 1921. By Alfred H. Brooks.

Professional Paper 129—Shorter Contributions to General Geology, 1921. By David White, Chief Geologist.

Professional Paper 130—The Laramie Flora of the Denver Basin. By F. H. Knowlton.

Water Supply Paper 490-D—Routes to Desert Watering Places in the Papago Country, Arizona. By Kirk Bryan.

Mineral Resources of the United States, 1919. Part II—Nonmetals.

Cobalt, Molybdenum, Nickel, Tantalum, Titanium, Tungsten, Radium, Uranium and Vanadium in 1921. By Frank L. Hess.

Sand and Gravel in 1921. By L. M. Beach.

Gold, Silver, Copper, Lead and Zinc in Montana in 1921. By C. N. Gerry.

Geological Survey of Alabama—Report on the Progress for the Fiscal Years 1918–1922.

U. S. Geological Survey—*Concluded.*
Geological Survey of Alabama, Museum Paper No. 6—The Anculosae of the Alabama River Drainage. By Calvin Goodrich.
Kentucky Geological Survey, Series 6, Vol. 5—Geology and Coals of Webster County.
Kentucky Geological Survey, Series 6, Vol. 8—Clay Deposits of Kentucky.
Wisconsin Geological and Natural History Survey, Bulletin 64—The Inland Lakes of Wisconsin. By Edward A. Berge and C. Juday.
Canada Department of Mines Branch—Talc and Soapstone in Canada. By Hugh S. Spencer.
Canada Department of Mines, Geological Survey. Summary Report, 1921. Parts B–E.
Canada Department of Mines, Geological Survey, Memoir 130, No. 111, Geological Series—Geology and Mineral Deposits of the Bridge River Map—Area, British Columbia. By W. S. McCann.
Bulletin of the Imperial Geological Survey of Japan. Vol. XXV, No. 4.
Bulletin on the Explanatory Text of the Geological Map of Japan—Yoshioka Special Sheet; Shobara Sheet.
Secretaria de Industria, Comercio Y Trabajo—Boletin del Petroleo. Vol. XIII, Numos. 5–6.
Secretaria de Industria Comercio Y Trabajo—Boletin Minero, Organo del Departamento de Minas, Tomo XIII, Num. 5.

Societies and Educational Institutions.

Bulletin of the State University of New Mexico—Geology of the Sandia Mountains. By Robert W. Ellis.
Year Book of the American Ceramic Society, 1921–1922.
Mining and Metallurgical Society of America, October, 1922.
Proceedings of the American Philosophical Society, Vol. LXI, No. 3.
Proceedings of the Engineers' Society of Western Pennsylvania, June, 1922.
Monthly Bulletin of the Canadian Institute of Mining and Metallurgy, December 1922.
Alumni Number of the Colorado School of Mines, Vol. XII, No. 7.
Journal of Geology, October and November, 1922.
The Mining Congress Journal, November, 1922.
The Philippine Journal of Science, August, 1922.

Books.

Mineral Industry, Vol. XXX, 1921.

Maps.

U. S. Geological Survey Topographical Sheets:
Barnhart, Texas.
Confluence, Pennsylvania.
Dos Palos, California.
Friant, California.
Garrison, North Dakota.
Lafayette National Park, Maine.
Kerman, California.
Lake Crescent, Washington.
Munroe, Wisconsin-Illinois.
Moosehead Lake, Maine.
Pozo Farm, California.
Pozo Quadrangle, California.
Pysht, Washington.
Round Mountain, California.
Tyrone District, New Mexico.

Imperial Geological Survey Map of Japan.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

American Petroleum Institute, New York.
Architect and Engineer, San Francisco.
Arizona Mining Journal, Phoenix, Arizona.
Asbestos, Philadelphia, Pennsylvania.
Brick and Clay Record, Chicago.
Cement, Mill and Quarry, Chicago, Illinois.
Chemical Engineering and Mining Review, London, England.
Engineering and Mining Journal-Press, New York.
Financial Insurance News, Los Angeles, California.
Journal of Electricity and Western Industry, San Francisco.
Metallurgical and Chemical Engineering, New York.
Mining and Engineering Record, Vancouver, B. C.
Mining and Oil Bulletin, Los Angeles.
Oil Age, Los Angeles.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil News, Galesburg, Illinois.
Oildom, New York.
Oil, Paint and Drug Reporter, New York.
Oil Trade Journal, New York.
Oil Weekly, Houston, Texas.
Petroleum Age, New York.
Petroleum Record, Los Angeles.
Petroleum Refiner, Kansas City, Missouri.
Petroleum World, Los Angeles.
Queensland Government Mining Journal, Brisbane, Australia.
Rock Products, Chicago, Illinois.
Safety News, Industrial Accident Commission, San Francisco.
Salt Lake Mining Review, Salt Lake City, Utah.
Southwest Builder and Contractor, Los Angeles.
Standard Oil Bulletin, San Francisco.
Stone, New York.
The Record, Associated Oil Company, San Francisco.

Newspapers.

The following papers are received and kept on file in the library:

Amador Dispatch, Jackson, Cal.
Arkansas Oil and Mineral News, Hot Springs National Park (Arkansas).
Bakersfield Morning Echo, Bakersfield, Cal.
Blythe Herald, Blythe, Cal.
Bridgeport-Chronicle-Union, Bridgeport, Mono Co., Cal.
California Oil World, Los Angeles, Cal.
Colusa Daily Sun, Colusa, Cal.
Daily Midway Driller, Taft, Cal.
Del Norte Triplicate, Crescent City, Cal.
Exeter Sun, Exeter, Cal.
Gateway Gazette, Beaumont, Cal.
Georgetown Gazette, Georgetown, Cal.
Gilroy Gazette, Gilroy, Cal.
Goldfield News, Goldfield, Nevada.
Guerneville Times, Guerneville, Cal.
Healdsburg Enterprise, Healdsburg, Cal.
Humboldt Standard, Eureka, Cal.
Inyo Independent, Independence, Cal.
Inyo Register, Bishop, Cal.
Lake County Bee, Lakeport, Cal.
Mariposa Gazette, Mariposa, Cal.
Mining and Financial Record, Denver, Colo.
Mountain Democrat, Placerville, Cal.
Mountain Messenger, Downieville, Cal.
Nevada Mining Press, Reno, Nevada.

Oatman Mining Press, Oatman, Arizona.
Oregon Observer, Grants Pass, Oregon.
Oroville Daily Register, Oroville, Cal.
Petroleum Reporter, Etna Mills, Cal.
Placer Herald, Auburn, Cal.
Plumas Independent, Quincy, Cal.
Plumas National Bulletin, Quincy, Cal.
Sacramento Union, Sacramento, Cal.
San Diego News, San Diego, Cal.
Santa Barbara Daily News, Santa Barbara, Cal.
Shasta Courier, Redding, Cal.
Siskiyou News, Yreka, Cal.
Siskiyou Standard, Fort Jones, Cal.
Stockton Record, Stockton, Cal.
Sunset Journal, Sunset District, San Francisco, Cal.
Tuolumne Prospector, Tuolumne, Cal.
Ventura Daily Post, Ventura, Cal.
Weekly Trinity Journal, Weaverville, Cal.
Western Sentinel, Etna Mills, Cal.

PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of consumers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

Sufficient publicity has not heretofore been given to this feature of the Bureau's work, but in 'Mining in California' a suitable medium is provided for current inquiries of this nature, and, therefore, written or verbal inquiries that come to the attention of the Bureau are summarized in each issue.

The name of the product wanted or offered, only, is published; the name of the owner of the deposit, or buyer, and other details being supplied upon request.

In writing, the reference number of the item should be given.

Mineral Products or Deposits for Sale.

02–146 High-grade silica sand; also hematite suitable for paint.
02–147 Hydraulic mine, equipped, Trinity County.
02–148 Large high-grade magnesite deposit less than one mile from railroad.
02–149 Coal deposit. Vein 6 to 16 feet thick; good quality, on highway in Trinity County.
02–150 Quicksilver deposit; also prospecting drill tools and casing.
02–151 Gold mine. Assays $12 up per ton. Price $2,000.
02–152 Copper ore.
02–153 High-grade manganese ore.
02–154 Gold quartz mine; has produced over one million; Sierra County. Four tunnels, no crosscutting.
02–155 Gem mine. (Tourmaline and Kunzite.) Three claims in San Diego County. Cash or terms.
02–156 Limestone deposit; eight miles from railroad; down-hill haul.
02–157 Dolomite. Twelve miles from railroad. San Benito County.
02–158 Silica, silica sand, and ground floated silica.
02–159 Limestone deposit; 3 miles from railroad; Kern County.
02–160 Arsenopyrite. Large body in Sierra County.

Mineral Products or Deposits Wanted.

03–129 Celestite (strontium sulphate).
03–130 Quicksilver deposit.
03–131 Colored rock granules (yellow, black, green, red, sparkling) for stucco dash; tonnage.
03–132 Bauxite deposit.
03–133 Montmorillonite or bentonite; tonnage.
03–134 Barite; deposit or tonnage.
03–135 Arsenical pyrite; large body.
03–136 Limestone deposit within fifty miles of Los Angeles.

EMPLOYMENT SERVICE.

Following the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

The Bureau registers technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

A list of applicants for positions and 'positions open,' received by the Bureau during each 30-day period preceding the date of publication of the Monthly Chapter is carried in each issue.

Each notice is designated by a key number, and communications sent to the Bureau in reply to any notice will be forwarded to the proper party without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau, to avoid possible loss.

Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

01–45 Superintendent or assistant superintendent. Technical graduate; ten years' experience Utah, Nevada and California mines. Age 34; married; references. Salary wanted $250–$300.

01–46 Engineer. Technical graduate. Member A. I. M. E. Capt. Engineers, U. S. Army. Twenty years' experience in foreign countries and United States, covering designing, drafting, operation and construction of public works, railroads, mining and chemical plants. Speaks Spanish, Hindustani and Chinese fluently. Will accept moderate salary or share of profits. Detail record on file. References.

01–47 Assistant to mining engineer or drafting. Technical education. Two years' experience, mucking, mining, surveying and drafting. Age 23. Single. References. Salary open.

01–48 Mining Engineer, foreman or shift-boss. Eight years' general experience, mine surveyor, geologist and engineer. Age 33. Married. References. Salary open.

01–49 Geologic work in mining or oil. Graduate, specializing in geology. Age 22. Married. References. Salary open.

01–50 Laboratory assistant, assayer or chemist. Experience in analytical laboratory and assay office of large California mine. Age 24. References. Salary open.

01–51 Geologist. Technical graduate. Experience 1912–1922, covers copper, lead, zinc, gold, iron, manganese, chrome, asbestos, precious stones and coal explorations in Russia. Age 33. Married. References. Salary open.

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STATE OF CALIFORNIA

THIRTIETH BIENNIAL REPORT

OF THE

Superintendent of Public Instruction

FOR THE

SCHOOL YEARS ENDING JUNE 30, 1921, AND JUNE 30, 1922

Transmitted to the Governor
September 15, 1922



CALIFORNIA STATE PRINTING OFFICE
FRANK J. SMITH, Superintendent
SACRAMENTO, 1923

22497

LETTER OF TRANSMITTAL.

In accordance with provision of section one thousand five hundred thirty-two of the Political Code, I herewith submit to the Honorable William D. Stephens, Governor of California, the report of the Superintendent of Public Instruction for the biennial period ending June 30, 1922.

Respectfully submitted.

WILL C. WOOD,
Superintendent of Public Instruction.

Sacramento, California,
September 15, 1922.

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EDUCATIONAL DIRECTORY.

Superintendent of Public Instruction.

(Elected November 5, 1918.)

Name	Term expires	Address
Will C. Wood	January, 1923	Alameda

Staff of the Superintendent of Public Instruction.

Job Wood, Jr., Deputy	Sacramento
Sam H. Cohn, Assistant Superintendent	Sacramento
Ethel Richardson, Assistant Superintendent	Los Angeles
Georgiana Carden, Supervisor of Attendance	Berkeley
Edna M. Stangland, Secretary	Sacramento
W. S. Dyas, Bookkeeper Text-book Department	Sacramento

STATE BOARD OF EDUCATION.

(Appointed by the Governor.)

Name	Term expires	Address
E. P. Clarke	December, 1922	Riverside
Mrs. O. Shepard Barnum	August, 1925	312 S. Fifth St., Alhambra
Mrs. Agnes Ray	August, 1923	272 Twenty-third St., Oakland
Mrs. Elizabeth Phillips	August, 1924	1006 Putnam Ave., Porterville
George W. Stone	August, 1924	143 High St., Santa Cruz
Stanley B. Wilson	August, 1923	205 New High St., Los Angeles

NOTE—Will C. Wood, Superintendent of Public Instruction, is Secretary of the Board, according to law.

Commissioners of Education.

(Assistant Superintendents of Public Instruction appointed by State Board of Education.)

Margaret S. McNaught, Commissioner of Elementary Schools	Sacramento
Albert C. Olney, Commissioner of Secondary Schools	Sacramento
Edwin R. Snyder, Commissioner of Vocational Education	Sacramento

State Supervisors.

Herbert R. Stolz, Physical Education	Sacramento
J. B. Lillard, Agricultural Instruction	Sacramento
Maude I. Murchie, Teacher Training in Home Economics	Sacramento
J. C. Beswick, Trade and Industrial Instruction	Sacramento

Assistant Supervisors.

Miss Winifred Van Hagen, Physical Education	Oakland
A. J. Schuettner, Physical Education	Sacramento

Assistant Secretaries.

Florence B. Argall	Sacramento
Marion H. Ketcham, Retirement Salary	Sacramento
Helen Dimmick, Credentials	Sacramento

COUNTY SUPERINTENDENTS OF SCHOOLS.

County.	Name.	Address.
Alameda	D. E. Martin	Oakland
Alpine	Mrs. Eugenia M. Bruns	Gardnerville, Nevada
Amador	Mrs. Sabra R. Greenhalgh	Jackson
Butte	Irvin Passmore	Oroville
Calaveras	Teresa Rivara	San Andreas
Colusa	Perle Sanderson	Colusa
Contra Costa	Wm. H. Hanlon	Martinez
Del Norte	E. A. Moore	Crescent City
El Dorado	E. J. Fitzgerald	Placerville
Fresno	Clarence W. Edwards	Fresno
Glenn	S. M. Chaney	Willows
Humboldt	Robert A. Bughee	Eureka
Imperial	H. C. Coe	El Centro
Inyo	Mrs. M. A. Clarke	Bishop
Kern	L. E. Chenoweth	Bakersfield
Kings	Miss M. L. Richmond	Hanford
Lake	Minerva Ferguson	Lakeport
Lassen	Mrs Julia A. Norwood	Susanville
Los Angeles	Mark Keppel	Los Angeles
Madera	Craig Cunningham	Madera
Marin	Jas. B. Davidson	San Rafael
Mariposa	John L. Dexter	Mariposa
Mendocino	Roy Good	Ukiah
Merced	Mrs. Belle S. Gribi	Merced
Modoc	Mrs. Nettie B. Harris	Alturas
Mono	Mildred Gregory	Bridgeport
Monterey	Jas. G. Force	Salinas
Napa	Lena A. Jackson	Napa
Nevada	Miss Elizabeth M. Richards	Nevada City
Orange	R. P. Mitchell	Santa Ana
Placer	Irene Burns	Auburn
Plumas	Mrs. Kate L. Donnelley	Quincy
Riverside	Ira C. Landis	Riverside
Sacramento	Carolyne M. Webb	Sacramento
San Benito	Mrs. Dorothy B. Slaven	Hollister
San Bernardino	Mrs. Grace C. Stanley	San Bernardino
San Diego	Ada York	San Diego
San Francisco	Alfred Roncovieri	San Francisco
San Joaquin	Mrs. Effie S. Anderson	Stockton
San Luis Obispo	Robert L. Bird	San Luis Obispo
San Mateo	Roy W. Cloud	Redwood City
Santa Barbara	A. S. Pope	Santa Barbara
Santa Clara	Miss Agnes Howe	San Jose
Santa Cruz	Miss Cecil M. Davis	Santa Cruz
Shasta	Mrs. Charlotte Cunningham	Redding
Sierra	Belle Alexander	Downieville
Siskiyou	W. L. Kleaver	Yreka
Solano	Dan H. White	Fairfield
Sonoma	Ben Ballard	Santa Rosa
Stanislaus	A. G. Elmore	Modesto
Sutter	Lizzie Vagades	Yuba City
Tehama	Mamie B. Lang	Red Bluff
Trinity	Miss Lucy Young	Weaverville
Tulare	J. E. Buckman	Visalia
Tuolumne	G. P. Morgan	Sonora
Ventura	Mrs. Blanche T. Reynolds	Ventura
Yolo	Harriett S. Lee	Woodland
Yuba	Jennie Malaley	Marysville

CITY SUPERINTENDENTS OF SCHOOLS.

City.	County	Name of Supt.
Alameda	Alameda	C. J. Du Four
Alhambra	Los Angeles	Charles E. Barber
Bakersfield	Kern	Charles E. Teach
Berkeley	Alameda	H. B. Wilson
Chico	Butte	Chas. H. Camper
Eureka	Humboldt	Geo. B. Albee
Fresno	Fresno	Wm. John Cooper
Grass Valley	Nevada	J. S. Hennessey
Long Beach	Los Angeles	W. L. Stephens
Los Angeles	Los Angeles	Mrs. Susan Dorsey
Modesto	Stanislaus	W. E. Faught
Oakland	Alameda	Fred M. Hunter
Oroville	Butte	L. M. Trempe
Palo Alto	Santa Clara	A. C. Barker
Pasadena	Los Angeles	J. F. West
Petaluma	Sonoma	Bruce H. Painter
Pomona	Los Angeles	G. V. Whaley
Richmond	Contra Costa	W. T. Helms
Riverside	Riverside	A. N. Wheelock
Sacramento	Sacramento	Chas. C. Hughes
Salinas	Monterey	Arthur Walter
San Bernardino	San Bernardino	Percy R. Davis
San Diego	San Diego	Henry C. Johnson
San Jose	Santa Clara	Walter L. Bachrodt
San Luis Obispo	San Luis Obispo	Arthur H. Mabley
San Rafael	Marin	Oliver R. Hartzell
Santa Ana	Orange	John A. Cranston
Santa Barbara	Santa Barbara	Paul E. Stewart
Santa Cruz	Santa Cruz	John W. Linscott
Santa Monica	Los Angeles	Horace M. Rebok
Santa Rosa	Sonoma	Jerome O. Cross
Stockton	San Joaquin	Ansel S. Williams
Tulare	Tulare	A. W. Ray
Vallejo	Solano	E. L. Cave
Ventura	Ventura	Arthur L. Vincent
Visalia	Tulare	De Witt Montgomery

ORGANIZATION OF THE STATE DEPARTMENT OF EDUCATION.

THE STATE BOARD OF EDUCATION.

Membership.

The Board is appointed by the Governor and the members serve for four years. The law provides for a board of seven members.

Officers.

The officers of the State Board of Education are the president and vice president elected by the board, the secretary (Superintendent of Public Instruction) elected by the people, and three assistant superintendents, designated the Commissioner of Elementary Schools, the Commissioner of Secondary Schools, and the Commissioner of Industrial and Vocational Education. The commissioners are appointed by the board. The Superintendent of Public Instruction (secretary) and the commissioners take part in the deliberation of the board, but have no vote.

Meetings.

The regular meetings of the board are held quarterly. Special meetings are called by the president from time to time.

Powers and Duties.

The powers and duties of the State Board of Education, generally stated, as defined by law, are as follows:

1. To adopt rules and regulations, not inconsistent with law, for the government of the schools of the state.

2. To standardize the courses of instruction, requirements for entrance, requirements for graduation, and textbooks of the normal schools of the state.

3. To appoint:

   (1) Three Commissioners of Education;
   (2) A Supervisor of Physical Education and assistant supervisors;
   (3) A Supervisor of Vocational Agriculture;
   (4) A Supervisor of Teacher Training in Home Economics;
   (5) A Supervisor of Trades and Industries;
   (6) Such expert and clerical assistance as may be necessary, within the limits of the board's appropriations.

4. To study the educational needs of the state and make recommendations for the improvement of the administration of the public schools.

5. To grant
   High school teachers credentials,
   Junior high school credentials,
   Elementary school credentials,

Special teachers credentials,
Elementary and secondary grade life diplomas,
Attendance officer credentials, and
Health and development credentials.

For the most part this work is handled by the Commission of Credentials, hereinafter discussed.

6. To accredit universities, colleges, normal schools, and other educational institutions for kindergarten, elementary, high school, junior high school, and special certification, and prescribe regulations governing such certification by county boards of education.

7. To adopt textbooks for the elementary schools, contract for the same, copyright the materials therein, and enforce the uniform use thereof.

8. To administer the funds appropriated for vocational education and vocational rehabilitation of men injured in industry, by the Federal Congress and the Legislature, and prescribe rules and regulations governing the organization of courses of study under the Federal Act relating to vocational education.

9. To adopt rules and regulations governing courses in physical education.

10. To prescribe a list of textbooks for use in the high schools of the state and contract for such textbooks in the name of the state.

11. To call a convention of high school principals annually.

12. To approve or disapprove of the courses of study of all high schools of the state.

Compensation.

The members of the board are paid $15 a day for actual service during sessions and $10 a day for committee work. Their actual and necessary traveling expenses are allowed.

THE TEACHERS' RETIREMENT SALARY FUND BOARD.

Membership and Officers.

Members of the State Board of Education constitute the Teachers' Retirement Salary Fund Board. The officers are the same as for the State Board of Education.

Powers and Duties.

1. To approve and allow retirement salaries of public school teachers entitled to the same.

2. To audit all claims and demands against the retirement salary fund.

3. To invest the moneys in the permanent fund in securities and collect the income thereon.

4. To conduct investigations into all matters relating to the retirement salary law.

Nature of Trusteeship.

The administration of this fund involves much careful and painstaking work. It involves the investment of a reserve fund of about $1,500,000. Every application for full retirement, when granted involves an annual expenditure of $500 per annum for the remainder of the life of the applicant, so all applications must be carefully investigated and considered.

THE STAFF OF THE DEPARTMENT OF EDUCATION.

I. Executive Office.

Superintendent of Public Instruction (Ex officio secretary and executive officer.)	1
Secretary	1
Assistant secretary State Board of Education	1
Assistant secretary Teachers' Retirement Salary Fund Board	1
Bookkeeper	1
Assistant bookkeeper (retirement salary)	1
Mailing clerk	1
Stenographer	1
Messenger	1

II. Elementary Schools Division.

Commissioner of Elementary Schools	1
Secretarial stenographer	1

III. Secondary Schools Division.

Commissioner of Secondary Schools	1
Secretarial stenographer	1

IV. Vocational Education Division.[1]

Commissioner of Vocational Education	1
Supervisor of Agricultural Education	1
Supervisor of Home Economics Training	1
Supervisor of Trades and Industry	1
Supervisor of Rehabilitation	1
Assistant in Rehabilitation	1
Secretarial stenographer	1
Stenographers	3

V. Physical Education Division.

Supervisor of Physical Education	1
Assistant supervisors	2
Secretarial stenographer	1

VI. Division of Normal and Special Schools.

Deputy Director of Education	1
Secretary	1
Stenographer	1

VII. Division of Immigrant Education.

Assistant superintendent	1
Stenographer (half-time)	1

[1]The Rehabilitation Work is a subdivision of the Vocational Education Division.

VIII. Legal Division.

Deputy superintendent	1
Stenographer	1

IX. Division of Statistics and Foreign Language Schools.

Assistant superintendent	1
Statistical clerk	1

X. Textbook Division.

Head of division	1
Assistant	1
Part-time clerk	1

XI. Credentials Division.

Assistant secretary in charge	1
Credentials clerks	4
Stenographers and clerks	6

XII. Attendance Division.

State supervisor of attendance	1

GENERAL PLAN OF DEPARTMENTAL ORGANIZATION.

I. Professional Agencies.

The professional agencies of the state office include the elementary school division, the secondary school division, the vocational education division, Americanization division, and the physical educational division.

II. Executive Agencies.

The executive agencies of the state office, not including the superintendent's office, include the three secretarial offices, the legal division, the statistical division, attendance division, division of normal and special schools, and the textbook division.

DEPARTMENTAL MEETINGS.

There are two departmental councils—the Cabinet and the Commission of Credentials, the former being a department organization, the latter a legal organization.

There is an annual joint meeting of the Cabinet, the members of the Department of Education at the University of California, the Dean of the School of Education at Stanford University, the Dean of the School of Education at the University of Southern California, and the Deans of the Schools of Education of Mills College, Pomona College and Occidental College and teachers college presidents for the purpose of organizing cooperative investigations of educational problems.

THE CABINET.

Composition.

The Cabinet consists of the Superintendent of Public Instruction, the Commissioner of Elementary Schools, the Commissioner of Secondary Schools, and the Commissioner of Vocational Education.

Functions and Duties.

Its functions shall be:

1. To discuss all plans of a professional nature, with a view to the development and working out of a unified policy.

2. To consider all suggestions for legislation bearing upon professional problems of general concern.
3. To coordinate the movements of the professional representatives of the department so as to prevent unnecessary duplication of activity and to effect a workable and economical plan for visiting state institutions and supervising the schools of the state.
4. To assign the investigation of all problems referred to the Cabinet by the State Board of Education and to consider reports thereon before presentation to the board.

Organization.

The Superintendent of Public Instruction shall be Chairman of the Cabinet and shall prepare a program for each meeting. Any member may bring up for discussion during the meeting any matter on which he desires to confer with the members.

Meetings.

A regular meeting shall be held at 10 o'clock a.m. on the first Monday of each month, and special meetings may be called by the Superintendent at any time. It shall be the duty of each member to attend all regular meetings unless excused by the Superintendent. The regular meeting shall have precedence over any other business.

Minutes.

The minutes of meetings shall be kept in a book provided for the purpose and shall be open to the inspection of the members of the Cabinet and members of the State Board of Education.

Limitation.

The Cabinet shall have no legal standing, and all correspondence concerning its business shall be conducted by the superintendent or department head concerned on his own stationery.

COMMISSION OF CREDENTIALS.

Composition.

The Commission of Credentials consists of the Superintendent of Public Instruction, Commissioner of Elementary Schools, the Commissioner of Secondary Schools, and the Commissioner of Vocational Education.

Functions and Duties.

1. To consider all applications for regular high school, junior high, elementary, kindergarten, and special credentials.

2. To consider reports of the commissioners on applications for accreditation and report thereon to the board.

3. To arrange for the examination of candidates for the regular high school credentials and special credentials.

Organization.

The commission shall elect a chairman. An assistant secretary is assigned by the board.

Meetings.

The commission shall arrange regular meetings to consider credential matters on which conference is necessary.

Minutes.

The minutes of the meetings, and a complete list of credentials granted, shall be kept by the secretary in a book provided for the purpose.

EXECUTIVE AGENCIES.

Superintendent of Public Instruction and ex officio Secretary in Charge.

Duties.

1. To act as chief executive officer of the board, carrying out in person, or through assistants, all educational policies determined by the board.

2. To supervise the different departments, divisions and offices of the state department and decide all conflicts of authority; to assume responsibility for the proper administration of the department and to see that all work assigned is properly performed and all reports are properly made.

3. To superintend the schools of the state and visit and investigate in person, and through assistants, the kindergartens, elementary schools, secondary schools, junior colleges, teachers colleges, the California Polytechnic School, and all other educational institutions supported in whole or in part by the state.

4. To visit all orphan asylums receiving state aid and look into the educational features thereof.

5. To call a convention of city and county superintendents annually and prepare a program therefor.

6. To require reports and prepare and publish blanks for reports and such other forms as may be required by law.

7. To compile bienially a report of the activities of his office and of educational advances during the biennium and to make recommendations for the improvement of schools.

8. To interpret in person, or through assistants, the laws relating to schools.

9. To cause all state school moneys appropriated or otherwise made available for school purposes to be apportioned according to law.

10. To pass upon all claims against the funds of the state set aside for the state departments of education and see that the accounts of the departments are properly kept.

11. To act as a regent of the State University.

12. As director of education, to perform duties heretofore performed by boards of trustees of the several state normal schools and of the California Polytechnic School and the California School for the Deaf and the Blind, subject to limitations of law.

13. To perform such other duties as may be prescribed by law.

SECRETARY TO THE SUPERINTENDENT.

Duties.

1. To receive and distribute all correspondence and open all mail directed to the superintendent, answering all correspondence of a routine nature.

2. To attend to all complaints concerning correspondence and have charge of the filing in the superintendent's office.

3. To attend to the details of publication of all bulletins of a professional nature.

4. To act as secretary of the Cabinet.

5. To have charge of the department library and publications received.

6. To investigate and pass upon all applications for the certificate of scholastic preparation for entrance to dental colleges, subject to approval of the superintendent.

ASSISTANT SECRETARY OF THE STATE BOARD OF EDUCATION.

Duties.

1. To keep the minutes of the State Board of Education, under the direction of the secretary and have same ready within ten days after the adjournment of each meeting.

2. To answer in the name of the secretary all board correspondence of a routine nature.

3. To be responsible for the safe keeping of all books, records and papers of the State Board of Education.

4. To make all purchases, check all bills and all claims for traveling expenses, and prepare all warrants in payment of claims for services, materials and traveling expenses.

5. To supervise the keeping of accounts of all appropriations and revenues and of all expenditures, segregating the items for convenience in budget making.

6. To exercise supervision over and direct the work of all non-professional employees of the board, except those assigned to work with the professional departments and the Commission of Credentials.

7. To prepare or have prepared, quarterly, an itemized report of receipts, expenditures and unexpended balances for presentation to the board at each regular meeting.

8. To prepare all contracts and bonds for the lease of plates or the purchase of manuscripts for elementary school textbooks and see that they are properly signed and filed within four months after any adoption.

9. To prepare all contracts and bonds required from publishers under the high school textbook law and see that they are properly signed and filed within four months after receipt of notification of the official listing of books from the Commissioner of Secondary Schools.

10. To perform such other duties as may be assigned by the secretary.

LEGAL DIVISION.

Deputy Superintendent of Public Instruction in charge.

Duties.

1. To edit and have printed the school law.

2. To annotate the school law from decisions of the courts and opinions of the superintendent.

3. To advise educational officers as to the interpretation of the school law and methods of procedure thereunder, all opinions to be subject to approval by the superintendent.

4. To investigate and report to the superintendent all appeals for salary withheld.

5. To keep on file and properly indexed, all opinions, interpretations and decisions of the superintendent.

6. To assist the superintendent in visiting the orphan asylums.

7. To assume responsibility for the offices of the Superintendent of Public Instruction during his absence.

DIVISION OF STATISTICS AND FOREIGN LANGUAGE SCHOOLS.

Assistant Superintendent in charge.

Duties.

1. Subject to the approval of the superintendent, to prescribe the blanks, forms, registers and regulations for making all statistical reports to county and state school officers.

2. To attend to the gathering, tabulation and editing of all statistical data.

3. To apportion school moneys.

4. To prepare the annual statistical tables for publication in the biennial report.

5. To bring about a study of retardation, its causes and the means of reducing the same.

6. To gather information concerning the progress of educational measurements and the development of educational standards, and to encourage local boards to introduce such work.

7. To supervise all foreign language schools.

TEXTBOOK DIVISION.

Bookkeeper in charge.

Duties.

1. To receive and fill all orders for textbooks.

2. To keep records and accounts showing all orders for the publication of textbooks, the number of textbooks printed, the number distributed to the several school districts and state institutions, the stock on hand, and expenditures from the textbook fund and from the orphans' textbook fund.

3. To prepare for each regular meeting a report showing stock of textbooks on hand, amounts expended for textbooks during the previous quarter, balances available for the publication of textbooks, and estimates of the number of textbooks needed during the next quarter.

4. To keep all books and accounts of the office of the Superintendent of Public Instruction, and prepare a monthly statement showing expenditures for the various purposes, and balances.

SUPERVISOR OF ATTENDANCE.

Duties.

1. To study the problem of school attendance and other problems of child welfare directly affecting the elementary schools.

2. To cooperate with local supervisors of attendance in the enforcement of the compulsory education law.

3. To prepare forms for the registration of minors and gather statistics of such registration.

4. To organize and supervise classes organized under law for children of migratory workers.

5. To assist the Superintendent of Public Instruction in visiting orphan asylums receiving state aid, and investigate educational conditions therein.

PROFESSIONAL AGENCIES.

Elementary School Division.

Commissioner of Elementary Schools in charge.

Duties.

1. To visit and investigate the elementary schools of the state.

2. To direct and supervise all investigations of textbooks for elementary schools and collect and approve all claims for expert reading, subject to approval by the secretary.

3. To visit and investigate the kindergarten classes of the state and make recommendations for their improvement and for better articulation of such classes with the elementary schools.

4. To supervise the investigation of applications for accreditation by institutions preparing teachers for regular elementary school work, the actual detail work to be done by the secretary of the Commission of Credentials, and while visiting outside the state, to look into the organization of teacher-training courses in accredited institutions whenever she can do so conveniently and at slight expense.

5. To suggest ways and means for improving elementary school teachers in the service. This will involve the preparation of a bulletin of suggestions on the organization of teachers' institutes, the organization of professional reading circles, and plans for official recognition of such work. It would also involve the working out of a plan of cooperation with the universities and teachers colleges in their extension work with elementary school teachers.

6. To visit and investigate special schools and classes of elementary grade established for the deaf, crippled and atypical children, and classes for children with speech defects, and to become acquainted with institutions for the care and education of such children with a view to close cooperation.

7. To visit and investigate the several state teachers colleges and the training schools thereof, and counsel with teachers college authorities concerning better preparation of teachers for kindergarten and elementary schools.

8. To make a special study of rural life and rural institutions related to the schools and devise ways and means for improving the rural elementary schools.

9. To investigate and supervise all post-graduate courses of elementary grade.

10. To make every reasonable effort to coordinate the work of all agencies that are seeking to cooperate with the elementary schools or influence their curricula and organization.

11. To perform such other duties as may be prescribed by law or assigned by the superintendent under the direction of the State Board of Education.

SECONDARY SCHOOL DIVISION.

Commissioner of Secondary Schools in charge.

Duties.

1. To visit and investigate the secondary schools of the state.

2. To advise local boards and school officials in the making of course of study.

3. To investigate the course of study of the several high schools and junior high schools, and recommend the approval or disapproval thereof to the State Board of Education not later than the third regular meeting of each year.

4. To cooperate with the Commissioner of Vocational Education in the supervision of evening high schools.

5. To counsel with university authorities concerning entrance requirements, with a view to better articulation of high schools and colleges.

6. To investigate and report on junior high school courses, post-graduate high school courses and junior colleges.

7. To supervise the preparation of the official list of high school textbooks, junior college textbooks and junior high school textbooks; to appoint expert readers of such textbooks; to turn over to the assistant secretary a statement of the amount due each expert reader for his services within one month after the listing of such books; to receive fees for the listing of textbooks and turn same over to the assistant secretary with a complete statement of the sources thereof before the publication of the official list, and to enforce the high school textbook law.

8. To arrange the program of each convention of high school principals.

9. To prepare and publish the high school directory annually.

10. To prepare and publish a manual of suggestions concerning the organization and conduct of high schools, suggested forms for keeping records, suggestions for the organization of libraries, suggested courses of study, the rules and regulations of the State Board of Education applicable to high schools and any other matter tending toward the improvement of the high school organization.

11. To perform such other duties as may be assigned by law or by the superintendent under the direction of the State Board of Education.

VOCATIONAL EDUCATION DIVISION.

Commissioner of Vocational Education in charge.

Duties.

1. To visit and investigate all vocational industrial and technical schools and classes of the state.

2. To direct and supervise the work of all assistants in his department and require reports thereon.

3. To cooperate with the Federal Board of Vocational Education in the administration of the Smith-Hughes law in so far as it relates to California, and of the law for the rehabilitation of persons injured in industry.

4. To cooperate with the State University and the state teachers colleges in organizing courses of teacher-training under the Smith-Hughes law.

5. To advise local boards and school officials in the making of courses of study in the vocational arts.

6. To supervise the organization and conduct of pre-vocational courses in elementary and junior high schools and vocational courses in junior colleges.

7. To cooperate with the Commissoner of Secondary Schools in the supervision of evening high schools.

8. Upon invitation, to cooperate with penal and reformatory institutions in the organization of suitable vocational courses therein.

9. To cooperate with federal and state agencies in the reeducation of maimed soldiers and civilians.

10. To study the problems of vocational opportunities, guidance and placement, and counsel with local boards concerning the organization of work therein.

11. To perform such other duties as may be assigned by law or by the superintendent under the direction of the State Board of Education.

PHYSICAL EDUCATION DIVISION.

Supervisor of Physical Education in charge.

Duties.

1. To supervise all courses of physical education offered in the elementary, high and teachers colleges of the state.

2. To prepare and publish a manual of physical education.

3. To cooperate with local authorities in efforts to control and overcome growth handicaps.

4. To advise school officials and teachers concerning the hygiene of instruction and school sanitation.

5. To cooperate with university and local agencies in the study of mental hygiene.

6. To disseminate proper ideas as to the care, nurture and physical training and instruction of the children of the state.

7. To counsel and cooperate with the universities and teachers colleges in the preparation of teachers of physical education.

8. To devise ways and means of training teachers in the service in the proper aims and methods of physical education.

9. To give an opinion on each application for a special credential to teach physical education.

10. To investigate and make a recommendation upon each application for a health and development certificate, the actual detail work to be done by the secretary of the Commission of Credentials.

11. To direct and supervise the work of all assistants in his department.

12. Upon invitation, to cooperate with penal and reformatory institutions and all other institutions maintained by the state in the organization of suitable courses of physical education therein.

13. To perform such other duties as may be assigned by law or by the superintendent under the direction of the State Board of Education.

DIVISION OF IMMIGRANT EDUCATION.

Assistant Superintendent in charge.

Duties.

1. To visit, investigate and supervise elementary and secondary classes in Americanization and home teachers.

2. To investigate and recommend courses of study for Americanization classes.

3. To investigate and recommend courses of study for the preparation of all students for the duties of citizenship.

4. To cooperate with teacher-training institutions in the preparation of teachers of citizenship and Americanization.

5. To cooperate with the Commission of Immigration and Housing and the Federal Bureau of Naturalization in Americanization work.

DIVISION OF NORMAL AND SPECIAL SCHOOLS.

Deputy Director of Education in charge.

Duties.

1. To receive and investigate all estimates sent in by the various normal and special schools and recommend approval or disapproval by the director.

2. To investigate all claims and recommend approval or disapproval thereof by the director.

3. To assist the director in determining policies such as proposed extensions of the course of study, proposed increase in the number of faculty members, the holding of summer sessions, the conduct of extension classes, etc.

4. To supervise generally the work of all custodians of buildings and grounds and to cooperate with the business managers of the several institutions.

5. To cooperate with the State Engineering Department in the preparation of plans for new buildings and other public works.

6. To assist in working out a scientific classification of teaching positions in the several institutions.

7. To assist in working out a scientific salary schedule which shall take into consideration the class of position, training and experience of the employee and the cost of living.

8. To visit the several institutions from time to time and keep in touch with them.

9. To study the organization in each institution with a view to the promotion of efficiency and economy and to make recommendations thereon from time to time.

REPORTS OF PROGRESS.

FOREIGN LANGUAGE SCHOOLS.

Section 1534 of the Political Code, approved June 3, 1921, placed in the hands of the Superintendent of Public Instruction the responsibility of control of private schools conducted wholly or in part in the language of a foreign nation. The legislature, however, failed to provide means, other than a fee of $2 charged each applicant for a permit to conduct or teach in such a school, for adequate supervision of these schools. In consequence, there has been practically no inspection of the schools.

Examination of applicants has been held from time to time in San Francisco, Los Angeles, Fresno, Stockton and Sacramento. This has been done at the expense of the applicants, however.

The following table gives an idea of the distribution of the applicants:

	Japanese	Chinese	German	Total
Granted	181	77	6	264
Failed	45	4	--	49
Pending	34	15	--	49
Total	260	96	6	362

Both Chinese and Japanese leaders have expressed complete satisfaction with the operation of the law, and have at all times given every evidence of their willingness to cooperate in carrying out its provisions. In the preparation of textbooks to meet the requirements of the law, both the Chinese and Japanese have called this office into consultation and have placed at the services of the deputy in charge of this work every aid needed. Translations of the texts have been submitted for his inspection, and suggestions have been well received and carried out. An entirely new set of texts for use in California is being prepared by the Japanese Educational Association of California. Through the courtesy of Mr. V. S. McClatchy translations have from time to time been made for this office without cost to the state.

An amendment to section 1534 of the Political Code, correcting certain errors in the law as it now stands, will be submitted to the coming legislature. One amendment necessary to the proper carrying out of this law will be an increase in the fee from $2 to $10, the fee now charged for other types of examinations, which will provide greater funds for the inspection of these schools.

REPORT OF ASSISTANT SUPERINTENDENT IN CHARGE OF IMMIGRANT EDUCATION.

At the opening of the school year on September 1, 1921, a brief outline of aims for the year in the field of immigrant education was submitted to the State Superintendent of Public Instruction. A copy of that outline follows here, and as far as possible in reporting on the year's work this outline will be adhered to. I am happy to report that we have not forgotten these aims at any time during the year and that our hopes for improvement over last year in both the quality and quantity of the work have been realized far beyond our modest expectations.

AIM FOR YEAR 1921-22.

A. IMMIGRANT EDUCATION OF ADULT FOREIGN BORN.

I. Teacher training.

1. Working toward ideal: "No teachers of adult immigrants who have not had special training for this work."
2. Short institutes held in every center where schools are conducting classes for adult foreigners on
   (*a*) Methods of teaching English,
   (*b*) Methods of citizenship training,
   (*c*) Methods of preparing applicants for second papers.

These institutes are held under auspices of local school authorities and all teachers are *strongly* urged to attend. For large cities a two weeks' course is held, meeting three days a week for one hour and a half.

II. Expansion of work.

This is going to be difficult in a period of great unemployment, for people are not interested in education when they can not get jobs.

1. Home teachers.
   (*a*) At least seven communities where home teachers have never been employed, or have been employed only on part time, should be urged to start the work. Richmond, Crockett, Santa Barbara, San Diego, Fillmore, Ontario have already been approached.
   (*b*) Increase number of home teachers employed in San Francisco, San Jose, Long Beach, Alameda and other places as opportunity offers.
2. Night school and other adult classes.
   (*a*) Increase number of factory classes.
   (*b*) Adult classes are now being held in twenty-two cities and thirty-four rural communities, with a total of 343 classes, and enrollment of 10,458.

   If unemployment is not serious, ten new rural communities should offer classes; total enrollment for state increase 20 per cent.
   (*c*) Opening of new classes in immigrant neighborhoods, as well as centrally located high school buildings.

B. EDUCATION OF NON-ENGLISH SPEAKING CHILDREN.

I. Teacher training.

1. Continuation of extension work started by San Francisco, San Jose, Chico, Fresno and Santa Barbara State Teachers Colleges, and starting such extension in San Diego, and Southern Branch of University.

II. Demonstration of methods of teaching by taking classes in rural schools and inviting inspection.

C. GENERAL ACTIVITY.

I. Conference on Industrial Americanization with employees of large numbers of foreign-born.
How can schools assist in stabilizing the labor question?

II. Urge city and county superintendents to employ supervisors of Americanization.

III. Gather data to show growth of and development in 1921-22 as compared with 1920-21.

IV. Work out satisfactory course of study for children in migratory schools.

A. IMMIGRANT EDUCATION OF ADULT FOREIGN BORN.

I. Teacher training.

The ideal set in this field is rapidly being realized. In another year, except as an emergency, there will be practically no teachers of adult immigrants who have not taken special preparation and training. Three things have made this possible: (1) greater facilities for obtaining training; (2) more stringent requirements for the secondary credential in citizenship, and (3) recognition of the importance of training by superintendents and others charged with the employment of teachers.

This year, California teachers have had many opportunities to obtain courses in methods of teaching foreign adults, and plans are all made for even greater opportunity next year. Last summer, courses were given at the University, both at Berkeley and Los Angeles, at the University of Southern California and at the Teachers Colleges in San Jose and San Francisco. All of these places are giving courses this summer, but this year the courses are specified exactly. Six units in all are required —two in the technique of modern language teaching, two in racial backgrounds and the last two in any related subject chosen by the student to fit his own needs as a worker in the field. In the past greater leniency in choice of subject has been shown. However, it seems obvious that if a man or woman is seeking a license to teach English to foreign adults he or she should know how to teach English and should also know foreign adults.

The University of California has been particularly generous in bringing Dr. H. R. Miller from Oberlin College to give two courses, one on the immigration question. In addition, the University is maintaining an excellent demonstration school in Oakland in connection with the course on Methods of Teaching. The assistant superintendent in charge of

immigrant education directed the courses at the Southern Branch of the University, in Los Angeles, during the summer of 1922.

San Francisco Teachers College has made a remarkable venture in teacher training by taking over a property in the Italian quarter at which a model school will be developed to set standards in all the work of immigrant education. This school is being used in the summer of 1921-22 to initiate the training school for home and Americanization teachers which will now become a permanent feature of the college curriculum.

San Jose Teachers College has engaged a specialist in recreation in addition to the regular staff for the summer course. In this way the play life, in their native villages, of most of the nationalities in California will be interpreted in terms of possibilities for better recreation in America. Both Chico and Santa Barbara Teachers Colleges are offering courses in Americanization, although not the full group required by those seeking the special secondary credential.

During the past winter the University of Southern California has been maintaining a course which was largely attended by Los Angeles city teachers. For the year 1922-23, the extension division has engaged the services of a teacher who will give methods courses in any part of the state. The places tentatively chosen, cooperating with the State Superintendent of Public Instruction, are Los Angeles, San Diego, Orange County, Long Beach, Ventura, Santa Barbara, Fresno, Kings and Stanislaus counties, San Francisco, Stockton, Oakland, Alameda and San Jose.

The employment of this one person is a step toward the consummation of a larger plan which is still in abeyance. During the winter a committee appointed by President Barrows to outline a program of citizenship training for the university has been meeting with the assistant state superintendent in charge of immigrant education. The appended plan was presented by the assistant superintendent and adopted unanimously by the whole committee: Dr. Van Nostrand, director of the extension division, Dean Hart, of the summer session, and a representative of the American Legion. No action has been taken by the president's office, but the extension division has already made its appointment.

Some Citizenship Needs of the Public Schools.

1. *Teachers* who can deal with non-English speaking children in the primary grades.
2. *Teachers* who can deal with older non-English speaking children who have been educated in their own country, but can not fit into their grade in an American school because of their language handicap.
3. *Teachers* who understand the social forces in America that are making for the assimilation of the immigrant and can make the public evening school take its place as an important element in the general scheme.
4. *Teachers* with executive ability who can organize and supervise the immigrant education program in a school system.
5. *Teachers* with training in civics and an understanding of modern questions—political, social, industrial—who can teach citizenship to adults.

How This Need Can Be Met By the State University.

I. Ultimate, complete program.

1. Division of immigrant education in school of education with
   (*a*) director who can give courses covering the background of the immigration question; anthropology as it deals with migrations of people, history of immigration in the old world and America, immigration and social institutions, industry, etc. Problems of immigration in America. This director should be free for *extension* work and intensive short courses in various parts of the state for at least one-half of his time.
   (*b*) Instructor in pedagogy of immigrant question.
      (1) Methods of teaching English to adults and children.
      (2) Methods of school administration in foreign communities.
      (3) Technique of home teaching.
      (4) Group and community organization.
   (*c*) Instructor in citizenship education.
   (*d*) Demonstration and practice schools in a foreign neighborhood.
2. Southern Branch.
   Special teachers' courses in subjects indicated under (*a*), (*b*), (*c*) above and a demonstration and practice school in a foreign neighborhood.
3. Extension division.
   (*a*) Special intensive courses in all parts of the state under the director of the division in the school of education.
   (*b*) An expert teacher of foreign-born children and adults employed on full time to assist in 3 (*a*) above, and when not engaged in formal courses to supervise and confer with teachers of foreign children and adults.

II. Immediate program.

1. Graduate class in Los Angeles, to study material suitable for use in classes of ungraded foreign children. Findings of this research group to be printed by University or State Board of Education.
2. Employment of full-time instructor for the extension division, as indicated in 3 (*a*) above.

In addition to these formal courses offered during the winter and summer sessions, carrying university credit and preparing for a state board credential, many short institutes have been held all over the state, these being open only to teachers then employed in teaching foreign adults or those especially designated by the local superintendents as substitutes. These institutes were all directed by the assistant superintendent in charge of immigrant education, and the classrooms of the teachers visited before the formal conferences, so that the suggestions made were in every case practical and specific. Such institutes were held in San Diego, Los Angeles, Kings County, Tulare, Fresno, Stock-

ton, Oakland and San Francisco. About 400 teachers attended and marked improvement in classroom methods were noticed.

As so many opportunities are afforded for teachers to receive adequate preparation for their work with foreign adults, the state board felt justified in making requirements more nearly commensurate with the importance of the work. These standards will be rigidly maintained in the future. They are as follows:

Applicants for the special secondary certificate in citizenship must have a bachelor's degree or an elementary certificate, based upon two years of training, or the equivalent, and four years' teaching experience plus at least six units of special work in an accredited course given by a college or university. This special course, which all applicants must take, shall include two units on modern language teaching, two units on the problems of immigration and two units on some allied subject elected by the applicant.

After another year it would be well to raise the standards still further and require two units in a study of American institutions and the responsibilities of citizenship.

As superintendents have had trained teachers on their staff, they have recognized their superiority and the consequent improvement of attendance. Therefore, untrained teachers are no longer acceptable.

Recommendations for Teacher Training.

For the future we feel that in teacher training, if a director could be employed in this department under the state superintendent who would give full time to coordinate the work done by all the teacher-training institutions and the Extension Division of the University, supervise classes and give courses where the extension division can not afford to go, no further pioneering would be necessary and a completely adequate program would be under way.

II. Expansion of Work.

At the beginning of the year it was thought that all expansion might be difficult because of the business depression, which prevents school boards from undertaking new expenditures and makes the worker uninterested in education on account of his daily fear of unemployment. Business, however, proved to be more stable and an exceptional growth in the night schools can be reported. There were increases both in the number of classes and in attendance of from 50 to 150 per cent.

Home Teachers.

1. Many communities where home teachers have never been employed have had them this year or engaged them for next year. Still other districts have employed full-time teachers of adults who have done considerable work with home classes. Cities where home teachers were employed have increased the number of such teachers. These new fields include: Crockett, Santa Barbara, Fillmore, Ontario, Fowler, Tulare, Visalia, Hanford, San Jose, San Francisco, Long Beach and Los Angeles. Last year there were fifty-nine home teachers employed in California. This year there are sixty-eight. Last year there were seventy-five full-time teachers doing adult immigrant education work and this year there are more than one hundred.

2. The increase in classes and attendance has been even more striking. In 1920-21, twenty-two cities were carrying on adult work, with 269 classes and an enrollment of 9108. In 1921-22, there were twenty-eight cities doing the work, with 402 classes and an enrollment of 14,741. Outside the cities, in the union high school districts, there were thirty-five districts in 1920-21, where classes for adult foreigners were offered and there are fifty-two in 1921-22. Last year there were seventy-seven classes in these districts, with a total enrollment of 1360. This year there were 140 classes, with a total enrollment of 3554. Not only have these classes increased in number and in size, but the plan of organization has very decidedly improved. Whereas, last year, it was considered sufficient if the union high school offered classes in the high school building, this year the plan of carrying education to the people that need it has been very generally adopted, and classes now meet in the elementary schools in the high school union where the foreign population warrants it, regardless of the distance from the central building, and the high school pays the bill.

There are many other ways in which numbers alone do not represent the increase and expansion of the adult immigrant classes. During the past year, many changes have come about which tend to raise the standard of the work. The first is the recognition of the importance of supervision. In the past, especially in the union high school districts, classes were started and taught on an hourly basis by teachers who were already carrying a full-time day program. The responsibility for building up the class and creating a closer organization, was left with the superintendent or high school principal, who had too many other duties to give this any particular attention. Now both union high school districts and cities are appointing trained supervisors, who select the teachers and supervise them, and determine where classes are needed and the type of lessons that would be suitable. It is only when the work is undertaken thus as a regular department, that it is vital and permanent.

The second factor which gives permanence to the program is the law passed at the last session of the legislature apportioning state and county money for evening schools. The $2700 which accrues on the first thirty units of average attendance justifies any new district in starting adult classes, because this money will pay for a full-time supervisor for the first year.

The third, and an exceedingly important factor in bringing about a higher type of education, can be stated less concretely than the other two. This is the socialization of the adult work and the added dignity which has been given to it. The night school is ceasing to be a group of classes, academic in character, which bear little relation to the life of the individual attending them. Partly because the plan has been so generally adopted of having the night school in the immigrant community, it has come to serve as the important civic agency in meeting a large part of the needs of the foreign born. In many of the small towns all over California this year, there were night school commencements, which were attended by the foreigners and Americans alike and in every instance played an important part in breaking down the barriers of prejudice between these two groups in the communities.

In many places the night schools have been organized as clubs with much of the responsibility for the direction of the school resting upon the students themselves. In these cases, all the recreation program is taken care of by the student body and many things are undertaken which lead to important community activities.

With increasing socialization, there has been much greater leniency in the choice of meeting places. Under the rural high schools, there are classes for men and women on the ranches. Some of these mothers' classes have made the first American contact which the foreign women have had. In the citrus belt, many of the fruit packers' camps have a club room or other meeting place where trained teachers are organizing clubs and classes for the foreign adults. In the railroad lumber camps and in the camps where construction workers live there are many teachers working for the local school, but conducting their classes in a room or cabin provided by the industry. This makes for such close association between the immigrant and his teacher that the most practical and useful kind of lessons can be provided.

As Los Angeles has led in the past in the completeness of its program, it continues the steady development of all phases of the work with cumulative results. Many interesting stories of their unique ways of organizing and maintaining classes could be told, but they are scarcely suitable for a report of this sort.

Here, as in many other places, much effort is made to use the students' capacity for sharing responsibility and to develop a program of adult education which is sufficiently democratic to help immigrants to fit into the life of a democracy.

B. EDUCATION OF NON-ENGLISH SPEAKING CHILDREN.

The initiation of a state plan for education of non-English speaking children has been one of the most significant accomplishments of the past year. Although we have had foreign children in our schools for many years, little recognition of that fact has been made either by teacher training institutions or school boards and others responsible for curricula. The child who cannot speak English has been a laggard in our schools, always suffering from a handicap which no one helped him to overcome. Although he came with the wealth of the tradition of the whole world, because he was different and strange, the gifts with which he could enrich the life of America have been rejected.

It is therefore with great hopes for the future that we point out the progress made in this line. An important advance has been in the training of teachers. Many teachers' colleges are now giving specific attention to the education of the foreign child. Fresno has a teacher on the faculty this year who has spent a year at Columbia studying this question. San Jose is giving particular attention to the foreign child in the rural school and has taken over a country school, which is largely Portuguese as a regular part of the observation and practice work.

San Diego has a member of its faculty who has had much experience with foreign children, who gave a course this summer on teaching Mexican children. Some instruction of this sort will now be a permanent part of the curriculum.

The splendid development of a training center in the Italian quarter of the San Francisco Teachers College has been mentioned. The work

is beginning with classes of primary kindergarten age. Here it will be possible to develop, not only correct methods of teaching English, but all the enriched curriculum which such an environment calls for. This will be a school which belongs to the community, which interprets America to the community and the community to America. Teachers going out into their own schools from this experience will do much for education in California.

The university in its southern branch has taken a decided step in demanding that every teacher who receives the diploma in the future shall have had at least nine weeks training in methods of teaching foreign children. During the summer session in the southern branch, this year, there was a demonstration class made up of non-English speaking children, and much was gained by the sixty or more teachers from all over the state who watched the progress of that group and joined in the discussion of the methods employed.

In addition to the work of the regular teacher training institutions, the state department has had the assistance of a supervisor in this field for the past year. Since there were no state funds available to finance such assistance, it was necessary to have each county pay for her services during the time she was working in that particular county. From December 1st to May 1st she worked for periods of from one week to two months in Monterey, Merced, Santa Barbara and San Diego counties, visiting in all 105 schools, with a total of 240 visits. In every case this supervisor, Miss Flora Philips, spent considerable time with the teachers and usually took classes for a demonstration lesson. No adequate estimate of the value of this service can be made. Everywhere teachers expressed their gratitude for the assistance given them. This next year, several counties will have full time supervisors who will be available for teachers who do not know how to meet the difficulty which arises when their children cannot understand them. San Bernardino and Fresno counties had such supervision last year. Ventura, Monterey and Santa Barbara have undertaken it for next year.

The attention given to this special subject is but one evidence of the importance it is assuming in educational progress. Cities now are beginning to see the necessity of administrative provision for the foreign child. Whereas, formerly he was put into the first grade work just as the English speaking child, the establishment of the pre-primer class now gives him a term in which to learn the spoken English before he is obliged to read and write it. Both Los Angeles and San Diego have this pre-primer class. Here the foreign child, with an opportunity to compete with his equals, begins his school life in a happy environment, with a chance to develop self confidence and the power of self expression. All over the United States, cities are planning to follow this grading for the elimination of retardation and the intelligent management of their children.

The more significant evidence of statewide progress has been the definite provision made for the non-English speaking child in the state course of study. During the year the Commissioner of Elementary Education has been writing a new course of study for the state beginning with the first three grades. This department was called into consultation and with the aid of Miss Philips, mentioned above

as supervisor, prepared amendments and additions to the course of study to adapt it to the needs of the foreign child. Three important facts were recognized.

First—A child who speaks no English should be given one year and a half to finish the first grade. Hence the establishment of a pre-primer class of one term in which most of the time is spent acquiring the oral English which the child needs.

Second—Recognition should be made of the fact that the foreign child has a home life, traditions and ideals which are different from those of the American child; all that is good and helpful in his inheritance should be developed and intensified. This will give dignity to his attitude toward his parents and make possible a greater contribution to America.

Third—The foreign child should be used to give the American child a better understanding and appreciation of the peoples of the rest of the world, so that through his contacts with the foreign child in the schoolroom, the American of the next generation will be more of a factor in bringing about a better understanding of the nations of the world.

It is a decidedly high water mark in educational progress, when such a point of view can be written into a state course of study.

For the future there should be someone employed jointly by the State Superintendent of Public Instruction and the Commissioner of Elementary Education to interpret this part of the course of study and bring about its adoption by the schools of California in spirit as well as in letter.

C. GENERAL ACTIVITY.

Certain activities have been undertaken by the department, which fall under none of the above heads. During the winter, the Assistant Superintendent in charge of Immigrant Education made a trip throughout the East and attended the national conference on immigrant education which occurred under the auspices of the National Education Association in Chicago.

Many valuable suggestions and much encouragement and stimulation was gained from this trip. It was particularly gratifying to see how the California home teacher plan was being adopted in other states and to know that our work here is considered very highly by Eastern experts. As a result of the contacts on this trip, California was asked to present a paper on this subject at the National Education Association in Boston in July.

Another important event of the year was the illiteracy conference called by the National Education Association, in San Francisco, under the leadership of Mrs. Cora Wilson Stuart.

An excellent program was planned by the State Superintendent of Public Instruction and remarkable stimulation was given to the work of adult immigrant education. Although the purpose of this conference was to emphasize the importance of education of the native-born illiterate, the meetings interpreted this purpose in the broadest possible way so as to include not only foreign-born illiterates but all adults whose education is not adequate to their needs.

An important activity of the department for the year has been the preparation of two pamphlets and the arranging for a third by Miss

Sarah Barrows of the San Francisco Teachers College for use of teachers who have either foreign children or adults. These pamphlets have already been called for in sufficient quantity to exhaust the supply, so that it has not been possible to fill the orders either within or outside the state.

Several projects which were contemplated for the year have not been carried out. One was the conference with employees of foreign labor, to work out closer cooperation between the schools and the industries. This has been deferred until a period of greater industrial stability.

Another important plan, which was not carried out, will probably be done better this year. This is the contemplated conferences in both the north and the south of all those officially concerned with the naturalization and citizenship of aliens. It is hoped in the early fall that meetings may be held of judges, naturalization examiners and citizenship teachers, in order to set the highest possible standards for the demands which should be made and the opportunities given, to those seeking to function as citizens in our American life.

With the law on our statute books requiring county superintendents to send notices of school opportunities to every applicant for first or second papers, it is important that the schools and the federal government work in close cooperation. It has been somewhat difficult to establish the necessary machinery in the county superintendents offices for carrying out this law. It is interesting to note that 4707 people have applied for first papers, 4279 for second and 5464 have received notices telling them where they can attend school and receive instruction which will fit them to become citizens. This law, which reaches every man, no matter where he lives, is a factor in carrying out the important part of the state program, which is the education of the foreign adult in the rural community. We have set for ourselves the ideal here, which no other state has, namely, that wherever a man may live he should have an equal opportunity for an education. Especially in California, where the cultivation of the fields and the carrying on of mighty engineering projects which stagger the imagination, are the real genius of our industrial life, do we insist that those who make us great shall not pay too dear a sacrifice of their personal development in leaving the congested city for the important work of the country.

REPORT OF STATE SUPERVISOR OF ATTENDANCE.

The work of the State Supervisor of School Attendance for the year 1921-22, in accordance with directions from the Superintendent of Public Instruction, has included:

I. The securing of appointments of qualified persons to act as supervisors of attendance in the various counties and cooperation with city and county superintendents of schools in the enforcement of compulsory school attendance.

II. The preparation of all forms for working permits and forms to be used in taking the annual registration of minors.

III. The establishment and maintenance of schools for the children of migratory laborers in rural districts.

IV. An investigation of the school attendance of Indian children in California.

Each project, while somewhat distinct in character, has been directly related to a common objective, namely the enrollment in and regular attendance at a public school of every child between the ages of eight and sixteen years or his exemption therefrom in accordance with law; and for every child exempted a continuance of responsibility and effort that seeks to secure for him educational facilities adjusted to his needs and his capabilities.

I. Appointment of Supervisors of Attendance.

The emphasis of effort was placed upon securing supervisors of attendance for the counties rather than for the cities or separate districts. The year's work has resulted in the appointment of thirty-one such officers, an increase of twenty over previous years. Of the thirty-one appointed, eighteen gave full time to the work with salaries ranging from $1,200 per year and expenses to $3,000 per year and expenses. The average salary paid was $1,913.34 per year and expenses. Only one county paid $1,200; two counties paid $3,000. One county had two full time supervisors. All were certificated for the work upon credentials granted by the State Board of Education.

Distribution by Counties.

ALAMEDA:
County—One, full time.
Cities—Alameda—One, part time.
Berkeley—One, full time.
Oakland—Director of Attendance also Director of Americanization, four assistants.
Districts—Two.

BUTTE:
County—One, part time, combined with office of public health nurse.
Cities—Chico—One, part time.
Oroville—One, part time.

CONTRA COSTA:
City—Richmond—One, full time and one part time assistant.

FRESNO:
County—Two, full time.
City—Fresno—One, full time.
Districts—Two.

GLENN:
County—One, office combined with that of probation, by County Government Act.

HUMBOLDT:
City—Eureka—One, full time.

IMPERIAL:
County—One, full time.

KERN:
County—One, part time, combined with work of supervisor of physical education.
City—Bakersfield—One, full time.
Districts—Three.

KINGS:
County—One, full time.
District—One.

LOS ANGELES:
County—One, full time.
Cities—Alhambra—One, part time.
Glendale—One, full time.
Long Beach—One, full time.
Los Angeles—Director and seventeen full time assistants.
Pasadena—One, full time.
Pomona—One, part time.
Santa Monica—One, part time.
Districts—Eleven.

MADERA:
County—One, full time.

MARIN:
City—San Rafael—One, part time.

MERCED:
County—One, part time.
District—One.

MODOC:
County—One, part time.

MONTEREY:
County—One, full time.
City—Salinas—One part time, combined with work of school nurse.
District—One.

NAPA:
District—One.

NEVADA:
County—One, part time, combined with office of public health nurse.
City—Grass Valley—One, part time.

ORANGE:
County—One, full time.
City—Santa Ana—One, part time.

RIVERSIDE:
City—Riverside—One, part time.
Districts—Two.

SACRAMENTO:
County—One, full time.
City—Sacramento—Director and two assistants, all full time.

SAN BERNANDINO:
County—One, full time.
City—San Bernardino—One, full time.
Districts—Six.

SAN DIEGO:
County—One, full time.
City—San Diego—One, full time.

SAN JOAQUIN:
County—One, part time.
City—Stockton—One, full time.

SAN FRANCISCO:
City and County—One director, two full time assistants, one policeman.

SAN LUIS OBISPO:
County—One, part time, combined with Fish and Game Warden.
City—San Luis Obispo—One, part time.

SAN MATEO:
Districts—Five.

SANTA BARBARA:
County—One, full time.
City—Santa Barbara—One, full time, with one unpaid deputy.
Districts—Two.

SANTA CRUZ:
City—Santa Cruz—One, part time.

SANTA CLARA:
County—One, full time.
Cities—Palo Alto—Not supplied.
San Jose—One, full time.

SHASTA:
County—One, part time, combined with work of rural supervisor.
District—One.

SISKIYOU:
County—One, part time, combined with probation.

SOLANO:
County—One, full time.
City—Vallejo—One, full time.
Districts—Two.

SONOMA:
County—One, full time.
City—Petaluma—One, part time.
District—One.

TEHAMA:
County—One, part time, combined with office of public health nurse.

SUTTER:
County—One, part time.

STANISLAUS:
City—Modesto—One, part time.
Districts—Two.

TULARE:
County—One, full time.
Cities—Tulare—One, part time.
Visalia—One, part time.
Districts—Three.

VENTURA:
County—One, full time.
City—Ventura—One, part time.
Districts—Four.

YUBA:
County—One, part time, combined with work of supervisor of music.

Summary.

County Supervisors of Attendance:	
Full time	18
Part time	13
Total	31
City Supervisors of Attendance:	
Full time	17
Part time	18
Assistant	27
Total	62
District Supervisors of Attendance:	
Total	138

Cooperations with superintendents of schools.

In order to assist in a uniform interpretation of the duties of a supervisor of attendance, particularly in territory outside cities, an outline of the activities to be expected of such an officer was sent to the superintentendents early in October, 1921; this was followed by a form for monthly reports and later, by a bulletin (Superintendent of Public Instruction, Bulletin No. 9) which set forth the responsibilities, under the law, of all persons concerned in the enforcement of compulsory full-time school attendance. Other than this, no attempt was made to impose uniformity of procedure in the details of securing full enrollment and maintaining regularity of attendance. Rather was effort directed toward making clear the underlying principles of the work through actual demonstration of their application to the conditions peculiar to each county. These principles, briefly stated, are:

1. Education for every child is not only a privilege but an obligation under the laws of the state.

2. The privilege of an education is for every type of child, the school system being sufficiently flexible in operation and diversified in curriculum to permit of adaption to the needs and the capabilities of all.

3. The obligation involves the cooperation of every member of a community in the enforcement of the compulsory education laws.

4. The public schools are for all the children. A separate school for any group is admissible only when specialized instruction is necessary to facilitate the assimilation of such group by the community and is never to be established for the purpose of social segregation.

5. The most effective means for combating child labor is enforcement of school attendance.

6. Employment, intelligently selected and continuously directed, may be made a valuable part of a child educational program and should not be confused with child labor which views a child merely as a diminutive man or woman valued solely for immediate daily output.

7. Irregularity of attendance may be as detrimental to the educational development of a child as nonattendance.

8. Truancy is usually the result of a social maladjustment beyond the understanding or control of the truant and should be corrected at the source.

The application of these principles has not been a matter merely of enunciation and discussion but actual demonstrations in adjusting type cases in company with the local officers. Under the law, the State Supervisor of Attendance, even when acting as the duly authorized agent of the Superintendent of Public Instruction has no power of enforcement of school attendance beyond the right to revoke a working permit nor is it recommended that more power be sought. The enforcement of school attendance is a community's business and full responsibility should be centered therein. A representative from the state office is more effective as an interpreter of the law and as a messenger bringing first hand tidings of efforts and results elsewhere than as an officer until whose coming action may be delayed and to whom responsibility may be shifted.

The calling into play of community interest in the enforcement of school attendance is the best work a supervisor of attendance can do. The method employed is one county is this:

Quarterly reports to the county superintendent of schools are made by each school principal. These reports contain the name of each pupil, his age, grade, standing in each subject, total days of absence with each day or fractional day's absence classified by cause. The causes specified are: sickness, weather, work, parental indifference, truancy. The reports are analyzed by the supervisor of attendance and taken by him to the respective districts for discussion with the Social Committee—a committee previously appointed by the Superintendent of Schools. The total number of days of absence are translated into terms of financial loss to the district and the causes scrutinized. If sickness is largely responsible, the health authorities are called in to diagnose the district's case and to prescribe proper remedies. If weather has prevented attendance, transportation and roads are considered. If the children have been kept out to work the child labor law is evoked, or if there is an emergency need, not yet over, for help with a crop, an adjustment of the school day may be temporarily effected. If parental indifference is the trouble, public opinion will speak not only to the parents, but to the justice of the peace before whom a parent may be called. If there is a case which honestly can be classified as truancy, the child in question is dealt with personally. Other counties utilize a similar method, but with the Union High School District as the administrative unit and the committee made up of representatives from each included elementary school and the high school.

The following table was compiled from the annual reports of the superintendents of the counties to the Superintendent of Public Instruction on state enrollment and average daily attendance for the years 1920-21 and 1921-22.

Table Showing Per Cent of Gain or Loss in Enrollment and Average Daily Attendance in the Elementary Schools in 1921-22 over 1920-21, by Counties.

Counties	Enrollment		Average daily attendance		Rate of average daily attendance	
	Gain	Loss	Gain	Loss	1920-21	1921-22
Alameda	2.0		4.6		81.4	83.5
Alpine				7.0	77.7	72.2
Amador		1.0	2.0		87.1	90.2
Butte	1.3		3.3		83.2	86.0
Calaveras		3.5		2.4	88.0	88.8
Colusa	1.6		3.1		86.4	87.7
Contra Costa		6.8	1.5		86.6	93.9
Del Norte	0.7		7.4		75.5	80.5
El Dorado		8.7		1.3	82.3	88.3
Fresno	3.2		5.8		83.7	85.8
Glenn		6.3	1.6		85.8	92.7
Humboldt	2.9		3.9		84.9	85.7
Imperial		12.1		5.1	71.8	75.8
Inyo		0.1	2.8		83.1	85.7
Kern	7.7		7.7		84.1	84.1
Kings	4.0		6.3		83.0	84.9
Lake	0.3			3.0	88.3	85.5
Lassen	8.8		8.6		81.6	81.4
Los Angeles	9.5		12.1		72.1	73.8
Madera	2.4		4.5		82.6	84.3
Marin	5.4		9.2		80.1	83.0
Mariposa		0.6	2.3		75.6	77.9
Mendocino	1.1		3.9		83.9	86.2
Merced	9.4		11.3		85.8	87.3
Modoc	6.0			0.2	83.2	78.3
Mono	16.2		15.0		77.9	77.0
Monterey		3.8	0.3		82.8	86.2
Napa	0.8			0.3	86.8	85.8
Nevada		1.5			85.1	86.4
Orange	13.9		12.5		82.1	81.2
Placer	13.4		9.0		88.4	84.9
Plumas		7.8			71.3	76.8
Riverside	3.8		6.7		78.7	80.9
Sacramento	5.1		7.5		79.3	81.1
San Benito	5.0		4.3		85.0	84.4
San Bernardino	9.8		10.9		79.5	80.3
San Diego	3.8		6.7		78.5	80.7
San Francisco	1.2		2.4		77.2	78.1
San Joaquin	4.3		4.9		84.2	84.8
San Luis Obispo	1.9		4.4		84.4	86.5
San Mateo	4.0		4.9		85.6	86.3
Santa Barbara	4.9		5.6		79.7	80.3
Santa Clara	2.4		5.0		83.4	85.6
Santa Cruz	2.6		4.8		86.4	88.3
Shasta	0.1		3.7		80.0	82.9
Sierra	17.2		16.4		82.4	78.7
Siskiyou		1.9	3.1		81.0	85.2
Solano	4.4		5.5		83.7	84.5
Sonoma	5.8		5.2		85.8	85.3
Stanislaus	3.4		3.6		86.2	86.3
Sutter	4.9		8.5		85.7	88.6
Tehama	2.6		0.2		87.7	85.6
Trinity	12.2		11.4		79.4	78.8
Tulare	6.4		8.5		84.7	86.3
Tuolumne	10.9		10.0		87.6	86.9
Ventura	4.9		10.4		76.9	80.9
Yolo	2.6		4.0		87.6	88.8
Yuba	2.6		3.4		87.0	87.6
Totals	5.0		6.9		78.9	80.4

Table Showing Per Cent of Gain or Loss in Enrollment and Average Daily Attendance in the Elementary Schools in 1921-22 over 1920-21, by Cities.

Cities	Enrollment		Average daily attendance		Rate of average daily attendance	
	Gain	Loss	Gain	Loss	1920-21	1921-22
Alameda	0.6		1.4		84.7	85.9
Alhambra	11.4		7.0		85.9	81.1
Bakersfield	4.3		7.1		80.9	83.0
Berkeley	3.2		3.2		77.2	77.2
Chico		0.7			82.3	82.9
Eureka	3.4		6.4		86.5	88.8
Fresno		0.4	5.0		81.2	83.5
Glendale	25.2		24.4		84.9	84.8
Grass Valley	0.8		1.3		85.8	86.2
Long Beach	7.7		8.2		77.7	78.1
Los Angeles	9.3		13.2		67.0	69.4
Modesto	2.0		3.1		84.4	87.3
Oakland	0.6		2.1		81.8	83.1
Oroville	3.9		9.8		83.3	88.1
Palo Alto	1.3		4.0		83.0	85.2
Pasadena	6.8		7.6		79.6	80.2
Petaluma	22.4		2.7		87.8	74.3
Pomona	5.3		6.1		79.8	80.5
Richmond		0.9		0.9	84.0	84.0
Riverside	9.8		11.7		84.5	85.8
Sacramento	4.2		4.8		77.5	77.9
Salinas		17.9		3.8	82.0	93.2
San Bernardino	8.6		1.2		79.2	82.1
San Diego	0.5		5.1		76.8	80.4
San Jose	3.9		6.0		80.8	82.6
San Luis Obispo	3.2		4.9		84.1	85.5
San Rafael	6.9		7.4		74.7	85.1
Santa Ana	14.2		10.9		82.8	80.7
Santa Barbara	9.8		10.7		79.9	80.6
Santa Cruz	0.1		0.3		85.2	88.3
Santa Monica	6.6		5.9		75.0	74.6
Santa Rosa		5.3		2.1	80.3	82.8
Stockton	4.0		5.1		84.6	85.5
Tulare		0.6	3.5		85.3	88.9
Vallejo	4.6		2.4		81.2	79.4
Ventura	11.1		10.5		84.7	83.7
Visalia	8.3		11.1		82.5	84.6

The figures pertain to the elementary schools only. They were selected because the elementary school group corresponds more closely to the compulsory full-time attendance group than any other, and because the figures for the last two years on elementary school data are comparable. It should be borne in mind, however, in using this table as the basis of an estimate of the attendance work that the group includes children between six and eight years of age over whom no compulsion may be exercised and that it omits children under sixteen years of age who are attending high schools.

The table is chiefly valuable as indicating the progress in each city and in each county as a whole.

The best endorsement of the work being done by the supervisors of attendance lies in the fact that every county and district (with whom appointments are optional) having had the services of such an officer during the past year is continuing with the work for the coming year and one county (San Bernardino) has already perfected plans providing for two supervisors instead of one.

No direct amendment of "an act to enforce the Educational Rights of Children" is sought at this time. Desired amendments of related statutes will be noted in connection with the reports of the registration of minors and the education of Indian children. In addition it is recommended that the Teacher's Retirement Salary Act be amended to continue its burdens and benefits to persons transferring from teaching service to the attendance service. This recommendation is based upon two considerations: (1) the value of teaching experience in the training of a supervisor of attendance, and (2) the danger of relegating to the attendance service individuals eligible to the retirement salary.

II. Forms for the Working Permits and the Registration of Minors.

Working permits.

In view of the changes made in the compulsory education law in 1921, it was necessary to issue a complete new set of working permit forms. The new forms are an improvement over the old in that they are simple and because there is included a certificate of age and a prescribed health certificate.

This certificate of age had been found necessary to provide against false statements of age and to serve as protection for both child and employer.

The business of issuing working permits needs to be given more attention. When this responsibility was placed with the school authorities by the legislature of 1919, it was with the hope that the school through its greater number of officers and its more intimate knowledge of the individual child was in a better position to perform intelligently the details of the service than was the Bureau of Labor.

Results have justified the change to a considerable extent. Fewer children are exempted from school attendance in order to work but a greater knowledge of industrial conditions is needed by those invested with authority to issue working permits. An industrial survey of the work open to children between the ages of fourteen and sixteen years is needed without delay in Los Angeles, San Francisco, Oakland, Fresno, Sacramento and Stockton. Provision for the follow-up of the minors securing permits is also essential, particularly in reference to their condition of health.

Although a child under sixteen years is not allowed to enter industry without being physically fit, his age, the prolonged hours of effort within doors, and reduced periods of recreation together with the probability of poor home conditions lessen his chances of continued healthful development and present a plea for the continuation of health supervision over him. The fact that the employed child under sixteen years of age is now required to attend part-time classes opens the possibility of health supervision through this avenue.

The number of working permits issued between July 1, 1921, and June 30, 1922, is listed below by counties. A report of this number has been furnished, in accordance with law, to the Commissioner of the Bureau of Labor Statistics.

Working Permits Issued by Counties.

Alameda	142	Marin	0	San Luis Obispo	221
Alpine	0	Mariposa	3	San Mateo	4
Amador	0	Mendocino	42	Santa Barbara	30
Butte	122	Merced	0	Santa Clara	10
Calaveras	2	Modoc	0	Santa Cruz	16
Colusa	0	Mono	0	Shasta	4
Contra Costa	31	Monterey	0	Sierra	0
Del Norte	0	Napa	4	Siskiyou	3
El Dorado	4	Nevada	5	Solano	49
Fresno	137	Orange	2	Sonoma	4
Glenn	4	Placer	0	Stanislaus	6
Humboldt	7	Plumas	0	Sutter	0
Imperial	1	Riverside	5	Tehama	0
Inyo	6	Sacramento	151	Trinity	1
Kern	4	San Benito	0	Tulare	3
Kings	155	San Bernardino	11	Tuolumne	2
Lake	34	San Diego	4	Ventura	4
Lassen	0	San Francisco	448	Yolo	4
Los Angeles	795	San Joaquin	17	Yuba	0
Madera	0				
Total					2497

The Bureau of Labor has reported to the Superintendent of Public Instruction violations of child labor law as indicated below:

Employment without permit	27
Employment during prohibited hours	6
Employment in prohibited occupation	2
Employment in excess of 8 hours per day	7
Employment under minimum age	4
Total	46

The United States Immigration Service reports to the Superintendent of Public Instruction the names of all children under sixteen years of age entering by the various ports of the United States and manifested to California. The names of these children have in turn been reported to the school authorities of the places of their prospective residences. The following lists the number of such cases, segregated by nationalities:

Scotch	42
Italian	99
Irish	20
French	12
English	91
Hebrew	51
Magyar	1
Scandinavian	18
Dutch	17
Finnish	6
German	21
Dalmatian	16
Armenian	11

Welsh	5
Greek	5
Croatian	20
Russian	1
Spanish	16
Slovak	1
Swiss	4
Slovanian	2
Liberian	4
Syrian	8
Mexican	377
Japanese	3
South American	5
African Black	1
West Indian	1
Total	858

Registration of minors.

In the fall of 1921 the first registration of minors was taken in accordance with the amendment of Section 1662 of the Political Code effected in the 1921 Legislature. It was an unpopular measure with school superintendents, principals and teachers which was not offset by any enthusiasm on the part of parents who, under the law, are required to register their children each year. The work has been done, generally speaking, in a half-hearted way which is evident in the results, these being, in general, so far short of comprehensiveness as to be practically valueless from a statistical standpoint.

However, unpopular and poorly done as it was, and expensive as it was, in some unaccountable way the idea of an annual census of school children has gained in favor during the year. It is possible that the publication of the returns from the Federal census of 1920, available subsequent to the California registration of minors, showing that California ranked ninth in percentage of school attendance has awakened interest in the subject and disturbed a certain complacency. Without doubt, the conference on illiteracy held in San Francisco in February, 1921, under the leadership of Mrs. Cora Wilson Stewart, revealed the need of information on the numerical relation between California school enrollment and California school age population. At any rate, there now appears a willingness on the part of officials and a demand on part of supervisors of attendance to continue the effort but with certain conditions changed. The chief defects in the present law may be listed as follows:

1. Lack of penalty for failure to comply imposed upon any person responsible, whether parent, teacher or attendance officer.

2. Lack of provision for remuneration for teachers or other persons required to work extra hours in securing registrations in the homes.

3. An annual repetition of data appears an unnecessary burden both in effort and expense.

4. The lack of definite requirement in the utilization of the findings from registration.

It is recommended, therefore, that the registration law be amended to provide:

First.—That a penalty be imposed for failure to comply with the provision of the law.

Second.—That the supervisor of attendance be made the official registrar of minors of the territory under his jurisdiction and that the necessary temporary assistant registrars be appointed by the trustees of each district, such assistants to be approved by the City or County Superintendent of Schools and paid for their services from the funds of the districts.

Third.—That the registration of minors be taken only in the odd-numbered years.

Section 2.

KINDERGARTEN SCHOOLS.

Table No. 1. Showing Counties Maintaining Kindergartens, Teachers Employed, Pupils Enrolled, Average Daily Attendance, Average Number of Days Schools Were Maintained.

Table No. 2. Average Annual Salary Paid Supervisors, Principals and Teachers.

Table No. 3. Number of Visits Made by County Superintendents of Schools, by School Trustees, and Number of Volumes in School Libraries.

Table No. 4. Receipts from All Sources, and Expenditures for All Purposes; valuation of All Kindergarten Property, Average Cost per Pupil for Maintenance.

TABLE No. 1.

Statistics of Kindergarten Schools, Showing Number of Teachers, Enrollment, Average Attendance, and Average Number of Days School Was Maintained, by Counties.

Counties	Total number of teachers employed (all women)		Total enrollment				Average daily attendance		Average number of days schools were maintained	
			1920-1921		1921-22					
	1920-21	1921-22	Boys	Girls	Boys	Girls	1920-21	1921-22	1920-21	1921-22
Alameda	82	77	2,688	2,707	2,661	2,668	2,552	2,554	185	187
Alpine										
Amador										
Butte	2	2	21	36	28	43	34	38	170	169
Calaveras										
Colusa	1	1	21	18	32	28	19	35	168	162
Contra Costa	11	11	361	380	315	352	346	331	185	184
Del Norte										
El Dorado	1	1	7	11	11	8	14	10	170	172
Fresno	16	20	528	535	648	698	474	668	172	175
Glenn										
Humboldt	4	5	102	113	88	107	98	91	188	169
Imperial	8	8	184	201	174	183	200	176	167	170
Inyo	1	1	19	18	8	15	18	18	163	165
Kern	21	23	414	462	487	500	437	503	161	155
Kings	4	5	88	73	88	89	102	98	128	165
Lake										
Lassen	2	2	46	46	46	56	54	63	169	174
Los Angeles	399	408	7,428	7,532	8,337	8,491	8,446	9,508	175	172
Madera	2	2	60	58	53	48	66	54	158	172
Marin	6	6	130	173	114	152	132	134	182	180
Mariposa										
Mendocino										
Merced	3	3	70	90	81	76	91	106	166	164
Modoc	1	1	17	12	8	14	15	10	131	113
Mono										
Monterey										
Napa	1	1	16	19	15	15	19	18	175	172
Nevada										
Orange	27	30	483	471	588	595	538	649	164	170
Placer										
Plumas										
Riverside	12	12	221	250	259	249	275	287	173	171
Sacramento	21	22	595	597	565	577	560	498	179	178
San Benito										
San Bernardino	15	18	370	374	482	470	399	552	166	168
San Diego	41	43	860	875	917	972	836	933	182	184
San Francisco	35	40	1,283	1,224	1,365	1,285	1,040	1,157	191	194
San Joaquin	3	5	144	167	213	246	126	185	175	166
San Luis Obispo	2	2	34	71	61	57	60	65	178	180
San Mateo	9	11	260	275	279	257	277	271	185	183
Santa Barbara	11	13	271	277	314	304	260	294	188	188
Santa Clara	13	15	457	442	474	451	367	425	181	172
Santa Cruz	3	3	230	268	89	81	73	88	187	182
Shasta	1	1	12	16	19	25	17	18	145	155
Sierra										
Siskiyou	2	2	37	40	45	54	37	43	166	155
Solano	6	7	125	122	166	143	136	154	178	176
Sonoma	3	3	80	82	83	97	70	84	178	176
Stanislaus	3	5	109	114	93	114	98	98	172	182
Sutter		2			37	40		47		157
Tehama	2	2	30	27	37	33	28	38	166	166
Trinity										
Tulare	8	10	184	209	236	242	176	252	161	163
Tuolumne	1	1	16	15	19	20	14	20	178	178
Ventura	4	5	125	135	117	134	126	135	185	183
Yolo	2	2	47	45	44	51	44	43	179	177
Yuba	1	1	28	15	18	21	26	28	176	173
Totals	790	832	18,201	18,595	19,714	20,061	18,700	20,779	*176	*175

*Average.

TABLE No. 2.

Statistics of Kindergarten Schools, Showing Average Annual Salary Paid Supervisors, Principals and Teachers (all women).

Counties	Average annual salary paid			
	1920-21		1921-22	
	Number	Salary	Number	Salary
SUPERVISORS.				
Alameda	1	$1,760 00	1	$1,490 00
Kern	1	2,030 00		
Los Angeles			2	3,075 00
Sacramento	1	2,820 00	1	2,820 00
Santa Barbara	1	1,750 00	1	1,750 00
Santa Clara	1	1,894 34	1	2,197 00
Totals	5	*2,050 86	6	*2,401 00
PRINCIPALS.				
Alameda	16	1,876 68	5	1,798 00
Fresno	5	1,380 00		
Humboldt	4	1,225 00		
Los Angeles	269	1,399 12	299	1,579 00
Modoc			1	880 00
Orange	7	1,157 14		
Riverside	2	1,325 00	3	1,367 00
San Diego	27	1,408 70	24	1,440 00
Santa Barbara	2	1,325 00	5	1,400 00
Santa Clara	6	1,849 33	6	1,816 00
Ventura			1	1,500 00
Totals	338	*1,422 24	344	*1,546 00
TEACHERS.				
Alameda	66	1,692 92	77	1,778 00
Butte	2	1,195 00	2	1,242 25
Colusa	1	1,200 00	1	1,400 00
Contra Costa	11	1,573 67	11	1,577 27
El Dorado	1	900 00	1	1,200 00
Fresno	11	1,034 82	20	1,539 10
Humboldt			5	1,188 00
Imperial	8	1,587 50	8	1,568 75
Inyo	1	990 00	1	1,170 00
Kern	20	1,391 06	23	1,361 82
Kings	4	1,187 50	5	1,249 00
Lassen	2	1,170 00	2	1,291 50
Los Angeles	130	1,104 49	107	1,123 96
Madera	2	1,425 00	2	1,525 00
Marin	6	1,510 00	6	1,471 00
Merced	3	1,340 00	3	1,373 00
Modoc	1	875 00		
Napa	1	1,140 00	1	1,500 00
Orange	20	1,274 74	30	1,259 83
Riverside	10	1,217 00	9	1,288 88
Sacramento	20	1,509 00	21	1,482 80
San Bernardino	15	1,305 00	18	1,370 00
San Diego	14	1,197 42	19	1,210 00
San Francisco	35	1,600 00	40	1,642 50
San Joaquin	3	1,720 00	5	1,568 00
San Luis Obispo	2	1,325 00	2	1,450 00
San Mateo	9	1,163 33	11	1,213 63
Santa Barbara	8	1,293 75	7	1,207 14
Santa Clara	6	1,438 33	8	1,395 00
Santa Cruz	3	1,366 33	3	1,486 33
Shasta	1	1,000 00	1	1,350 00
Siskiyou	2	1,050 00	2	1,050 00
Solano	6	1,338 33	7	1,454 29
Sonoma	3	1,403 75	3	1,500 00
Stanislaus	3	1,320 00	5	1,372 00
Sutter			2	1,267 50
Tehama	2	1,050 00	2	1,058 22
Tulare	8	1,194 71	10	1,307 00
Tuolumne	1	1,000 00	1	1,220 00
Ventura	4	1,271 25	4	1,335 00
Yolo	2	1,320 00	2	1,320 00
Yuba	1	1,200 00	1	1,020 00
Totals	448	*1,333 66	488	*1,399 00

*Average.

TABLE No. 3.

Statistics of Kindergarten Schools, Showing Number of Visits to Schools by School Officers, and Number of Volumes in School Libaries.

Counties	Number of visits made by county superintendent of schools		Number of visits made by school trustees		Number of volumes in school libraries	
	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22
Alameda	34	16	78	65	770	797
Alpine						
Amador						
Butte	2	2	1	7	6	5
Calaveras						
Colusa	2	3	2	1	8	0
Contra Costa	7	6	16	10		36
Del Norte						
El Dorado	1	1		1	19	23
Fresno	19	26	14	11	64	116
Glenn						
Humboldt	3	4	19	13	0	0
Imperial	7	3	10	5	48	26
Inyo	2	1		2		0
Kern	11	7	43	39	209	207
Kings	4	6	10	14		
Lake						
Lassen	2	4	3	2	4	5
Los Angeles	336	408	173	113	1,129	1,677
Madera	1	3	1	2		
Marin	7	6	8	3	355	20
Mariposa						
Mendocino						
Merced	3	3	3	13		
Modoc	2	2	2	3	5	8
Mono						
Monterey						
Napa	1	3	1		5	5
Nevada						
Orange	21	17	20	32	172	281
Placer						
Plumas						
Riverside	4	2	18	10	21	28
Sacramento		32		11	357	318
San Benito						
San Bernardino	13	11	16	37	175	1,509
San Diego	5	77	15	16	458	420
San Francisco	93	97	23	43	72	115
San Joaquin		2		7	51	58
San Luis Obispo	1	2		4	12	11
San Mateo	11	13	11	20	119	135
Santa Barbara	4	5	4	3	253	261
Santa Clara	15	18	16	21	55	228
Santa Cruz	4	4	4	1		
Shasta	1	2	2	1		
Sierra						
Siskiyou	2	2	7	4	5	65
Solano	8	8	17	22	41	
Sonoma	3	3	3	3		
Stanislaus	2	4	2	7	6	15
Sutter		4		4		
Tehama	2		2	1	5	17
Trinity						
Tulare	8	10	10	5	12	63
Tuolumne	2	2	1			20
Ventura	3	3	5	4	63	73
Yolo	4	2	1	1	47	59
Yuba	2	1	3		24	24
Totals	652	825	564	561	4,570	6,625

TABLE No. 4.

Statistics of Kindergarten Schools, Showing Receipts and Expenditures, Valuation of All Property, and Cost per Pupil per Annum for Education of Kindergarten Children, Not Including Cost of Buildings, by Counties.

Counties	Receipts from all sources, including balance on hand		Total expenditures		Valuation of all Kindergarten property		Average cost per pupil for maintenance, not including cost of buildings	
	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22
Alameda	$218,260 38	$221,199 00	$207,478 27	$209,732 10	$67,444 00	$70,253 00	$79 05	$79 25
Alpine								
Amador								
Butte	3,715 56	3,161 82	2,735 51	2,698 36	210 00	288 00	80 45	69 42
Calaveras								
Colusa	1,709 82	1,512 33	1,384 04	1,533 31	320 00	325 00	70 77	43 80
Contra Costa	35,936 82	36,645 13	20,361 25	20,088 00			58 84	60 68
Del Norte								
El Dorado	935 68	1,457 66	905 25	1,442 14	400 00	500 00	64 66	144 21
Fresno	59,132 28	89,664 69	28,873 78	59,482 86	11,889 00	12,035 00	55 64	83 06
Glenn								
Humboldt	13,978 01	15,325 40	10,991 06	11,719 16		620 00	112 15	128 78
Imperial	34,818 88	25,395 44	25,507 91	21,139 47	2,844 00	2,844 00	125 09	120 11
Inyo	1,579 72	2,204 91	1,527 72	1,958 07	300 00	3,900 00	64 81	98 50
Kern	72,889 27	112,113 16	49,162 93	78,337 26	25,525 00	73,000 00	89 86	74 29
Kings	11,879 45	18,187 53	5,973 72	11,622 12	1,257 00	5,380 00	55 19	86 58
Lake								
Lassen	5,158 73	3,849 67	3,274 48	2,993 83	2,000 00	2,000 00	60 63	47 52
Los Angeles	848,819 16	1,000,566 64	748,634 92	878,523 19	22,794 00	21,050 00	88 33	91 93
Madera	4,352 71	4,415 30	3,599 41	3,876 28	2,900 00	2,900 00	54 54	70 45
Marin	15,807 52	17,295 02	13,027 83	12,814 75	3,215 00	1,550 00	92 80	90 20
Mariposa								
Mendocino								
Merced	8,564 48	7,917 20	8,508 47	6,187 89	4,600 00	4,600 00	64 25	57 61
Modoc	916 33	885 95	890 05	885 95	408 00	410 00	59 34	88 60
Mono								
Monterey								
Napa	1,896 62	3,457 70	1,306 26	2,667 04		110 00	66 80	93 90
Nevada								
Orange	50,683 85	80,133 70	41,699 90	33,352 98	19,730 00	107,700 00	73 70	49 16
Placer								
Plumas								

Riverside	25,249 38	31,131 63	15,214 44	23,292 07	14,985 00	14,985 00	55 32	81 16
Sacramento	48,166 47	48,465 51	46,534 55	43,998 77	26,912 00	6,660 00	80 03	84 96
San Benito								
San Bernardino	53,078 90	67,445 43	31,075 51	40,418 51	5,664 00	13,815 00	77 88	69 17
San Diego	101,795 14	106,577 63	86,801 15	98,728 67	26,600 00	26,775 00	103 64	105 68
San Francisco	56,795 52	66,941 73	56,795 52	66,941 73	72 00	9,660 00	54 61	57 51
San Joaquin	7,332 75	10,231 62	5,395 96	9,091 47	430 00	1,240 00	42 83	49 14
San Luis Obispo	5,053 50	4,888 81	3,815 08	3,979 16	5,655 00	5,659 00	63 58	60 30
San Mateo	18,989 20	26,036 63	14,189 83	18,866 39	7,890 00	10,780 00	51 22	67 69
Santa Barbara	25,171 29	27,799 32	19,919 47	22,744 45	14,754 00	37,954 00	75 01	76 84
Santa Clara	38,245 75	42,959 72	30,457 97	34,138 28	17,122 00	17,497 00	80 82	77 33
Santa Cruz	5,975 12	6,535 40	5,077 87	5,274 18			69 56	59 93
Shasta	2,078 92	2,745 87	1,523 05	1,691 09	168 00	170 00	82 23	93 95
Sierra								
Siskiyou	3,089 83	2,689 77	2,459 24	2,543 78		950 00	62 21	58 96
Solano	15,619 66	18,825 34	11,448 45	13,966 01	4,075 00	4,850 00	82 45	87 71
Sonoma	8,153 53	12,732 90	4,568 42	4,789 28			65 26	55 11
Stanislaus	11,325 02	12,318 10	8,065 63	7,274 68	1,330 00	1,330 00	74 32	73 00
Sutter		2,767 94		2,531 26		620 00		50 61
Tehama	3,123 07	3,029 95	2,046 95	2,522 18			72 75	66 37
Trinity								
Tulare	22,692 39	30,785 50	18,706 93	23,855 19	3,511 00	4,460 00	101 13	90 26
Tuolumne	1,520 87	1,437 98	1,028 26	1,283 62		470 00	73 44	64 18
Ventura	10,414 38	13,925 16	6,622 40	8,841 84	5,250 00	5,250 00	45 88	63 28
Yolo	3,938 63	4,280 28	2,827 75	2,925 18	830 00	850 00	63 94	68 00
Yuba	6,700 77	1,711 37	6,247 73	1,547 70	527 00	527 00	60 79	55 27
Totals	$1,865,545 36	$2,191,651 84	$1,556,664 92	$1,802,299 25	$301,521 00	$473,967 00	*$81 27	*$83 26

*Average.

Section 3.

ELEMENTARY SCHOOLS.

Table No. 5. Showing Number of Districts, Number of Teachers Allowed District on Average Daily Attendance and Number of Teachers Employed.

Table No. 6. Grade of Certificates Held by Teachers Employed.

Table No. 7. Number of District Superintendents and Average Salary; Number of Principals and Average Salary; Number of Regular Teachers and Average Salary; Number of Supervisors and Average Salary; Number of Special Teachers and Average Salary.

Table No. 8. Total Number of Pupils Enrolled in Regular Elementary Schools, Boys and Girls; Total Number of Pupils Enrolled in Post Graduate Elementary Schools, Boys and Girls; Total Number of Pupils Enrolled in all Grades in Regular Elementary Schools and in Post Graduate Schools.

Table No. 9. Number of Graduates, Boys and Girls, from Elementary Schools and Post Graduate Elementary Schools; Average Daily Attendance in all Elementary Schools by Counties.

Table No. 10. Average Number of Days Each County's Schools Were Actually Open, Number of Visits Made by County Superintendents of Schools and School Trustees, Number of Books in School Libraries.

Table No. 11. Showing Amount Apportioned per School Year by the State to each County.

Table No. 12. Showing Receipts by Counties from all Sources of the Elementary Schools.

Table No. 13. Showing Expenditures by Counties for All Purposes for the Elementary Schools; Valuation of Property, Sites and Buildings, Libraries and Apparatus; Total Bonded Indebtedness for Elementary School Purposes.

Table No. 14. Rate per Pupil Apportioned by the County Superintendent of Schools on Average Daily Attendance; Average Cost per Pupil on Average Daily Attendance.

TABLE No. 5.

Statistics of Elementary Schools, Showing Number of Districts.

Counties	Number of school districts at close of year.							
	1920 21				1921 22			
	Regular active	Joint	Active union	Suspended	Regular active	Joint	Active union	Suspended
Alameda	43	1			43	1		
Alpine	3				3			
Amador	37	2	1	3	36	2	3	3
Butte	66			2	63		1	1
Calaveras	43	2		5	41	3		6
Colusa	29	1		2	28	1	2	3
Contra Costa	53		2		53		3	
Del Norte	15		1		15			1
El Dorado	52	2		4	48	2		6
Fresno	154	10	6	5	154	11	7	5
Glenn	44	2	1	1	41	2	3	4
Humboldt	107			7	107			7
Imperial	53		4		44		4	
Inyo	27				28		1	
Kern	109		3	2	107		5	2
Kings	35	1	2		38	1	2	1
Lake	30		3	3	31	1	3	3
Lassen	42			1	42			2
Los Angeles	148	1		4	146	1		4
Madera	45	1	2	4	49	1	3	2
Marin	44	3		2	44	3		1
Mariposa	29	2		2	27	2	4	
Mendocino	117		3	12	114		3	6
Merced	69	6	4		70	7	4	1
Modoc	43			2	43			
Mono	10		1	3	11		1	2
Monterey	92	3	8	4	93	3	9	4
Napa	51	3	3		51	3	3	
Nevada	38			6	38			2
Orange	49		2		49		2	
Placer	52	2	3	2	53	3	3	2
Plumas	30			1	31			5
Riverside	70	1	5	3	69	1	5	3
Sacramento	78	2	5	1	78	2	6	4
San Benito	36		2	4	36		3	4
San Bernardino	71	1	3	4	70	2	3	2
San Diego	110	1	7	8	111	1	12	5
San Francisco	1				1			
San Joaquin	88	1	2	3	86	1	2	5
San Luis Obispo	88		2		85		2	
San Mateo	35			1	35			1
Santa Barbara	68		2		66	1	2	1
Santa Clara	82	4	3		79	4	3	1
Santa Cruz	54		2		54		3	
Shasta	101			8	98			6
Sierra	13			3	15			2
Siskiyou	85		5	2	92		6	4
Solano	50	2		2	50	2	1	1
Sonoma	147	1	2	5	144	1	3	8
Stanislaus	59	3	2	1	59	3	2	1
Sutter	33		2	1	33		3	2
Tehama	56		1	3	52	3	1	
Trinity	22		1	8	26		1	
Tulare	129	4	2	3	127	3	2	3
Tuolumne	30				31			1
Ventura	54	2	2	1	55	2	2	
Yolo	44	3		2	45	3		2
Yuba	38		2	1	38		3	1
Totals	3,401	67	101	141	3,376	76	131	130

TABLE No. 5—Continued.

Statistics of Elementary Schools, Showing Number of Teachers Allowed and Employed.

Counties	Number of teachers allowed on attendance		Total number of teachers actually employed in each county			
			1920-21		1921-22	
	1920-21	1921-22	Men	Women	Men	Women
Alameda	1,276.79	1,380.36	160	1,347	155	1,401
Alpine	3	3		3		3
Amador	49.39	55.16	5	47	5	49
Butte	156	171	13	161	17	170
Calaveras	50.50	53.03	6	46	6	45
Colusa	52.67	56.72	7	52	7	52
Contra Costa	263.21	290.64	21	279	24	290
Del Norte	19	21	3	17	4	17
El Dorado	58.68	60.59	2	60	3	58
Fresno	738.05	779.43	59	662	54	734
Glenn	70.60	78.90	4	89	5	79
Humboldt	202	228	15	201	17	214
Imperial	184	191	21	236	21	202
Inyo	42	47	3	41	4	41
Kern	323	365	19	343	22	377
Kings	122.77	148	11	118	13	129
Lake	38.37	39.34	6	32	7	33
Lassen	59	65	7	56	11	59
Los Angeles	3,561.05	4,116.09	304	3,952	379	4,430
Madera	89.07	102.11	5	91	7	96
Marin	111.63	132.54	6	116	10	132
Mariposa	29.15	28.96	4	26	3	25
Mendocino	163	177	12	146	12	154
Merced	152.17	181.24	9	142	9	155
Modoc	49	56	7	46	6	48
Mono	9	11	1	9	2	9
Monterey	161.50	170.50	8	154	12	157
Napa	89.75	102	5	85	6	89
Nevada	64	67	6	62	6	62
Orange	302.20	364.04	32	328	32	383
Placer	106.67	118.36	8	90	8	99
Plumas	35	37		38		39
Riverside	235.90	274.95	13	258	18	264
Sacramento	366.36	413.11	21	425	25	451
San Benito	53.34	61.55	4	53	3	55
San Bernardino	338.19	395.22	18	361	25	404
San Diego	449	497.83	34	469	37	512
San Francisco	1,371	1,427	46	1,495	40	1,543
San Joaquin	359.61	410.51	42	336	49	367
San Luis Obispo	143	157	15	143	10	151
San Mateo	181	200	13	181	15	187
Santa Barbara	168.12	189.18	14	184	15	194
Santa Clara	427	489.74	33	437	39	471
Santa Cruz	135.16	147.21	6	132	5	146
Shasta	120	127	2	117	6	113
Sierra	14	17	1	13	2	15
Siskiyou	139	155	18	122	21	128
Solano	136.63	152.41	10	125	13	138
Sonoma	287.73	327.46	18	278	19	297
Stanislaus	244.53	275.37	17	237	22	263
Sutter	51	62	6	56	7	53
Tehama	83.50	92.17	10	85	7	90
Trinity	23	28	2	23	6	22
Tulare	332.33	393.43	24	317	35	339
Tuolumne	50	57.40	2	49	2	53
Ventura	140.63	171.69	13	157	15	169
Yolo	80.48	90.47	6	79	5	80
Yuba	57	62	4	60	6	57
Totals	14,619.13	16,371.71	1,158	15,258	1,314	16,393

TABLE No. 6.

Kinds of Certificates Held by Teachers Employed in Elementary Schools.

Counties	High school		Elementary (Grammar school)		Primary		Special	
	1920–21	1921–22	1920–21	1921–22	1920–21	1921–22	1920–21	1921–22
Alameda	170	171	1,160	1,214	7	3	170	168
Alpine			3	3				
Amador			51	52			1	2
Butte	2	3	172	180				
Calaveras			52	51				
Colusa	2	1	55	55			2	3
Contra Costa	4	2	281	297	2	1	13	14
Del Norte	1		19	21				
El Dorado			62	61				
Fresno	1		716	769			4	19
Glenn	1	1	82	82	1	1		
Humboldt	2		201	223	6	2	7	6
Imperial	5	6	241	202	6	9	5	6
Inyo	1	4	42	41			1	
Kern	7	12	342	363	2		11	24
Kings	1	1	123	137		1	5	3
Lake	2	1	35	39			1	
Lassen		1	63	67				2
Los Angeles	160	179	3,715	4,172	37	23	341	435
Madera			93	100			3	3
Marin	2	2	116	134			4	6
Mariposa			30	28				
Mendocino	1	3	157	162				1
Merced	2		149	164				
Modoc	1	1	52	53				
Mono	2	2	8	9				
Monterey	7	6	154	163	1			
Napa	1	4	87	87		1	2	3
Nevada	2	2	64	63		1	2	2
Orange	18	19	334	375		8	8	13
Placer			97	103			1	4
Plumas	1	1	37	38				
Riverside	5	6	255	264	4	4	7	8
Sacramento	6	5	412	449			28	22
San Benito	4	2	52	55	1	1		
San Bernardino	10	11	348	404	6	4	15	10
San Diego	16	13	476	507	1	4	10	25
San Francisco	85	41	1,349	1,437	13	10	94	95
San Joaquin	2	1	357	392	1	2	18	21
San Luis Obispo	3	1	148	155		1	7	4
San Mateo	9	8	177	184	1	1	7	9
Santa Barbara	14	9	171	181	3	4	10	15
Santa Clara	25	13	436	474	3	4	6	19
Santa Cruz	3	2	133	144			2	5
Shasta			119	119				
Sierra		1	14	16				
Siskiyou	1	1	139	148				
Solano	4	7	128	138			3	6
Sonoma	9	2	280	307			7	7
Stanislaus			248	281	1	2	5	2
Sutter	1		53	59			8	1
Tehama		2	93	92			2	3
Trinity	2	1	23	27				
Tulare	2	3	333	362			6	9
Tuolumne			51	55				
Ventura	1	1	162	172	1	2	6	9
Yolo	1	1	82	82			2	2
Yuba			61	60			3	3
Totals	599	553	14,893	16,072	97	89	827	993

TABLE No. 7.

Statistics of Elementary Schools, Showing Number of District Superintendents and Average Annual Salary Paid Each.

Counties	1920-21				1921-22			
	Men		Women		Men		Women	
	Number	Salary	Number	Salary	Number	Salary	Number	Salary
Alameda	50	$3,119 26	15	$2,819 62	56	$3,008 28	16	$2,813 75
Alpine								
Amador								
Butte	2	2,825 00			2	2,700 00		
Calaveras								
Colusa								
Contra Costa	7	2,760 00	2	2,480 00	8	2,988 75	3	2,680 00
Del Norte								
El Dorado								
Fresno	14	2,939 28	1	2,039 49	15	3,010 67	2	1,750 00
Glenn								
Humboldt	1	2,400 00						
Imperial	4	2,830 00			6	2,763 33		
Inyo	1	420 00						
Kern	4	2,955 00	9	2,069 22	3	3,733 33	10	2,380 00
Kings	2	3,000 00			2	2,575 00		
Lake								
Lassen	1	3,000 00			1	3,000 00	2	1,665 00
Los Angeles	67	2,886 31	93	2,550 18	77	3,145 68	108	2,871 44
Madera					1	3,600 00		
Marin	3	2,892 00			4	3,120 00		
Mariposa								
Mendocino	1	3,000 00			1	2,400 00		
Merced	2	3,090 00						
Modoc								
Mono								
Monterey	2	3,306 00			2	3,356 00		
Napa	1	2,460 00						
Nevada	1	2,700 00			1	3,300 00		
Orange	10	2,590 00			10	2,760 00	1	2,100 00
Placer								
Plumas								
Riverside	1	2,000 00	3	1,633 33	1	2,000 00	1	2,000 00
Sacramento	2	2,820 00	13	2,695 38	2	2,820 00	14	2,665 71
San Benito	1	2,850 00						
San Bernardino	2	2,845 50	5	1,960 80	6	3,062 33	7	1,837 14
San Diego	6	2,833 33	4	2,750 00	7	2,600 00	4	2,750 00
San Francisco	10	2,270 00	79	2,492 66	8	2,237 50	79	2,612 91
San Joaquin	2	2,475 00			2	2,550 00		
San Luis Obispo	2	1,700 00			1	3,600 00		
San Mateo	5	2,875 20			5	3,120 00		
Santa Barbara	3	3,786 67			1	3,000 00		
Santa Clara	2	4,025 00			4	1,575 00		
Santa Cruz								
Shasta			1	1,800 00	1	2,500 00		
Sierra								
Siskiyou	1	2,475 00			2	3,125 00		
Solano	1	2,850 00			4	2,300 00		
Sonoma	3	2,663 33			1	2,400 00		
Stanislaus	1	2,640 00	1	2,400 00	2	2,460 00	2	2,100 00
Sutter								
Tehama	1	2,000 00			1	2,100 00		
Trinity								
Tulare	3	3,166 67			4	3,425 00		
Tuolumne								
Ventura	4	3,225 00			3	3,400 00		
Yolo	1	2,400 00			1	2,400 00		
Yuba	1	2,400 00					1	1,400 00
Totals	225	*$2,883 80	226	*$2,508 62	245	*$2,965 52	250	*$2,684 41

*Averages

TABLE No. 7—Continued.

Statistics of Elementary Schools, Showing Number of Principals and Average Annual Salary Paid Each.

Counties	1920-21				1921-22			
	Men		Women		Men		Women	
	Number	Salary	Number	Salary	Number	Salary	Number	Salary
Alameda	15	$2,027 00	21	$2,041 23	15	$2,202 30	25	$1,957 00
Alpine								
Amador	5	1,560 00			5	1,850 00		
Butte	8	1,805 38	13	1,432 23	8	1,707 87	14	1,450 78
Calaveras	2	1,500 00	4	1,085 00	2	1,560 00	4	1,353 12
Colusa	6	1,725 00	1	1,350 00	6	1,890 90	2	1,475 00
Contra Costa	5	1,726 00	29	1,652 50	7	1,895 71	32	1,782 45
Del Norte			2	1,537 50	1	1,400 00	2	1,512 50
El Dorado	2	1,158 75	1	1,260 00	2	1,432 50	2	1,500 00
Fresno	33	1,793 03	72	1,548 59	38	1,917 80	85	1,642 24
Glenn	4	1,812 50	10	1,159 35	4	1,912 50	12	1,218 50
Humboldt	7	1,696 42	24	1,393 12	10	1,866 50	27	1,508 55
Imperial	6	1,928 33	34	1,788 32	7	1,850 00	46	1,597 00
Inyo	1	1,800 00	5	1,126 20	2	1,267 50	2	1,372 50
Kern	7	1,802 14	35	1,624 24	6	2,213 83	38	1,805 56
Kings	2	1 931 25	13	1,419 46	7	1,728 57	18	1,484 72
Lake	2	1,537 50	3	1,175 00	4	1,726 50	1	1,125 00
Lassen			2	1,530 00				
Los Angeles	60	2,196 28	183	1,640 86	52	2,240 16	174	1,767 66
Madera	2	1,625 00	13	1,347 69	4	1,366 25	13	1,475 32
Marin	2	2,200 00	19	1,615 15	2	2,300 00	22	1,690 00
Mariposa								
Mendocino	5	1,422 00	8	945 31	4	1,890 00	12	1,350 83
Merced	5	1,630 00	24	1,313 70	7	2,015 00	25	1,492 41
Modoc	3	1,435 85	2	1,162 25	3	1,633 63	2	1,305 00
Mono								
Monterey	4	2,162 50	18	1,682 77	6	2,232 33	20	1,587 55
Napa	3	2,026 66	5	1,344 00	3	2,420 00	3	1,520 00
Nevada	2	1,275 00	1	950 00	2	1,725 00	1	1,410 00
Orange	11	1,740 91	46	1,468 58	11	1,855 45	42	1,669 00
Placer	5	1,520 00	5	1,040 00	5	2,052 00	7	1,430 00
Plumas			5	1,300 00			5	1,480 00
Riverside	8	1,769 00	30	1,425 33	8	1,794 37	34	1,491 76
Sacramento	6	1,511 67	26	1,562 54	7	1,941 78	27	1,730 00
San Benito			6	1,344 25	2	2,392 50	5	1,360 50
San Bernardino	6	2,016 66	41	1,490 17	5	1,770 00	40	1,539 00
San Diego	8	2,211 50	29	1,453 20	11	2,179 27	29	1,626 19
San Francisco			11	2,021 82			12	2,337 50
San Joaquin	24	2,079 91	34	1,481 61	27	2,000 00	36	1,564 00
San Luis Obispo	6	1,610 00	14	1,329 10	6	1,816 67	14	1,489 28
San Mateo	6	1,950 00	15	1,612 80	7	2,020 00	15	1,658 00
Santa Barbara	7	2,135 71	22	1,694 32	8	2,192 97	23	1,784 78
Santa Clara	17	2,281 82	37	1,577 10	9	2,163 33	38	1,597 30
Santa Cruz	3	1,896 00	11	1,370 90	3	2,160 00	15	1,475 73
Shasta			3	1,185 00	2	1,242 50	5	1,441 60
Sierra			1	1,215 00			1	1,400 00
Siskiyou	8	1,560 34	5	1,217 00	10	1,642 25	6	1,501 67
Solano	fi	2,025 00	8	1,576 03	6	2,375 00	14	1,641 07
Sonoma	8	1,677 50	33	1,535 49	9	1,825 00	41	1,477 00
Stanislaus	11	1,806 55	28	1,420 35	13	1,912 70	27	1,427 66
Sutter	5	1,563 00	4	1,181 25	6	1,790 83	6	1,305 00
Tehama	5	1,336 00	10	1,064 50	5	1,538 35	16	1,292 14
Trinity			3	1,026 00	1	1,260 00	1	1,260 00
Tulare	15	1,635 53	49	1,346 53	21	1,749 52	54	1,440 08
Tuolumne			7	1,354 64	1	2,400 00	6	1,470 62
Ventura	4	1,807 77	19	1,444 80	5	1,790 00	18	1,557 64
Yolo	4	1,817 25	8	1,387 50	3	1,996 66	9	1,502 33
Yuba	2	1,442 50			3	2,100 00	3	1,480 00
Totals	366	*$1,883 18	1,052	*$1,513 14	401	*$1,958 98	1,125	*$1,612 05

*Averages

TABLE No. 7.—Continued.

Statistics of Elementary Schools, Showing Number of Regular Teachers and Average Annual Salary Paid Each.

Counties	1920-21				1921-22			
	Men		Women		Men		Women	
	Number	Salary	Number	Salary	Number	Salary	Number	Salary
Alameda	20	$1,621 60	1,198	$1,853 04	29	$1,766 00	1,276	$1,878 00
Alpine			3	983 33			3	1,217 00
Amador			46	951 89			47	1,188 83
Butte	2	960 00	143	1,204 68	4	1,234 50	148	1,287 34
Calaveras	4	960 62	42	939 10	4	1,224 92	41	1,204 16
Colusa	1	1,105 00	48	1,155 52			47	1,324 45
Contra Costa	1	2,040 00	238	1,511 56	4	1,690 25	243	1,600 36
Del Norte	3	1,240 83	14	1,210 71	4	1,294 68	15	1,208 48
El Dorado	1	800 00	59	851 89			55	1,207 47
Fresno	11	1,418 83	584	1,468 08	11	1,882 95	633	1,543 05
Glenn			69	1,134 70	1	1,350 00	66	1,196 17
Humboldt	6	1,098 92	170	1,202 38	5	1,305 50	183	1,359 01
Imperial	1	1,800 00	195	1,519 14	7	1,519 00	154	1,450 00
Inyo	1	1,000 00	36	1,028 49	1	1,200 00	39	1,163 75
Kern	5	1,113 00	287	1,514 62	5	1,472 00	306	1,612 25
Kings	6	1,155 63	101	1,313 72	2	1,450 00	108	1,278 49
Lake	3	1,216 66	29	939 48	3	1,483 33	32	1,199 14
Lassen	7	1,337 14	56	1,118 43	9	1,256 66	56	1,299 24
Los Angeles	77	1,772 71	3,392	1,632 46	107	1,952 96	3,816	1,706 68
Madera	2	1,160 00	76	1,209 31	1	1,295 00	81	1,320 09
Marin			93	1,359 37	2	1,550 00	106	1,413 00
Mariposa	4	978 11	26	919 44	3	1,226 25	25	1,198 00
Mendocino	7	963 35	137	999 31	6	1,279 16	142	1,247 81
Merced	2	1,165 00	118	1,243 73	1	1,300 00	129	1,358 05
Modoc	4	1,016 93	44	1,037 20	2	1,221 63	47	1,210 00
Mono	1	960 00	9	1,114 66	2	1,275 00	9	1,434 63
Monterey	1	1,045 00	136	1,322 01	2	1,335 00	135	1,415 53
Napa	1	1,080 00	79	1,232 73	3	1,050 00	84	1,320 23
Nevada	2	1,142 50	59	991 60	2	1,369 00	59	1,284 00
Orange	6	780 41	267	1,363 61	4	1,440 00	333	1,478 30
Placer	3	862 08	83	931 37	3	1,483 33	88	1,116 32
Plumas			33	1,200 00			34	1,261 78
Riverside			219	1,235 19	2	1,425 00	235	1,284 13
Sacramento	2	930 00	367	1,622 98	3	1,191 65	390	1,655 08
San Benito	2	847 50	48	1,145 50	1	1,485 00	50	1,324 15
San Bernardino	8	P1,221 25	397	1,271 08	10	1,369 00	351	1,346 68
San Diego	13	1,672 92	421	1,510 12	13	1,676 92	459	1,581 44
San Francisco	8	1,477 50	1,339	1,764 15	8	1,585 00	1,380	1,770 14
San Joaquin	9	1,857 77	287	1,468 15	10	1,810 00	317	1,522 00
San Luis Obispo	7	930 00	122	1,188 20	3	1,225 00	134	1,330 00
San Mateo			157	1,383 05			164	1,453 12
Santa Barbara	3	1,500 00	154	1,497 85	2	1,650 00	158	1,560 72
Santa Clara			227	1,376 59	7	2,612 50	256	1,434 67
Santa Cruz	2	987 50	120	1,188 97	1	1,200 00	127	1,313 47
Shasta	1	812 50	114	798 59	3	1,170 00	108	1,223 86
Sierra	1	1,350 00	12	1,055 42	1	1,600 00	15	1,258 25
Siskiyou	9	883 30	117	1,046 17	9	1,253 33	122	1,271 80
Solano	3	1,446 67	117	1,306 82	3	1,476 67	123	1,457 80
Sonoma	7	1,353 21	238	1,217 11	7	1,359 00	251	1,320 44
Stanislaus	3	1,366 66	201	1,303 28	5	1,403 40	226	1,367 99
Sutter			45	1,123 82	1	1,350 00	46	1,257 56
Tehama	3	899 66	74	990 65	1	1,200 00	77	1,258 47
Trinity	2	870 00	20	826 50	5	1,152 00	21	1,095 00
Tulare	4	1,625 00	261	1,195 33	8	1,455 62	278	1,269 52
Tuolumne	2	852 50	41	986 68	1	1,350 00	46	1,188 00
Ventura	3	1,200 00	134	1,284 08	4	1,376 25	144	1,378 07
Yolo			70	1,226 21			70	1,308 66
Yuba	1	2,100 00	56	1,051 42	2	1,187 24	51	1,260 98
Totals	275	*$1,377 63	13,138	*$1,479 21	337	*$1,656 45	14,139	*$1,568 73

*Averages.

TABLE No. 7—Continued.

Statistics of Elementary Schools, Showing Number of Supervisors and Average Annual Salary Paid Each.

Counties	1920-21				1921-22			
	Men		Women		Men		Women	
	Number	Salary	Number	Salary	Number	Salary	Number	Salary
Supervisor of Subjects.								
Alameda	14	$2,691 28	28	$2,522 42	8	$2,999 00	21	$2,601 00
Alpine								
Amador								
Butte	1	1,560 00	4	1,250 00				
Calaveras								
Colusa								
Contra Costa			4	1,627 50	1	1,200 00	5	1,782 00
Del Norte								
El Dorado								
Fresno			3	2,546 51			3	2,350 00
Glenn								
Humboldt			3	1,233 33				
Imperial								
Inyo					1	450 00		
Kern								
Kings								
Lake								
Lassen								
Los Angeles	21	2,361 90	54	2,377 87	26	2,537 12	63	2,433 63
Madera								
Marin			4	1,768 95			4	1,607 00
Mariposa								
Mendocino								
Merced								
Modoc								
Mono								
Monterey			1	2,000 00				
Napa								
Nevada	1	1,800 00	2	1,450 00			1	1,800 00
Orange	1	1,800 00	1	1,800 00	1	1,875 00		
Placer							2	1,500 00
Plumas								
Riverside	2	2,250 00	2	1,900 00				
Sacramento	2	2,430 00	5	2,868 00	2	2,430 00	5	2,868 00
San Benito								
San Bernardino	1	2,000 00						
San Diego	2	2,555 00	7	2,285 71	2	2,600 00	6	2,433 33
San Francisco	3	3,200 00	7	2,742 86	1	3,600 00	5	2,628 00
San Joaquin			6	2,320 33			5	2,367 00
San Luis Obispo								
San Mateo								
Santa Barbara	1	2,200 00	1	2,200 00	1	2,200 00	2	2,400 00
Santa Clara	2	2,516 50	2	1,499 75	2	2,600 00	2	2,336 75
Santa Cruz			1	1,440 00	1	2,040 00	2	1,620 00
Shasta								
Sierra								
Siskiyou								
Solano							1	2,200 00
Sonoma								
Stanislaus			1	2,541 62			2	2,700 00
Sutter							1	3,000 00
Tehama	1	600 00	1	1,080 00				
Trinity								
Tulare								
Tuolumne							1	2,550 00
Ventura					1	2,000 00	2	1,650 00
Yolo								
Yuba								
Totals	52	*$2,429 10	137	*$2,302 80	47	*$2,522 90	134	*$2,394 80

*Averages.

TABLE No. 7—Continued.

Statistics of Elementary Schools, Showing Number of Special Teachers and Average Annual Salary Paid Each.

Counties	1920-21				1921-22			
	Men		Women		Men		Women	
	Number	Salary	Number	Salary	Number	Salary	Number	Salary
Teachers of Subjects								
Alameda	61	$2,056 59	85	$1,896 56	47	$1,876 00	63	$2,014 00
Alpine								
Amador			1	1,700 00			2	1,550 00
Butte			1	1,200 00	3	1,400 00	8	1,391 00
Calaveras								
Colusa			2	702 00	1	345 00	2	1,225 00
Contra Costa	6	1,671 33	8	1,562 50	4	1,860 00	7	1,337 14
Del Norte			1	550 00			1	550 00
El Dorado	1	225 00						
Fresno	1	225 00	2	1,487 48	1	1,800 00		
Glenn			1	1,400 00			1	1,400 00
Humboldt	1	1,800 00	4	1,550 00	2	1,450 00	4	1,325 00
Imperial	8	1,107 00	9	1,309 33				
Inyo								
Kern	4	2,070 25	12	1,757 50	7	1,878 57	24	1,872 91
Kings	1	1,500 00	4	1,342 50	2	1,900 00	3	1,333 00
Lake	1	175 00						
Lassen	1	450 00	1	450 00	1	500 00	1	254 44
Los Angeles	76	1,835 49	230	1,530 41	117	1,725 93	269	1,684 01
Madera	1	1,800 00	2	1,350 00	1	2,000 00	2	1,650 00
Marin	1	2,160 00			2	2,400 00		
Mariposa								
Mendocino							1	1,350 00
Merced					1	2,000 00		
Modoc								
Mono								
Monterey					1	1,800 00	3	1,353 33
Napa							2	1,650 00
Nevada					1	1,800 00	1	1,200 00
Orange	6	1,284 66	15	1,359 33	7	1,725 00	7	1,767 85
Placer			1	300 00			2	450 00
Plumas								
Riverside	2	1,600 00	4	1,512 50	1	1,600 00		
Sacramento	11	2,214 55	13	1,836 92	11	2,252 72	15	2,016 00
San Benito								
San Bernardino	2	1,325 00	7	1,507 14	4	1,587 50	6	1,600 00
San Diego	5	1,992 00	8	1,992 00	5	1,992 00	15	1,568 67
San Francisco	25	1,950 00	59	1,790 00	23	1,898 26	67	1,737 61
San Joaquin	7	2,216 66	9	2,180 00	10	1,938 00	9	2,167 00
San Luis Obispo	3	958 33	4	1,150 00			3	1,883 33
San Mateo	2	1,566 50	9	1,311 44	3	1,680 00	8	1,515 63
Santa Barbera	2	2,000 00	9	1,323 33	4	1,412 50	10	1,088 00
Santa Clara	8	1,141 19	163	1,761 07	15	1,095 25	177	1,781 97
Santa Cruz	1	1,800 00					2	1,748 00
Shasta								
Sierra								
Siskiyou	1	180 00	2	390 00				
Solano								
Sonoma	2	1,050 00	5	1,242 00	2	1,020 00	5	1,137 00
Stanislaus	2	1,870 00	6	1,525 00	2	2,020 00	5	1,704 00
Sutter	1	1,035 00	8	295 87	1	1,100 00		
Tehama			1	360 00	1	600 00	2	1,225 00
Trinity								
Tulare	2	1,758 00	7	1,209 42	2	1,908 00	7	1,403 00
Tuolumne								
Ventura	2	1,015 25	4	993 12	1	250 00	6	1,289 17
Yolo	1	1,800 00	1	750 00	1	1,800 00	1	185 00
Yuba			3	1,280 00	1	2,160 00	2	1,575 00
Totals	248	*$1,806 15	701	*$1,620 72	285	*$1,745 02	743	*$1,713 51

*Averages

TABLE No. 8.

Statistics of Elementary Schools, Showing Enrollment by Sex and by County, Including Post-Graduate Elementary Schools.

Counties	Elementary schools						Postgraduate elementary schools					
	Boys		Girls		Total		Boys		Girls		Total	
	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22
Alameda	25,686	26,300	24,390	24,782	50,076	51,082						
Alpine	20	20	16	16	36	36		1				1
Amador	599	597	588	576	1,187	1,173				3		3
Butte	2,615	2,630	2,325	2,376	4,940	5,006	5	5	4	2	9	7
Calaveras	544	515	490	484	1,034	999	6	6	2	4	8	10
Colusa	733	750	695	701	1,428	1,451			1	1	1	1
Contra Costa	4,697	4,861	4,669	4,802	9,366	9,663						
Del Norte	274	267	258	269	532	536				1		1
El Dorado	579	513	499	478	1,078	991	13	11	10	3	23	14
Fresno	13,399	13,867	12,450	12 832	25,849	26,699	5	2	5	1	10	3
Glenn	1,067	1 003	977	919	2,044	1,922						
Humboldt	3,095	3,160	2,870	2,982	5,965	6,142	3	5	6	4	9	9
Imperial	4,174	3,649	3,724	3,394	7,898	7,043						
Inyo	545	534	507	516	1,052	1 050						
Kern	5,495	5,964	5,178	5,539	10,673	11,503	1	4	2	5	3	9
Kings	2,401	2,462	2,136	2,259	4,537	4,721			1		1	
Lake	407	416	399	393	806	809						
Lassen	745	822	679	728	1 424	1,550		3	1	4	1	7
Los Angeles	81,012	88,704	76,076	83,408	157,088	172,112	1	5		3	1	8
Madera	1,443	1,495	1,367	1,384	2,810	2,879		3		3		6
Marin	2,142	2,383	1,867	1 844	4,009	4,227						
Mariposa	261	255	191	194	452	449	1		2	1	3	1
Mendocino	2,104	2,148	1,951	1,952	4,055	4,100	4	4	3	4	7	8
Merced	2,562	2,803	2,373	2,597	4,935	5,400						
Modoc	476	528	487	493	963	1,021	14		7		21	
Mono	64	86	90	93	154	179	1	2		1	1	3
Monterey	2,428	2,343	2 192	2,106	4,620	4,449	3		1		4	
Napa	1,401	1,415	1,216	1,223	2,617	2 638		4		3		7
Nevada	865	860	731	712	1,596	1,572						
Orange	6,081	6,915	5,762	6,577	11,843	13,492						
Placer	1,647	1,850	1,438	1,651	3,085	3,501						
Plumas	477	448	433	396	910	844						
Riverside	4,614	4,755	4,293	4,499	8,907	9,254			1		1	
Sacramento	7,300	7,751	6,568	6,830	13,868	14,581	6	9	5	1	11	10
San Benito	726	733	681	745	1,407	1,478						
San Bernardino	6,667	7,290	6,156	6,790	12,823	14,080		1	1	2	1	3
San Diego	8,367	8,768	8,048	8,287	16,415	17,055	2	2	3	5	5	7
San Francisco	29,873	30,033	26,413	26,976	56,286	57,009						
San Joaquin	6,828	7,175	6,448	6,672	13,276	13,847						
San Luis Obispo	2,096	2,105	1,853	1,921	3,949	4,026	8	4	4	3	12	7
San Mateo	3,318	3,515	3,139	3,202	6,457	6,717						
Santa Barbara	3,091	3,271	2,823	2,935	5,914	6,206						
Santa Clara	8,441	8,562	7,850	8,126	16,291	16,688						
Santa Cruz	2,182	2,273	1,982	2,001	4,164	4,274	1	2	3	1	4	3
Shasta	1,261	1,230	1,211	1,246	2,472	2,476						
Sierra	142	157	131	163	273	320	1	1	2	5	3	6
Siskiyou	1,920	1,907	1,726	1,671	3,646	3,578						
Solano	2,419	2,506	2,114	2,230	4,533	4,736						
Sonoma	4,725	5,020	4,252	4,482	8,977	9,502	11	13	10	9	21	22
Stanislaus	4,623	4,792	4,207	4,346	8,830	9,138						
Sutter	807	846	721	758	1,528	1,604						
Tehama	1,028	1,064	985	1,003	2,013	2,067						
Trinity	195	235	179	185	374	420	2	1	2	1	4	2
Tulare	6,004	6,404	5,578	5,924	11,582	12,328	1	4	4	5	5	9
Tuolumne	621	698	627	687	1,248	1,385						
Ventura	2,803	2,929	2,592	2,735	5,395	5,664						
Yolo	1,330	1,351	1,157	1,203	2,487	2,554						
Yuba	783	800	631	652	1,414	1,452	2	13	6	5	8	18
Totals	282,202	296,733	261,389	274,945	543,591	571,678	91	105	86	80	177	185

TABLE No. 8—Continued.

Statistics of Elementary Schools, Showing Total Enrollment of Pupils in Elementary Day and Evening Schools by Grades and Enrollment in Post-graduate Elementary Schools.

Enrolled in Elementary Schools.	1920-21	1921-22
Ungraded girls	48	
First year—		
Boys	63,082	62,314
Girls	55,862	55,796
Second year—		
Boys	37,774	39,452
Girls	33,902	35,363
Third year—		
Boys	33,960	37,374
Girls	31,495	35,190
Fourth year—		
Boys	32,456	34,489
Girls	30,263	32,140
Fifth year—		
Boys	32,153	33,053
Girls	29,735	30,469
Sixth year—		
Boys	29,726	31,209
Girls	28,006	29,018
Seventh year—		
Boys	27,306	29,539
Girls	26,159	27,904
Eighth year—		
Boys	25,845	29,303
Girls	25,919	29,065
Totals—		
Boys	282,202	296,733
Girls	261,389	274,945
Grand totals	543,591	571,678
Post-graduate Elementary Schools.		
First year—		
Boys	76	91
Girls	65	71
Second year—		
Boys	15	14
Girls	21	9
Totals—		
Boys	91	105
Girls	86	80
Grand totals	177	185

TABLE No. 9.

Statistics of Elementary Schools, Showing Number of Graduates from Elementary and Post-graduate Elementary Schools, and Average Daily Attendance in Such Schools.

Counties	Number of graduates from								Average daily attendance	
	Elementary schools				Post-graduate elementary schools					
	1920-21		1921-22		1920-21		1921-22		1920-21	1921-22
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls		
Alameda	2,010	2,628	2,111	2,080					40,769	42,678
Alpine	2	2							28	26
Amador	47	42	49	48					1,034	1,059
Butte	163	174	167	193					4,114	4,253
Calaveras	46	35	53	45					910	888
Colusa	51	55	56	57					1,234	1,273
Contra Costa	239	225	313	353					8,114	8,238
Del Norte	17	18	12	13					402	432
El Dorado	65	55	47	42					888	876
Fresno	976	979	851	1,004					21,654	22,919
Glenn	78	78	101	86					1,755	1,782
Humboldt	242	248	183	225					5,065	5,267
Imperial	228	204	241	199					5,671	5,343
Inyo	39	36	41	44					875	900
Kern	305	316	401	396				1	8,981	9,676
Kings	81	85	87	109					3,768	4,009
Lake	45	50	48	46					712	692
Lassen	37	51	55	49					1,162	1,263
Los Angeles	5,069	5,296	6,138	6,422					113,280	127,097
Madera	91	116	108	117					2,323	2,428
Marin	161	168	209	160					3,213	3,509
Mariposa	23	9	14	13					342	350
Mendocino	158	208	162	189					3,404	3,538
Merced	165	150	121	184					4,237	4,718
Modoc	34	45	35	36		1			802	800
Mono		6	7	5					120	138
Monterey	160	158	221	161					3,827	3,839
Napa	100	130	110	115				2	2,272	2,264
Nevada	62	96	19	16					1,359	1,359
Orange	517	512	473	587					9,730	10,956
Placer	105	111	145	116					2,729	2,975
Plumas	32	32	29	36					649	649
Riverside	318	346	337	357					7,018	7,493
Sacramento	543	603	603	681		1			11,007	11,836
San Benito	49	57	55	64					1,196	1,248
San Bernardino	345	385	464	477					10,197	11,317
San Diego	604	636	709	710					12,894	13,765
San Francisco	1,872	2,103	1,889	2,249					43,481	44,526
San Joaquin	346	394	397	427					11,187	11,743
San Luis Obispo	151	183	151	159					3,335	3,484
San Mateo	272	255	218	209					5,529	5,801
Santa Barbara	184	174	168	179					4,722	4,987
Santa Clara	594	644	647	664					13,600	14,285
Santa Cruz	203	198	224	207		1	1		3,599	3,774
Shasta	58	82	96	119					1,980	2,055
Sierra	9	10	17	13					225	252
Siskiyou	100	122	111	86					2,956	3,049
Solano	166	185	172	210					3,797	4,006
Sonoma	409	456	481	371	6	7			7,711	8,112
Stanislaus	292	325	445	418					7,616	7,891
Sutter	49	48	67	61					1,310	1,422
Tehama	95	104	117	95					1,767	1,771
Trinity	9	18	25	23					297	331
Tulare	424	478	544	548					9,813	10,650
Tuolumne	48	50	35	58					1,094	1,204
Ventura	133	144	175	151	1	1			4,152	4,587
Yolo	98	89	91	114					2,179	2,268
Yuba	48	45	70	52		3			1,231	1,273
Totals	18,767	20,452	20,915	21,850	7	14	1	3	429,316	459,324

TABLE No. 10.

Statistics of Elementary Schools, Showing Average Number of Days Schools were Actually Open for Year, Number of Visits by School Officers, and Number of Books in School Libraries, by Counties.

Counties	Average number of days schools were actually open		Number of visits by county superintendent of schools		Number of visits by school trustees		Number of books in school libraries	
	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22
Alameda	183	183	345	693	379	526	96,960	106,110
Alpine	147	171	6	6	2	3	1,610	1,946
Amador	157	173	84	97	104	104	15,653	16,711
Butte	154	174	331	312	196	226	31,576	23,130
Calaveras	166	180	64	64	113	100	22,459	19,369
Colusa	160	158	91	102	58	75	29,255	16,902
Contra Costa	183	183	201	364	430	470	27,658	55,105
Del Norte	177	188	21	26	18	35	8,618	8,709
El Dorado	145	167	53	74	147	166	26,406	27,156
Fresno	161	167	1,712	1,710	909	1,472	43,521	35,509
Glenn	164	167	196	210	83	54	27,657	23,979
Humboldt	171	176	193	443	543	647	50,106	48,829
Imperial	162	168	485	285	324	348	3,408	3,352
Inyo	161	166	37	52	111	104	5,275	2,715
Kern	155	173	413	312	646	787	53,871	53,116
Kings	184	162	137	176	212	274	21,071	26,306
Lake	163	166	38	41	50	91	10,955	9,791
Lassen	147	170	74	84	115	153	9,938	
Los Angeles	171	185	4,755	6,148	2,551	2,354	543,773	635,925
Madera	151	169	111	98	170	178		
Marin	187	183	301	453	173	233	51,143	55,381
Mariposa	145	169	28	34	77	74	12,845	12,754
Mendocino	150	169	178	190	322	313	60,722	66,600
Merced	163	162	153	184	286	342	53,133	39,855
Modoc	155	163	56	83	124	119	21,758	19,679
Mono	162	159	171	173	24	11	7,013	5,810
Monterey	183	185	198	157	353	287	77,297	29,921
Napa	182	182	127	155	189	172	26,853	25,268
Nevada	179	174	130	105	150	109	36,518	37,720
Orange	165	169	373	400	308	544	66,551	60,494
Placer	153	170	156	177	167	228	43,839	43,348
Plumas	157	161	42	49	102	73	11,584	8,692
Riverside	162	169	174	193	460	256	44,057	42,987
Sacramento	176	174	145	228	216	286	17,198	30,524
San Benito	187	178	254	167	116	125	19,020	
San Bernardino	168	168	297	477	525	498	86,862	95,863
San Diego	163	184	220	530	421	508	73,435	181,826
San Francisco	191	194	2,935	2,022	618	891	178,375	160,567
San Joaquin	165	167	200	234	274	376	79,939	79,650
San Luis Obispo	171	172	171	149	307	370	61,887	54,988
San Mateo	184	184	286	285	279	341	49,824	38,141
Santa Barbara	185	186	210	237	347	291	34,756	28,047
Santa Clara	176	172	521	486	578	730	27,771	27,987
Santa Cruz	182	181	175	218	185	208	39,159	36,339
Shasta	139	163	118	123	186	288	49,711	45,164
Sierra	163	173	16	15	24	21	9,301	9,094
Siskiyou	162	166	127	202	352	344	28,794	27,727
Solano	181	178	187	233	232	216	39,696	35,222
Sonoma	174	176	303	329	628	548	182,961	178,641
Stanislaus	167	173	329	384	281	367	61,966	55,021
Sutter	152	166	74	86	69	82	17,199	6,120
Tehama	157	165	80	88	115	176	4,339	3,556
Trinity	155	163	28	33	59	63	11,810	10,194
Tulare	160	164	542	909	460	483	118,391	100,171
Tuolumne	151	173	74	118	40	70	8,593	7,346
Ventura	171	176	170	243	144	119	41,581	39,432
Yolo	171	166	190	197	119	99	21,300	22,339
Yuba	154	171	75	67	53	58	20,531	18,702
Totals	*172	*179	19,161	21,710	16,524	18,486	2,827,682	2,855,830

*Averages.

TABLE No. 11.

Statistics of Elementary Schools, Showing Amount of Money Apportioned by the State to the Elementary Schools Within School Year Ending June 30, 1921, by Counties.

Counties	July 9, 1920 rate per pupil 61 cents	Sept. 8, 1920 $350 teacher basis	Feb. 19, 1921 attendance June 30, 1920	Total within school year 1920-21
Alameda	$22,926 24	$418,488 00	$251,316 52	$692,730 76
Alpine	17 08	1,050 00	177 66	1,244 74
Amador	777 75	19,663 00	7,770 98	28,211 73
Butte	2,114 26	52,850 00	25,089 54	80,053 80
Calaveras	725 29	18,998 00	6,349 70	26,072 99
Colusa	694 18	17,647 00	7,672 28	26,013 46
Contra Costa	4,564 63	85,512 00	49,751 38	139,828 01
Del Norte	265 35	6,650 00	2,809 66	9,725 01
El Dorado	552 66	20,968 50	5,408 76	26,929 92
Fresno	11,064 18	221,928 00	129,079 86	362,072 04
Glenn	939 40	24,465 00	10,843 84	36,248 24
Humboldt	3,136 01	70,700 00	33,071 08	106,907 09
Imperial	2,783 43	62,300 00	35,953 12	101,036 55
Inyo	531 92	12,600 00	5,435 08	18,567 00
Kern	4,417 62	101,850 00	51,593 78	157,861 40
Kings	2,002 02	40,348 00	22,602 30	64,952 32
Lake	464 21	14,217 00	4,717 86	19,399 07
Lassen	688 08	18,550 00	6,691 86	25,929 94
Los Angeles	52,142 19	1,052,579 50	626,856 86	1,731,578 55
Madera	1,129 72	30,173 50	13,778 52	45,081 74
Marin	1,826 95	37,208 50	19,595 24	58,630 69
Mariposa	264 13	10,895 50	2,243 78	13,403 41
Mendocino	2,197 22	55,300 00	21,431 06	78,928 28
Merced	2,227 72	47,978 00	24,714 48	74,920 20
Modoc	569 13	17,150 00	4,961 32	22,680 45
Mono	73 81	2,800 00	625 10	3,498 91
Monterey	2,124 63	54,341 00	22,806 28	79,271 91
Napa	1,371 89	30,583 00	14,344 40	46,299 29
Nevada	1,030 90	23,100 00	9,119 88	33,250 78
Orange	4,524 37	90,195 00	53,916 52	148,635 89
Placer	1,511 58	34,989 50	16,548 70	53,049 78
Plumas	414 19	11,550 00	4,000 64	15,964 83
Riverside	3,581 92	76,590 50	41,236 86	121,409 28
Sacramento	5,764 50	116,280 50	65,016 98	187,061 98
San Benito	714 31	18,137 00	7,652 54	26,503 85
San Bernardino	5,484 51	105,759 50	58,838 36	170,082 37
San Diego	6,699 63	140,000 00	73,459 12	220,158 75
San Francisco	26,086 04	471,450 00	281,485 82	779,021 86
San Joaquin	5,630 30	116,035 50	64,990 66	186,656 46
San Luis Obispo	1,828 78	48,300 00	20,305 88	70,434 66
San Mateo	3,104 90	59,500 00	34,202 84	96,807 74
Santa Barbara	2,652 28	56,262 50	29,149 40	88,064 18
Santa Clara	7,073 56	139,331 50	81,795 98	228,201 04
Santa Cruz	1,908 69	42,990 50	21,411 32	66,310 51
Shasta	1,391 41	42,350 00	12,995 56	56,736 91
Sierra	201 30	4,900 00	1,447 60	6,548 90
Siskiyou	1,821 46	46,900 00	18,516 12	67,237 58
Solano	2,172 82	45,587 50	23,069 48	70,829 80
Sonoma	4,271 83	97,541 50	47,487 86	149,301 19
Stanislaus	3,891 19	77,129 50	44,790 06	125,810 75
Sutter	721 63	18,200 00	8,178 94	27,100 57
Tehama	1,046 15	29,162 00	11,449 20	41,657 35
Trinity	234 24	8,750 00	2,013 48	10,997 72
Tulare	5,066 05	108,013 50	57,371 02	170,450 57
Tuolumne	755 79	17,899 00	7,172 20	25,826 99
Ventura	2,205 76	46,613 00	25,293 52	74,112 28
Yolo	1,254 16	28,388 50	13,692 98	43,335 64
Yuba	785 07	20,650 00	8,073 66	29,508 73
Totals	$226,421 02	$4,690,350 00	$2,552,375 42	$7,469,146 44

TABLE No. 11—Continued.

Statistics of Elementary Schools, Showing Amount of Money Apportioned by the State to Elementary Schools Within School Year Ending June 30, 1922, by Counties.

Counties	July 9, 1921 rate per pupil 59 cents	$700 Sept. 8, 1921 on teacher basis	Feb. 20, 1922 attendance June 30, 1921	Total apportionment within year
Alameda	$22,534 46	$921,053 00	$194,060 44	$1,137,647 90
Alpine	15 93	2,100 00	133 28	2,249 21
Amador	696 79	37,373 00	4,921 84	42,991 63
Butte	2,249 67	116,200 00	19,582 64	138,032 31
Calaveras	569 35	37,450 00	4,331 60	42,350 95
Colusa	687 94	39,669 00	5,873 84	46,230 78
Contra Costa	4,460 99	199,647 00	38,622 64	242,730 63
Del Norte	251 93	14,700 00	1,913 52	16,865 45
El Dorado	484 98	42,476 00	4,226 88	47,187 86
Fresno	11,574 03	530,635 00	103,073 04	645,282 07
Glenn	972 32	57,120 00	8,353 80	66,446 12
Humboldt	2,965 34	155,400 00	24,109 40	182,474 74
Imperial	3,223 76	142,800 00	26,993 96	173,017 72
Inyo	487 34	31,500 00	4,165 00	36,152 34
Kern	4,626 19	239,400 00	42,749 56	286,775 75
Kings	2,026 65	97,839 00	17,935 68	117,801 33
Lake	423 03	28,959 00	3,389 12	32,771 15
Lassen	600 03	43,400 00	5,531 12	49,531 15
Los Angeles	56,207 53	2,574,635 00	539,212 80	3,170,055 33
Madera	1,235 46	70,749 00	11,057 48	83,041 94
Marin	1,757 02	85,141 00	15,293 88	102,191 90
Mariposa	201 19	21,105 00	1,627 92	22,934 11
Mendocino	1,921 63	123,900 00	16,203 04	142,024 67
Merced	2,216 04	115,612 00	20,168 12	137,996 16
Modoc	444 86	37,800 00	3,817 52	42,062 38
Mono	56 05	7,000 00	571 20	7,627 25
Monterey	2,044 94	123,550 00	18,216 52	143,811 46
Napa	1,286 20	71,225 00	10,814 72	83,325 92
Nevada	817 74	46,900 00	6,468 84	54,186 58
Orange	4,834 46	228,340 00	46,314 80	279,489 26
Placer	1,483 85	77,749 00	12,980 04	92,222 89
Plumas	358 72	27,300 00	3,093 24	30,747 96
Riverside	3,697 53	178,367 00	33,405 68	215,470 21
Sacramento	5,829 79	268,352 00	52,393 32	326,575 11
San Benito	686 17	41,538 00	5,692 96	47,917 13
San Bernardino	5 275 78	252,133 00	48,537 72	305,946 50
San Diego	6,586 76	330,400 00	61,375 44	398,362 20
San Francisco	25,239 61	973,700 00	206,969 56	1,205,909 17
San Joaquin	5,827 43	278,527 00	53,250 12	337,404 55
San Luis Obispo	1,820 74	105,700 00	15,874 60	123,395 34
San Mateo	3,066 82	135,*00 00	26,318 04	164,484 86
Santa Barbara	2,613 70	126,084 00	22,476 72	151,174 42
Santa Clara	7,334 29	331,800 00	64,736 00	403,870 29
Santa Cruz	1,919 86	100,212 00	17,131 24	119,263 10
Shasta	1,165 25	88,900 00	9,424 80	99,490 05
Sierra	129 80	9,800 00	1,071 00	11,000 80
Siskiyou	1,660 26	107,100 00	14,070 56	122,830 82
Solano	2,068 54	103,341 00	18,073 72	123,483 26
Sonoma	4,258 03	227,759 00	36,704 36	268,721 39
Stanislaus	4,016 13	187,971 00	36,252 16	228,239 29
Sutter	733 37	42,000 00	6,235 60	48,968 97
Tehama	1,026 60	64,750 00	8,410 92	74,187 52
Trinity	180 54	16,800 00	1,413 72	18,394 26
Tulare	5,144 21	260,631 00	46,709 88	312,485 09
Tuolumne	643 10	38,031 00	5,207 44	43,881 54
Ventura	2,267 96	110,341 00	19,763 52	132,372 48
Yolo	1,227 79	61,236 00	10,372 04	72,835 83
Yuba	723 93	42,700 00	5,859 56	49,283 49
Totals	$228,860 41	$10,831,800 00	$2,043,544 16	$13,104,204 57

TABLE No. 12.

Statistics of Elementary Schools, Showing Receipts from All Sources Within the School Year Ending June 30, 1921, by Counties.

Counties	Balance on hand June 30, 1920	Total receipts from state	Total receipts from county	Total receipts from district taxes			Miscellaneous sources	Total receipts
				Taxes for maintenance	Special taxes for building	Taxes from sale of bonds		
Alameda	$492,028 36	$692,730 76	$1,320,718 30	$1,290,815 93	$117,410 80	$232,600 00	$27,301 33	$4,173,005 48
Alpine	3,364 56	1,244 74	2,563 60				440 95	7,613 85
Amador	13,582 05	28,205 42	29,960 63	9,795 25	713 84		3,547 06	85,804 25
Butte	44,201 12	80,073 01	178,729 30	66,250 21	37,633 13		4,766 96	411,653 43
Calaveras	23,166 03	26,085 52	33,936 05				2,143 33	85,330 93
Colusa	24,798 44	26,013 46	63,776 33	8,690 99	5,067 99		4,096 13	132,443 34
Contra Costa	193,927 24	139,769 47	335,337 41	156,660 38	64,242 51	444,000 00	14,755 32	1,348,692 33
Del Norte	10,494 58	9,720 13	22,427 50	187 41			1,247 79	44,077 41
El Dorado	20,254 34	26,931 24	35,590 91				936 14	83,712 63
Fresno	1,052,256 36	369,453 80	680,786 00	309,509 35	147,003 21	324,300 00	69,515 78	2,952,824 50
Glenn	79,233 27	35,952 00	82,963 00	27,610 23	14,616 99	79,408 00	194 27	319,977 76
Humboldt	103,412 11	106,904 00	194,610 00	48,192 32	20,583 62		4,241 66	477,943 71
Imperial	135,724 74	101,082 18	271,016 82	173,874 80	80,870 31	190,000 00	44,255 04	996,823 89
Inyo	14,250 22	18,567 00	30,103 42	9,330 46		40,000 00	1,373 76	113,624 86
Kern	218,733 82	157,861 40	413,163 15	239,078 34	142,946 34	547,325 00	12,903 21	1,732,011 26
Kings	196,245 66	65,629 92	114,068 12	44,489 28	22,465 40	209,500 00	1,000 26	653,398 64
Lake	9,447 59	20,693 64	30,653 67	12,482 91			5,963 25	79,241 06
Lassen	27,825 32	25,947 23	51,309 00	9,088 67	12,518 78	84,382 18	1,560 01	212,631 19
Los Angeles	1,596,152 15	1,731,552 23	4,589,683 76	3,070,414 67	918,929 36	2,533,400 00	453,835 44	14,893,967 61
Madera	79,387 69	45,081 74	91,184 50	22,235 69	23,146 85	92,600 00	4,239 78	357,876 25
Marin	99,484 65	58,630 69	115,550 10	51,194 60	14,412 38	142,500 00	3,942 01	485,714 43
Mariposa	8,659 17	13,418 52	19,711 77	442 39	80 58	1,000 00	2,780 52	46,092 95
Mendocino	74,055 62	79,038 05	132,796 00	12,964 58			2,534 57	301,388 82
Merced	20,512 10	74,920 20	130,057 24	75,119 35	6,962 40	92,900 00	6,721 26	407,192 55
Modoc	11,969 62	22,838 04	45,616 00	4,118 33	1,739 16		1,919 44	88,200 59
Mono	8,677 02	3,498 91	7,551 59				1,422 30	21,149 82
Monterey	164,985 26	79,268 86	175,982 27	52,175 79	14,425 01	164,000 00	4,560 83	655,398 02
Napa	50,649 45	46,299 29	75,190 09	44,012 61	4,233 50		1,062 58	221,447 52
Nevada	18,284 97	33,254 34	36,574 54	10,152 33	3,768 24		7,895 19	109,929 61
Orange	296,733 62	152,075 54	402,755 00	190,333 01	56,827 38	470,387 09	9,456 73	1,578,568 37
Placer	26,474 78	53,049 78	60,186 71	20,221 59	2,449 43	101,000 00	4,508 66	267,890 95
Plumas	14,080 68	15,958 12	69,539 56	8,913 71			3,598 45	103,090 52
Riverside	63,099 01	121,026 38	188,909 58	100,905 82	46,209 05	20,000 00	4,406 28	544,556 12
Sacramento	203,365 16	187,061 98	557,494 88	225,344 09	65,414 33	1,664,000 00	14,832 18	2,917,512 72
San Benito	25,692 40	26,503 85	49,309 68	16,830 80	4,733 82	151,000 00	270 11	274,340 66
San Bernardino	403,574 26	170,082 37	249,188 30	140,088 08	82,702 82	6,500 00	24,557 63	1,076,693 46
San Diego	129,934 69	220,158 75	404,640 00	219,493 04	104,288 61	361,200 00	25,768 79	1,465,483 88
San Francisco	18,984 87	778,175 43	2,029,565 92	314,828 19	767,275 00	680,826 02	121,067 77	4,710,723 20

San Joaquin	304,846 86	186,656 46	478,664 90	164,801 51	77,269 97	148,500 00	25,882 71	1,386,622 41
San Luis Obispo	85,803 85	70,434 66	129,857 27	49,973 58	15,432 36	203,000 00	1,254 62	555,756 34
San Mateo	65,863 67	96,788 00	176,402 00	88,391 15	37,434 80		1,846 58	466,726 20
Santa Barbara	146,721 58	88,098 82	238,577 50	85,207 00	30,800 00	403,506 00	6,210 43	999,121 33
Santa Clara	196,889 64	228,201 04	458,914 90	294,708 95	20,060 62	432,000 00	53,543 00	1,684,318 15
Santa Cruz	21,102 84	66,307 46	102,265 38	47,016 55	17,352 22		6,724 43	260,768 88
Shasta	55,492 37	56,653 90	84,037 33	5,579 43	3,052 50	3,400 00	593 34	208,808 87
Sierra	10,053 30	6,548 90	14,827 33	75 89				31,505 42
Siskiyou	135,570 14	67,657 11	111,888 35	28,577 89	2,520 34	51,000 00	3,365 67	400,579 50
Solano	42,225 22	70,829 80	138,026 90	53,161 93	22,105 44	257,200 00	3,115 12	586,664 41
Sonoma	51,302 48	141,621 50	241,770 50	64,831 23	16,989 44	56,000 00	13,198 21	585,713 36
Stanislaus	366,950 55	125,810 75	217,846 85	103,799 17	70,325 99	184,293 00	12,257 22	1,081,283 53
Sutter	32,632 92	27,100 57	50,100 76	23,208 34	5,188 01	90,000 00	1,545 47	229,776 07
Tehama	70,763 18	41,656 81	85,388 65	18,636 07	5,943 33	21,299 45	1,851 10	245,538 59
Trinity	12,750 08	11,008 24	12,565 20	935 71		600 00	4,301 00	42,160 32
Tulare	154,691 31	170,537 70	252,917 70	106,596 54	51,844 84	180,500 00	31,538 36	948,626 45
Tuolumne	13,921 12	25,826 99	39,856 57		1,367 14		1,732 53	82,704 35
Ventura	67,590 82	74,112 28	165,691 87	81,761 43	33,006 08	122,700 00	1,750 72	546,613 20
Yolo	85,015 15	43,335 64	86,115 52	26,247 01	10,265 91	20,000 00	2,046 33	273,025 56
Yuba	20,703 93	29,319 57	55,040 50	11,867 60	10,632 94		1,353 45	128,917 99
Totals	$7,918,593 99	$7,473,264 19	$16,454,956 87	$8,241,222 18	$3,215,262 77	$10,806,226 74	$1,073,732 76	$55,183,259 50

TABLE No. 12—Continued.

Statistics of Elementary Schools, Showing Receipts from All Sources Within the School Year Ending June 30, 1922, by Counties.

Counties	Balance on hand June 30, 1921	Total receipts from state	Total receipts from county	Total receipts from district taxes			Miscellaneous sources	Total receipts
				Taxes for maintenance	Special taxes for building	Taxes from sale of bonds		
Alameda	$697,361 49	$1,137,647 90	$1,223,345 60	$1,099,129 32	$261,475 76	$2,118,000 00	$33,888 75	$6,570,848 82
Alpine	3,843 19	2,249 23	2,741 89				194 78	9,029 09
Amador	18,378 54	41,397 67	37,562 86	5,603 49	32 28		388 30	103,363 14
Butte	81,322 75	137,958 59	153,919 92	69,757 07	27,592 03	102,000 00	4,212 34	576,762 70
Calaveras	20,116 71	42,345 35	48,594 00				1,094 07	112,150 13
Colusa	28,986 06	46,230 78	61,197 59	9,842 41	9,274 28	37,847 59	2,564 89	195,943 60
Contra Costa	339,716 55	239,230 83	334,734 12	140,442 00	40,292 80	316,050 00	4,146 47	1,414,612 57
Del Norte	10,656 35	16,143 93	20,988 96				1,647 34	49,436 58
El Dorado	17,277 13	45,672 90	46,240 23	488 94			299 00	109,978 20
Fresno	390,020 76	633,439 94	657,386 00	304,265 45	143,265 81	697,000 00	78,518 11	2,903,896 07
Glenn	116,870 29	65,681 40	72,753 25	22,034 69	1,205 37	115,446 00	2,509 55	396,500 55
Humboldt	124,457 58	178,269 40	192,731 00	24,131 79	24,926 68	10,350 00	16,141 81	571,008 26
Imperial	184,649 29	173,017 72	188,971 00	101,676 78	30,490 62	171,901 62	30,791 13	881,498 16
Inyo	32,945 32	36,152 34	35,665 00	6,694 25	4,951 30	17,000 00	1,574 06	134,982 27
Kern	472,728 59	281,175 75	494,313 00	300,482 83	252,038 84	326,900 00	21,223 34	2,148,862 35
Kings	243,383 27	114,335 68	112,425 40	41,945 00	26,319 32	69,000 00	1,150 55	608,559 22
Lake	21,230 79	32,350 70	33,522 54	4,248 20		81,067 00	713 20	173,132 43
Lassen	48,192 04	49,493 07	50,075 80	11,846 88		57,358 35	2,137 68	219,103 82
Los Angeles	2,599,869 19	3,162,446 35	4,646,986 96	3,279,953 84	1,025,688 00	8,664,000 00	727,164 89	24,106,109 23
Madera	41,737 47	83,041 94	93,979 00	34,320 96	6,444 63	57,077 00	9,216 77	325,817 77
Marin	103,961 99	100,391 90	98,620 56	51,463 01	14,358 56	35,000 00	15,466 98	419,263 00
Mariposa	11,695 34	22,732 92	18,813 76	77 26			412 80	53,732 08
Mendocino	80,736 98	142,018 16	147,630 00	9,791 86	973 16	237,009 00	3,302 43	621,461 59
Merced	75,736 44	135,301 86	128,831 18	45,268 74	33,329 41	202,700 00	4,027 47	625,195 10
Modoc	15,995 35	40,217 52	41,485 33	1,779 29		9,050 00	1,834 83	110,362 32
Mono	7,260 58	7,556 95	7,975 00				3,872 99	36,665 52
Monterey	230,957 67	140,995 42	148,665 20	46,262 22	33,753 84	48,892 98	1,800 07	651,327 40
Napa	47,620 52	81,225 92	80,017 98	11,320 44	13,327 24	300,000 00	764 74	534,276 84
Nevada	16,131 41	54,197 22	54,428 86	10,072 22			1,699 58	136,529 29
Orange	345,816 34	280,358 00	406,410 00	317,732 74	63,050 45	379,000 00	7,689 66	1,800,057 19
Placer	92,433 18	89,422 89	111,557 54	18,224 84	3,870 59		4,809 12	320,318 16
Plumas	36,104 25	30,747 96	28,950 21	4,885 82	3,556 59		2,135 63	106,380 46
Riverside	93,776 98	215,460 77	206,439 00	96,091 02	20,270 00	74,000 00	10,619 99	716,657 76
Sacramento	1,264,281 45	321,675 11	551,835 40	165,877 66	64,413 15	948,000 00	17,937 84	3,334,020 61
San Benito	73,664 47	47,917 13	49,877 42	8,874 94	2,222 45		812 88	183,369 29
San Bernardino	228,451 64	301,770 63	312,938 15	148,916 74	72,194 78	164,000 00	15,486 66	1,243,758 60
San Diego	412,797 51	394,162 20	429,352 00	224,443 91	108,903 84	113,200 00	48,920 93	1,731,780 39
San Francisco	285,613 51	1,205,909 17	1,941,945 68		1,780,015 50	1,013,704 46	118,827 33	6,346,015 65

San Joaquin	263,400 18	331,804 55	400,258 80	156,911 27	86,120 19	952,500 00	3,598 63	2,194,593 62
San Luis Obispo	215,465 29	120,595 34	130,597 54	64,773 94	7,252 29	14,000 00	2,611 67	555,296 07
San Mateo	48,669 63	163,083 09	171,221 75	84,173 47	13,353 70	256,000 00	6,080 28	742,581 92
Santa Barbara	490,204 88	148,374 42	183,985 00	85,049 00	28,480 00	159,000 00	4,675 74	1,099,769 04
Santa Clara	287,019 28	397,570 29	427,500 00	226,320 59		567,000 00	11,794 04	1,917,204 20
Santa Cruz	21,751 75	119,263 10	117,307 25	44,572 45	21,215 49	54,038 10	4,907 50	383,055 64
Shasta	65,669 34	99,481 57	105,531 60				9,975 31	280,657 82
Sierra	15,708 38	11,000 80	14,963 75	408 12				40,081 05
Siskiyou	83 507 26	120,054 70	121,233 75	17,548 37		1,764 84	18,637 34	362,746 26
Solano	271,432 53	123,483 26	137,514 00	41,287 08	21,403 72	14,000 00	3,036 37	612,156 96
Sonoma	112,125 60	259,506 00	258,504 00	79,659 18		70,500 00	15,088 65	795,383 43
Stanislaus	208,099 75	228,239 29	264,452 05	90,018 65	54,734 07	204,696 00	6,513 41	1,056,753 22
Sutter	76,111 28	48,945 17	51,526 50	17,078 75	4,701 47	62,500 00	234 23	261,097 40
Tehama	70,198 26	70,351 40	68,530 00	12,704 66	11,335 13	10,135 00	8,701 81	252,455 66
Trinity	9,794 82	17,694 26	18,334 40				1,413 86	47,237 34
Tulare	134,773 98	312,474 15	306,952 50	122,254 21	46,422 14	485,300 00	33,318 35	1,441,495 33
Tuolumne	12,280 61	43,891 09	45,642 59	10 71			1,597 37	103,422 37
Ventura	165,303 01	129,529 68	157,353 04	60,639 22	20,994 23	210,000 00	2,567 31	746,386 49
Yolo	41,715 31	72,835 83	74,751 81	13,868 01	4,697 94	15,000 00	499 00	223,367 90
Yuba	27,658 91	49,281 13	48,547 25	6,632 23	14,902 79		1,145 18	148,167 49
Totals	$11,535,669 02	$12,997,802 12	$16,378,614 97	$7,741,855 92	$4,404,350 44	$19,441,987 94	$1,336,395 01	$73,836,675 42

TABLE No. 13.

Statistics of Elementary Schools Expenditures for All Purposes for School Year Ending June 30, 1921.

Counties	General control	Teachers' salaries	Other expenses of instruction	Library	Operation of school plant	Maintenance of school plant	Fixed charges	Capital outlays	Auxiliary agencies and sundry activities	Total expenditures	Balance on hand
Alameda	$86,067 81	$2,565,702 80	$91,811 28	$27,202 73	$265,450 20	$113,231 56	$57,832 88	$734,709 85	$23,487 55	$3,905,496 66	$207,502 82
Alpine		2,959 00		1,507 43	1,484 57	1,259 27		2,345 23		67,425 71	3,842 31
Amador		215,713 37	3,860 22	4,885 28	5,734 55	8,668 68	560 14	38,919 29	555 10	329,270 96	18,378 54
Butte	7,769 28	315,403 27	12,288 45	4,205 32	31,694 55	8,033 12	3,251 75	30,144 76	6,760 38	382,382 47	82,382 47
Calaveras		80,792 56	4,206 32	1,377 77	2,345 53	515 57	482 58	4,513 02		64,133 35	21,197 58
Colusa		70,056 24	4,937 26	1,847 85	7,632 24	3,484 16	480 19	13,683 44	151 91	102,302 29	30,144 45
Contra Costa	2,549 39	477,347 83	10,495 90	6,058 35	48,679 46	42,497 91	5,726 48	408,715 36	8,969 32	1,010,958 35	332,712 95
Del Norte	6 00	24,356 25	3,831 79	783 13	2,630 71	563 33	921 60	1,875 09	108 85	35,421 06	10,658 35
El Dorado	14 03	53,132 90	2,025 53	1,107 61	2,580 13	923 80		1,096,010 85	44 604 16	2,562,802 94	17,277 13
Fresno	20,819 95	1,088,387 67	40,475 30	15,000 00	113,444 11	78,595 18	16,865 81	72,031 11	946 00	203,107 47	390,021 56
Glenn	1,597 05	260,769 04	13,207 34	9,058 56	30,876 21	13,631 24	2,767 41	12,523 17	56 11	353,486 13	116,870 29
Humboldt	2,666 67	387,860 91	21,526 03	3,925 47	40,953 92	9,163 29	2,767 41	279,190 67	39,901 92	812,174 60	124,457 88
Imperial	207 97	45,438 16	3,417 52	1,136 43	4,313 65	2,443 34	432 80	22,269 87	582 60	82,742 54	194,649 29
Inyo	11,709 11	515,834 92	40,322 57	8,953 18	79,200 76	56,011 60	13,373 76	178,334 67	50,761 00	1,259,703 33	472,217 93
Kern	1,079 56	163,043 36	13,590 21	2,852 14	25,094 94	14,182 05	300 25	856 81	8,637 53	57,919 32	243,343 27
Kings	16 36	78,855 06	4,460 75	2,125 00	8,033 12	2,928 80	1,946 60	72,107 76	614 13	162,788 22	49,842 97
Lassen		87,305 70	6,870,837 38	304,827 29	75,942 03	886,968 74	393,423 45	430,846 22	2,886,201 01	117,741 76	12,294,063 52	2,599,874 09
Los Angeles											
Madera		197 99	175,305 28	6,919 45	3,076 57	21,809 09	4,796 70	160,649 94	2,934 64	384,392 61	11,695 54
Marin			27,817 70	1,303 61	350 56	1,959 79	941 87	1,213 55		33,586 08	
Mariposa		393 95	162,736 12	10,933 96	2,077 43	24,395 80	5,203 18	18,073 18	2,570 96	226,151 84	80,736 98
Mendocino	1,176 20	188,069 52	14,784 24	4,704 24	11,170 74	5,761 05	1,838 63	67,881 08	6,713 23	332,656 11	74,536 44
Merced	294 19	100,137 00			227 02	1,465 50	864 85	255 00	827 39	12,776 66	7,373 16
Modoc		218,388 35	9,967 08	4,550 76	21,517 29	6,965 12	2,281 38	149,504 80	9,673 52	424,285 75	231,112 27
Monterey	1,417 45	746 95	115,215 25	9,054 99	1,625 51	12,630 10	6,616 08	1,182 87	21,334 74	173,195 53	16,133 41
Napa	344 38	70,812 32	3,628 53	1,309 39	7,838 61	2,989 83	1,582 72	542,029 91	5,726 50	1,233,940 12	344,928 25
Nevada	2,781 38	520,135 77	444,701 91	6,164 15	10,995 67	30,015 46	9,385 76	16,693 00	4,201 82	175,920 69	91,970 26
Orange	469 00	98,315 59	4,621 19	1,450 00	4,812 22	3,606 01	6,213 35	66,986 26		186,653 62	36,104 25
Placer	4,048 99	394,677 32	15,298 56	5,496 82	49,330 35	18,376 84	5,670 57	222,398 26	21,629 13	450,916 84	93,639 28
Plumas	37,139 52	736,358 24	24,112 33	8,266 17	73,180 85	64,096 02	7,264 80	682,128 50	20,690 54	1,653,231 37	1,594,284 45
Riverside	20 00	67,755 68	5,054 02	1,540 85	5,897 79	1,686 30	1,357 13	113,725 99	16,227 22	197,989 86	27,451 69
Sacramento	5,704 38	443,895 12	23,169 89	6,436 39	98,544 28	15,925 74	7,484 60	147,983 07	17,736 22	1,424,983 37	278,461 64
San Bernardino	9,559 17	699,455 55	52,340 45	12,790 02	81,259 74	45,233 76	14,498 40	139,793 77	16,227 10	1,052,886 10	412,797 51
San Diego		2,750,247 10	201,582 14	48,130 50	270,155 15	124,334 72	190,570 90	1,018,629 62	42,457 11	4,430,011 59	280,711 61
San Francisco		2,630,477 40	80,153 16	10,347 39	77,554 89	19,467 58	3,404 91	385,479 77	7,791 57	1,142,423 17	244,199 24
San Joaquin	25,567 54	1,171 08	186,356 60	11,799 91	5,196 85	18,167 57	6,743 43	2,723 40	99,038 75	7,783 82	338,881 41	216,874 93
San Luis Obispo											

San Mateo	1,619 44	275,161 23	2,792 05	3,832 12	64,068 53	12,108 68	4,683 85	50,585 14	3,205 53	418,056 57	48,669 63
Santa Barbara	10,469 56	273,252 55	27,526 64	5,913 54	34,908 39	14,053 84	5,185 15	132,938 04	4,668 74	508,916 45	490,204 88
Santa Clara	3,101 17	712,514 01	25,395 62	9,728 76	83,581 08	20,048 81	12,645 49	524,308 38	5,975 55	1,397,298 87	287,019 28
Santa Cruz	679 15	174,874 12	9,471 45	4,318 26	23,141 77	6,205 02	3,958 27	13,239 02	3,130 07	239,017 13	21,751 75
Shasta	243 53	99,995 55	3,556 59	1,766 56	13,271 84	12,371 47	987 28	6,399 89	29 30	138,622 01	70,186 86
Sierra	3 50	14,658 50	1,096 90	398 27	1,443 41	347 04	216 66	279 76		18,444 04	13,061 38
Siskiyou	369 80	153,517 99	7,939 16		19,137 58	4,898 76	2,513 40	125,317 18	1,482 86	315,176 73	85,402 77
Solano	5,545 18	185,649 36	10,458 42	4,420 53	22,734 49	11,005 54	2,125 39	71,353 20	1,939 77	315,231 88	271,432 53
Sonoma	2,048 04	350,223 61	26,175 39	5,604 18	31,271 87	20,922 72	4,752 53	17,875 01	5,879 54	473,752 89	111,960 47
Stanislaus	1,332 69	369,972 15	22,378 50	5,268 84	50,152 66	21,449 21	6,277 17	372,044 30	23,408 26	873,183 78	208,099 75
Sutter	340 70	66,883 28	5,512 23	1,697 69	7,782 26	6,287 54	1,326 55	62,107 22	1,327 75	153,265 22	76,510 85
Tehama	13 00	97,481 79	9,314 28	68 41	13,126 74	7,576 42	1,011 28	43,925 10		172,517 02	73,021 57
Trinity	36 20	21,850 00	1,278 04	616 00	2,093 22	618 39	45 65	1,570 19	4,257 81	32,365 50	9,794 82
Tulare	14,167 80	407,429 00	28,576 63	8,188 39	67,789 58	26,791 85	7,624 50	238,924 21	12,353 07	811,845 03	136,781 42
Tuolumne	201 06	51,978 23	2,792 04	1,103 93	6,268 88	1,141 64	358 40	3,419 41		67,263 59	15,440 76
Ventura	1,453 39	226,095 75	15,924 88	4,361 31	28,615 25	8,425 28	1,958 54	87,470 47	6,079 18	380,384 05	166,229 15
Yolo		106,792 41	8,413 88	2,083 09	13,076 22	3,798 48	3,577 73	92,542 14	1,026 30	231,310 25	41,715 31
Yuba		70,333 00	5,333 66	1,991 41	8,239 14	2,964 19	2,408 25	9,935 43		101,259 08	27,658 91
Totals	$540,513 03	$24,274,390 60	$1,263,804 19	$314,989 32	$2,937,183 69	$1,324,121 44	$860,978 20	$12,056,587 75	$568,120 86	$44,140,689 08	$11,042,570 42

TABLE No. 13—Continued.

Statistics of Elemenatary Schools, Showing Expenditures for All Purposes for School Year Ending June 30, 1922.

Counties	General control	Teachers' salaries	Other expenses of instruction	Library	Operation of school plant	Maintenance of school plant	Fixed charges	Capital outlays	Auxiliary expenses	Total expenditures	Balance on hand
Alameda	$110,443 94	$2,790,616 79	$102,782 11	$23,494 20	$260,772 86	$116,965 47	$33 366 36	$1,296,965 97	$78,162 90	$4,813,570 60	$1,757,278 22
Alpine		3,651 00		88 85	285 79	314 61		188 00	145 50	4,673 75	4,355 34
Amador	3 02	64,584 70	3,151 28	1,456 08	7,122 25	879 03	472 47	1,568 14	1,451 90	80,688 87	22,674 27
Butte	9,612 54	257,488 48	11,521 45	5,457 36	36,775 16	17,862 22	3,061 51	160,161 54	7,067 95	509,008 21	67,754 49
Calaveras		64,248 91	3,826 12	1,414 32	3,221 04	2,129 37	666 54	2,842 08		78,348 38	33,801 75
Colusa	5 00	79,036 43	5,990 87	2,223 14	8,735 66	4,552 83	1,072 85	17,330 74	3,873 25	122,800 77	73,142 83
Contra Costa	2,456 19	515,410 77	5,432 58	11,702 06	58,911 35	52,720 41	8,794 31	299,168 84	11,162 24	965,758 75	448,853 82
Del Norte	37 00	28,006 35	4,016 06	802 88	3,079 74	1,952 12	275 00	305 24	2,421 04	40,895 43	8,541 15
El Dorado	35 32	71,201 82	2,538 86	1,194 58	4,492 80	2,841 42	307 50	2,402 14	7 20	85,021 64	24,956 56
Fresno	18,195 13	1,257,643 40	93,454 68	20,619 96	140,252 20	65,382 13	24,513 10	675,208 45	22,450 05	2,317,719 10	586,176 97
Glenn	919 09	107,558 13	6,445 58	3,254 20	14,404 96	12,041 47	3,098 15	194,148 54	3,441 72	345,311 84	51,188 71
Humboldt	3,732 76	320,197 88	16,133 53	8,217 70	35,591 72	16,340 88	2,486 75	27,305 90	1,208 67	431,215 79	139,792 47
Imperial	16,752 55	328,691 50	15,586 22	4,576 24	53,066 73	19,485 44	11,432 48	187,702 25	25,654 86	662,856 57	218,641 59
Inyo	752 86	54,526 33	3,423 23	987 50	5,164 47	3,269 59	866 51	32,347 21	6,394 34	107,732 04	27,250 23
Kern	21,481 63	667,560 07	47,184 11	10,767 79	102,440 89	62,994 44	13,673 50	456,930 43	79,839 62	1,462,872 48	685,989 87
Kings	980 45	190,981 26	7,492 72	5,868 50	38,656 00	11,052 93	3,039 36	228,093 16	4,268 33	490,432 71	118,126 51
Lake	58 61	51,642 85	3,779 92	1,546 73	3,004 64	2,656 92	639 12	13,654 41	8,440 81	85,424 01	87,708 42
Lassen	163 62	91,867 70	6,649 20	2,975 00	8,430 72	4,854 09	1,496 51	31,334 92	635 72	148,407 48	70,696 34
Los Angeles	292,651 17	8,404,970 03	480,285 02	106,550 35	824,743 69	420,504 20	535,863 44	6,351,662 37	114,936 97	17,532,167 24	6,573,941 99
Madera	168 35	146,759 95	13,758 06	3,439 42	18,522 28	4,377 06	1,562 57	46,101 79	18,579 85	255,249 33	70,568 44
Marin	10,847 25	191,629 07	6,112 24	3,798 68	23,821 83	6,165 06	2,344 54	107,360 92	2,578 61	354,658 80	64,604 20
Mariposa	12 00	34,464 66	2,262 07	745 45	2,190 23	746 54	382 30	1,162 90	25 00	41,991 15	11,740 93
Mendocino	461 12	206,942 71	12,213 12	4,735 07	17,243 18	7,759 40	1,712 08	60,248 91	4 835 18	316,150 77	305,310 82
Merced	1,476 03	232,354 78	16,800 44	7,580 03	27,535 18	16,594 63	5,197 68	213,714 31	9,566 54	530,819 62	94,375 48
Modoc	55 86	66,827 24	4,407 63	729 54	8,464 55	1,187 75	434 21	11,936 27	108 75	94,151 80	16,210 52
Mono		15,345 11		277 47	1,835 60	353 78		630 35	466 00	18,908 31	7,757 21
Monterey	4,966 54	245,783 22	12,323 46	7,797 26	26,075 85	17,522 51	2,102 58	135,940 59	11,000 18	463,512 19	187,815 21
Napa	695 73	131,325 26	7,381 07	1,006 91	14,797 25	6,588 92	2,114 96	166,842 29	2,847 54	333,499 93	200,776 91
Nevada	2,083 36	87,970 84	3,306 37	1,441 50	8,367 12	6,551 91	1,236 01	4,665 09	368 26	115,990 46	20,538 83
Orange	13,362 36	624,953 65	33,039 68	11,864 01	92,336 18	41,399 76	8,543 64	455,975 63	25,788 76	1,307,263 67	492,793 52
Placer	96 19	140,360 40	5,839 82	3,575 75	21,611 87	9,054 71	4,953 36	71,398 32	6,849 03	263,739 45	56,578 71
Plumas	38 70	50,245 68	4,808 31	2,000 00	5,450 28	3,229 12	830 45	12,536 12	3,760 58	82,899 24	23,481 22
Riverside	8,235 31	374,487 26	14,815 99	7,273 58	51,348 79	29,840 55	5,946 03	75,597 99	26,873 69	594,419 19	122,238 57
Sacramento	24,930 04	818,126 07	43,629 39	12,080 20	85,878 70	74,336 71	10,312 86	1,519,865 08	29,488 47	2,618,655 52	715,385 09
San Benito	31 00	82,888 77	3,199 65	1,819 00	11,109 40	3,250 96	2,143 30	55,967 12	83 78	160,492 98	22,876 31
San Bernardino	5,642 97	554,394 04	30,785 47	11,835 62	104,679 55	28,328 86	7,216 75	130,740 74	22,948 21	896,572 21	347,186 39
San Diego	10,232 35	817,619 84	47,782 14	13,719 75	94,207 43	43,712 08	14,068 64	365,562 26	30,506 82	1,437,411 31	294,369 08
San Francisco		2,860,959 56	63,363 95	18,946 96	263,437 07	145,864 23	254,116 80	2,535,713 51	56,185 24	6,198,587 32	147 428 33
San Joaquin	26,960 51	673,200 38	29,771 58	13,064 82	82 588 90	24,667 90	4,604 06	441,336 90	8,930 08	1,305,125 13	889,468 49
San Luis Obispo	2,282 74	212,049 55	11,223 15	6,557 66	20,101 23	11,419 28	3,349 10	180,417 32	9,498 91	456,898 94	98,397 13

San Mateo	1,131 84	305,457 40	20,462 30	5,426 38	41,630 76	28,464 55	4,867 43	93,843 76	6,062 48	507,346 90	235,235 02
Santa Barbara	9,846 22	292,639 04	29,559 86	6,620 56	41,250 15	17,892 71	4,377 19	424,699 95	6,253 80	833,139 48	266,629 56
Santa Clara	3,076 25	792,741 64	30,787 14	9,931 25	87,059 83	23,579 35	14,161 76	224,630 55	11,614 57	1,197,582 34	719,621 86
Santa Cruz	2,338 64	209,521 02	9,601 00	4,662 33	29,961 35	9,818 90	1,073 21	42,118 65	5,152 75	314,247 85	68,807 79
Shasta	850 81	152,465 89	12,297 12	4,902 51	13,357 58	9,908 67	1,196 88	5,441 75	1,471 69	201,892 90	78,764 92
Sierra	18 10	21,605 00	1,212 02	495 47	1,919 80	1,084 55	162 50	175 00		26,672 44	13,408 61
Siskiyou	563 22	197,913 46	8,670 89	7,375 00	22,507 69	12,616 70	1,208 60	20,663 03	3,013 67	274,532 26	88,214 00
Solano	4,427 46	232,898 14	8,601 11	5,216 00	27,321 79	14,177 53	4,609 51	240,008 11	2,111 90	539,371 55	72,785 41
Sonoma	2,663 61	432,140 50	29,647 00	7,079 01	35,672 39	39,565 33	9,117 06	110,743 12	8,028 62	674,656 64	120,726 79
Stanislaus	1,954 14	396,312 07	20,846 62	10,773 60	53,199 06	20,313 39	8,299 53	321,489 02	26,631 59	859,819 02	196,934 20
Sutter	258 43	82,533 65	5,108 91	2,835 00	9,483 74	3,823 32	1,745 16	94,663 13	3,515 98	203,967 32	57,130 08
Tehama		123,909 89	9,149 03	57 00	16,935 44	10,727 53	1,888 03	44,987 92	4,824 59	212,479 43	39,976 23
Trinity	65 30	28,917 86	1,339 23	690 00	2,190 93	978 09	117 74	1,960 30	3,794 75	40,054 20	7,183 14
Tulare	6,899 58	526,529 76	30,990 72	11,751 45	73,819 38	42,325 08	7,828 35	158,289 84	25,984 58	884,418 74	557,076 59
Tuolumne	12 50	66,186 10	2,993 71	1,452 78	5,752 65	3,727 87	803 70	93 30	123 70	81,146 31	22,276 06
Ventura	13,005 58	251,425 81	14,565 62	4,169 17	28,546 73	9,943 89	3,527 55	159,441 41	6,008 12	490,633 88	255,752 61
Yolo		115,938 23	8,734 24	2,273 44	13,352 93	4,651 93	1,339 89	20,512 44	1,381 60	168,184 70	55,183 20
Yuba	276 14	83,978 39	5,916 59	2,276 96	7,711 28	7,220 80	1,009 92	12,463 03	2,028 70	122,881 81	25,285 68
Totals	$638,237 41	$28,231,496 89	$1,436,980 24	$437,474 03	$3,102,428 62	$1,562,549 48	$1,045,631 39	$18,549,257 05	$760,855 64	$55,764,910 75	$18,071,764 67

TABLE No. 13—Continued.

Statistics of Elementary Schools, Showing Valuation of All Property and Total Bonded Indebtedness of Such Schools for Years Ending June 30, 1921, and June 30, 1922.

Counties	Valuation of lots and school houses		Valuation of school libraries		Valuation of school furniture apparatus and equipment		Total valuation of school property		Total bonded indebtedness of districts outstanding	
	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22
Alameda	$8,972,160	$10,915,271	$105,693	$121,012	$419,172	$574,662	$9,497,025	$11,610,945	$3,707,875	$5,643,000
Alpine	3,675	3,575	1,050	1,155	1,200	1,200	5,925	5,930		
Amador	91,918	89,868	15,305	14,893	20,151	21,336	127,374	126,097		
Butte	550,340	690,586	11,665	13,665	49,625	65,970	611,630	770,221	275,580	261,720
Calaveras	68,825	68,425	7,890	7,840	11,115	11,065	87,830	87,330		
Colusa	189,590	197,250	8,220	7,370	20,170	29,670	217,890	234,290	80,000	122,000
Contra Costa	1,478,675	1,692,050	23,498	26,013	22,310	32,935	1,524,483	1,750,998	1,305,850	1,392,700
Del Norte	23,200	23,200	4,030	4,030	4,345	4,325	31,575	31,555		
El Dorado	89,075	90,800	8,441	9,162	8,730	9,161	106,246	109,123	35,000	34,000
Fresno	3,862,740	4,505,056	25,746	26,875	653,977	725,837	4,542,463	5,257,768	2,264,960	2,954,000
Glenn	341,850	514,750	11,305	10,915	21,195	25,105	374,350	550,770	242,800	343,100
Humboldt	449,666	513,955	11,965	12,839	23,395	52,939	485,020	579,733	24,800	
Imperial	1,313,950	425,403	2,900	3,200	145,020	144,766	1,461,870	573,369	1,099,300	1,078,900
Inyo	107,350	137,427	1,365	1,893	11,400	11,490	120,115	150,810	107,450	115,950
Kern	2,065,959	2,366,672	33,136	33,121	248,345	290,901	2,347,440	2,690,694	1,115,125	1,330,000
Kings	707,615	856,550	6,070	7,602	49,127	87,225	762,812	951,377	456,000	488,050
Lake	57,985	66,310	4,755	4,580	4,597	6,125	67,337	77,015	14,100	94,000
Lassen	145,695	149,320	4,230	4,130	17,155	14,915	167,080	168,365	88,224	133,000
Los Angeles	20,766,907	28,310,604	328,162	376,059	2,168,861	2,540,314	23,263,870	31,226,977	11,120,830	19,353,400
Madera	400,450	376,450	300	300	53,075	60,000	453,525	436,750	194,625	235,200
Marin	596,550	626,150	15,750	14,900	22,150	23,800	634,450	664,850	29,700	307,850
Mariposa	43,425	45,000	7,475	7,500	7,310	7,500	58,210	60,000	10,700	9,300
Mendocino	160,650	209,050	13,520	13,520	37,650	37,650	211,820	260,220	19,175	243,375
Merced	426,257	694,100	33,165	18,950	48,150	73,931	507,572	786,981	208,260	382,845
Modoc	92,255	104,635	7,495	6,700	9,640	13,480	109,390	124,815	25,040	20,260
Mono	5,825	5,625	1,450	1,550	1,950	2,000	9,225	9,175		
Monterey	520,465	550,459	22,800	21,690	61,331	69,950	604,596	642,099	374,000	388,850
Napa	188,125	413,525	7,700	7,195	10,650	11,155	206,475	431,875	18,600	317,650
Nevada	134,385	122,010	16,942	10,380	30,203	29,275	181,530	161,665		
Orange	1,791,028	2,050,990	26,615	23,725	98,860	92,750	1,916,503	2,167,465	1,255,887	1,633,000
Placer	224,375	274,275	5,210	5,275	16,685	20,260	246,270	299,810	134,700	130,200
Plumas	61,000	64,650	6,145	4,700	13,800	19,500	80,945	88,850		
Riverside	924,375	956,150	19,190	20,725	84,584	98,559	1,028,149	1,075,434	658,070	589,275
Sacramento	2,452,525	3,048,700	19,210	13,750	279,200	331,950	2,750,935	3,394,400	2,574,500	3,475,300
San Benito	136,525	270,025	5,035	4,985	8,655	9,180	150,215	284,190	184,775	174,850
San Bernardino	1,780,828	1,776,496	31,050	27,985	137,996	148,858	1,949,874	1,953,339	798,900	927,400
San Diego	2,163,690	2,279,120	39,395	38,790	113,067	135,050	2,316,152	2,452,960	1,115,165	1,058,445
San Francisco	12,461,000	14,309,075	81,000	94,000	550,000	837,000	13,092,000	15,240,075	5,813,600	5,388,600

San Joaquin	1,915,165	2,304,278	36,274	40,909	138,350	162,025	2,089,780	2,507,212	1,181,525	2,068,450
San Luis Obispo	374,680	453,100	18,010	14,925	30,550	37,100	423,240	505,125	334,990	329,440
San Mateo	851,300	899,500	14,250	14,400	40,150	52,700	905,700	966,600	422,600	646,600
Santa Barbara	630,510	1,030,630	27,886	20,172	91,545	116,185	749,941	1,166,987	611,950	636,575
Santa Clara	2,174,070	2,529,936	31,735	23,950	145,777	202,964	2,351,582	2,756,850	1,039,750	1,522,100
Santa Cruz	556,105	592,540	12,125	11,225	37,102	37,117	605,332	640,882	97,890	145,820
Shasta	233,040	179,110	30,967	29,190	25,405	25,095	289,412	233,395	12,850	10,500
Sierra	33,225	33,400	3,410	3,590	5,032	4,885	41,667	41,875		
Siskiyou	311,417	337,235	13,019	5,355	41,253	50,670	365,689	393,260	189,500	177,800
Solano	324,200	578,100	15,900	16,020	48,850	81,160	388,950	675,280	365,800	365,740
Sonoma	618,650	696,600	31,685	43,700	58,195	66,275	708,530	806,575	209,525	310,176
Stanislaus	1,502,925	1,905,250	20,795	23,030	124,458	144,900	1,648,178	2,073,180	904,050	1,079,800
Sutter	233,350	314,950	5,205	4,155	12,840	25,094	251,395	344,199	204,600	155,150
Tehama	288,150	291,350			34,540	36,550	322,690	327,900	126,945	73,977
Trinity	23,800	24,720	1,565	1,295	4,480	4,435	29,845	30,450	600	518
Tulare	1,421,100	1,612,100	28,750	30,425	111,200	133,500	1,561,050	1,776,025	896,007	1,272,518
Tuolumne	88,650	90,100	6,100	6,500	4,545	7,370	99,295	103,970	28,000	24,500
Ventura	552,360	690,128	9,610	8,170	42,875	55,602	604,845	753,900	225,500	428,500
Yolo	407,620	414,400	8,590	10,655	27,980	28,930	444,190	453,985	261,920	230,530
Yuba	190,470	190,470	6,150	6,750	8,850	15,850	205,470	213,070	21,000	21,000
Totals	$78,581,599	$94,961,454	$1,296,539	$1,337,390	$6,518,823	$7,960,196	$86,396,961	$104,259,040	$42,497,593	$58,025,914

TABLE No. 14.

atistics of Elementary Schools Showing Average Rate per Pupil Apportioned on Average Daily Attendance, and Averag Cost per Pupil, Not Including Cost of Sites, Building and Grounds.

Counties	Rate per pupil apportioned on attendance		Average cost per pupil in average daily attendance	
	1920-21	1921-22	1920-21	1921-22
Alameda	$27 62	$12 75	$79 24	$82 39
Alpine	52 11	29 02	131 12	172 53
Amador	10 89	6 11	63 03	74 71
Butte	36 50	13 96	70 60	82 02
Calaveras	16 80	17 00	65 51	85 03
Colusa	42 07	22 66	71 81	82 85
Contra Costa	36 84	22 43	74 22	80 91
Del Norte	39 67	13 23	80 51	94 28
El Dorado	17 69	9 65	71 58	94 31
Fresno	27 50	11 26	67 73	71 67
Glenn	39 00	14 51	74 68	84 82
Humboldt	26 67	12 35	67 31	76 69
Imperial	46 36	8 20	93 98	88 93
Inyo	23 14	9 52	66 48	83 76
Kern	42 17	33 35	86 29	103 96
Kings	24 17	10 16	61 23	65 44
Lake	23 42	11 40	80 14	102 71
Lassen	25 69	10 56	78 03	91 58
Los Angeles	41 36	23 89	83 05	87 96
Madera	32 17	14 76	67 79	84 92
Marin	29 87	9 26	68 74	70 48
Mariposa	25 59	*	95 27	116 65
Mendocino	26 19	11 78	58 59	72 32
Merced	25 37	9 13	62 49	67 21
Modoc	39 59	12 26	86 14	102 77
Mono	21 59	4 76	108 43	132 83
Monterey	37 67	12 06	71 80	85 48
Napa	11 47	10 26	66 98	73 61
Nevada	12 51	10 90	68 07	81 91
Orange	42 59	23 76	71 08	77 70
Placer	13 02	18 16	47 35	64 65
Plumas	76 39	4 76	93 64	108 42
Riverside	20 17	9 26	61 06	69 24
Sacramento	48 15	30 96	88 23	92 83
San Benito	29 38	12 32	69 66	83 75
San Bernardino	19 87	11 00	59 74	67 67
San Diego	27 17	12 76	70 17	77 87
San Francisco	40 44	29 77	94 96	82 26
San Joaquin	40 37	16 16	67 66	73 55
San Luis Obispo	29 17	12 76	71 91	79 36
San Mateo	26 34	11 54	66 46	71 28
Santa Barbara	44 17	17 76	79 62	81 90
Santa Clara	29 59	12 85	64 19	67 48
Santa Cruz	21 39	9 51	62 73	72 10
Shasta	19 45	13 50	66 77	95 60
Sierra	45 93	28 30	80 73	105 15
Siskiyou	24 76	10 53	64 22	83 26
Solano	29 57	13 76	64 23	74 73
Sonoma	22 59	9 00	59 12	69 50
Stanislaus	24 25	15 39	65 68	68 22
Sutter	28 49	12 26	69 58	76 86
Tehama	36 17	18 76	72 77	94 57
Trinity	13 02	9 96	103 68	115 08
Tulare	19 99	10 25	58 38	68 18
Tuolumne	22 66	12 31	58 35	66 22
Ventura	34 42	16 76	70 55	72 20
Yolo	30 90	10 96	63 69	65 11
Yuba	30 59	9 51	74 18	86 73
Averages	30 21	14 24	74 73	81 02

*Not apportioned according to law.

Section 4.

SECONDARY (HIGH) SCHOOLS.

Table No. 15. Showing Number of Schools, Number of Teachers Employed and Kinds of Certificates Held.

Table No. 16. Showing Number of Pupils Enrolled in Regular High Schools, Special Day and Evening Classes, Compulsory Part-time Classes, Junior Colleges, and Total Enrollment in the Regular High Schools, Special Day and Evening Classes, Compulsory Part-time Classes, Junior Colleges and Post Graduate High Schools.

Table No. 17. Showing Average Number of Days Schools Were Actually Open, Average Daily Attendance and Total Number of Graduates.

Table No. 18. Showing Amount of Money Apportioned to the High Schools by the State, Receipts from All Sources, Expenditures for All Purposes, Valuation of All Property, Outstanding Bonded Debts and Number of Books in Libraries.

Table No. 19. Showing Rate of County Tax and Average Cost per Pupil on Average Daily Attendance.

Table No. 20. Showing Number of Principals and Average Salary; Number of Regular Teachers and Average Salary.

TABLE No. 15.

Statistics of Secondary (High) Schools, Showing Number of Schools, Number of Teachers by Sex and by County, and Kinds of Certificates Held.

Counties	Number of schools		1920-21 Number of teachers employed								Total number employed	Kinds of certificate		Intermediate
			In regular high school				In junior colleges							
			Full time		Partial time		Full time		Partial time			Full high school	Special	
	1920-21	1921-22	Men	Women	Men	Women	Men	Women	Men	Women				
Alameda	38	25	182	419	71	107					779	429	348	2
Alpine														
Amador	3	3	5	11		1					17	12	5	
Butte	4	5	19	31	3	3					56	42	14	
Calaveras	2	3	4	5		1					10	7	3	
Colusa	5	5	9	19		1					29	24	5	
Contra Costa	7	7	20	53	3	8					84	57	27	
Del Norte	1	1	2	3	1						6	5	1	
El Dorado	1	1	5	3	1						9	7	2	
Fresno	16	18	136	187	28	17					368	231	137	
Glenn	3	3	7	20	1						28	24	4	
Humboldt	4	4	18	35	4	4					61	27	34	
Imperial	6	6	29	40	6	11					86	45	41	
Inyo	4	4	5	14							19	15	4	
Kern	5	5	38	56		3					97	62	35	
Kings	3	3	16	24		1					41	28	13	
Lake	3	4	6	10	3						19	15	4	
Lassen	4	4	4	8	1	2					15	11	4	
Los Angeles	56	54	664	1,250	29	50					1,993	1,119	874	
Madera	3	3	8	17							25	20	5	
Marin	3	3	11	21	7	7					46	26	20	
Mariposa	2	2	1	2							3	3		
Mendocino	9	10	13	26	2	1					42	35	7	
Merced	6	6	13	30	1	2					46	42	4	
Modoc	3	3	6	13							19	13	6	
Mono														
Monterey	6	5	25	29	1	1					56	37	19	
Napa	3	3	12	17		3					32	25	7	
Nevada	3	3	6	10	1	2					19	18	1	
Orange	8	8	63	94	1	4	1	1			164	113	51	
Placer	3	3	15	16							31	19	12	
Plumas	2	2	1	3							4	4		
Riverside	11	11	52	71	4	7	1		3		138	99	39	
Sacramento	6	6	43	92		7					142	81	61	
San Benito	1	1	6	7							13	12	1	
San Bernardino	8	8	68	104	8	8					188	106	82	
San Diego	11	9	66	114	30	45					255	148	107	
San Francisco	7	9	142	192	1	3					338	213	125	
San Joaquin	7	7	50	67	1	2					120	69	51	
San Luis Obispo	5	6	13	28	5	8					54	37	17	
San Mateo	5	4	18	30	4	2					54	32	22	
Sant Barbara	6	5	31	42	5	5					83	53	30	
Santa Clara	8	9	70	119	20	23					232	133	99	
Santa Cruz	3	3	16	34	4	2					56	37	19	
Shasta	3	3	9	15							24	21	3	
Sierra	1	1	3	3							6	6		
Siskiyou	4	3	17	24	1	2					44	37	7	
Solano	6	6	18	38	3						59	45	14	
Sonoma	7	7	43	79	6	5					133	96	37	
Stanislaus	8	8	34	71	3	8					116	80	36	
Sutter	2	2	4	9	1						14	9	5	
Tehama	4	4	11	18	3	1					33	26	7	
Trinity	1	1	2	4							6	5	1	
Tulare	10	10	40	68	4	9					121	86	35	
Tuolumne	2	2	3	11	1						15	12	3	
Ventura	6	6	20	30	2	3					55	37	18	
Yolo	3	3	8	17		1					26	20	6	
Yuba	2	2	9	10		1					20	11	9	
Totals	353	342	2,139	3,763	270	371	2	1	3		6,549	4,026	2,521	2

TABLE No. 15—Continued.

Statistics of Secondary (High) Schools, Showing Number of Teachers by Sex and by County, and Kinds of Certificates Held for Year Ending June 30, 1922.

Counties	Number of teachers employed								Total number employed	Kinds of certificates		
	In regular high schools				In junior colleges					Full high school	Special	Intermediate
	Full time		Partial time		Full time		Partial time					
	Men	Women	Men	Women	Men	Women	Men	Women				
Alameda	205	406	69	87					767	421	346	
Alpine												
Amador	5	13		1					19	11	8	
Butte	26	38	2	2					68	44	24	
Calaveras	4	5							9	6	3	
Colusa	14	17		1					32	25	7	
Contra Costa	24	62	3	7					96	74	22	
Del Norte	1	4	1						6	5	1	
El Dorado	4	6	1						11	7	4	
Fresno	133	189	15	36					373	208	165	
Glenn	9	21	1						31	26	5	
Humboldt	17	42	2	2	1		2		66	39	27	
Imperial	28	38	5	5					76	38	38	
Inyo	7	14							21	14	7	
Kern	42	65			1	2			110	63	47	
Kings	17	24	2	3					46	31	15	
Lake	9	12	2						23	17	6	
Lassen	3	13	2	1					19	15	4	
Los Angeles	696	1,415	91	104					2,306	1,309	997	
Madera	8	20							28	22	6	
Marin	13	25	6	9					53	37	16	
Mariposa	1	3							4	3	1	
Mendocino	18	29	3	1					51	41	10	
Merced	14	33		1		2			50	46	4	
Modoc	7	13							20	13	7	
Mono												
Monterey	26	32	2	1					61	45	16	
Napa	12	19	2	3					36	24	12	
Nevada	7	12		1					20	17	3	
Orange	76	113	5	8					202	133	69	
Placer	17	18	2	1					38	24	14	
Plumas	1	5	1						7	6	1	
Riverside	59	73	4	9					145	97	48	
Sacramento	59	103	1	3					166	105	61	
San Benito	5	11							16	12	4	
San Bernardino	75	104	13	10					202	113	89	
San Diego	76	116	34	44					270	144	126	
San Francisco	177	264	5	4					450	252	191	7
San Joaquin	51	75	8	14					148	88	60	
San Luis Obispo	12	28	10	10					60	40	20	
San Mateo	20	40	7	5					72	45	27	
Santa Barbara	29	49	3	5					86	54	32	
Santa Clara	65	123	28	33					249	155	94	
Santa Cruz	19	35	5	3					62	41	21	
Shasta		9		15					24	19	5	
Sierra	3	3							6	6		
Siskiyou	17	21	1	1					40	32	8	
Solano	20	43							63	49	14	
Sonoma	36	72	5	3					116	78	38	
Stanislaus	42	83	3	6					134	84	50	
Sutter	4	10	1						15	9	6	
Tehama	12	21	3	1					37	21	16	
Trinity	2	4							6	5	1	
Tulare	55	77	2	7					141	96	45	
Tuolumne	4	10	1						15	11	4	
Ventura	20	36	2						58	42	16	
Yolo	11	21	1	1					34	24	10	
Yuba	8	12							20	12	8	
Totals	2,325	4,149	354	448	2	4	2		7,284	4,398	2,879	7

TABLE No. 16.

Statistics of Secondary (High) Schools, Showing Enrollment in Regular High Schools, Special Day and Evening Classes, Compulsory Part-time Classes, and Junior Colleges for Year Ending June 30, 1921.

Counties	Regular high schools		Special day and evening classes		Compulsory part-time classes		Junior colleges		Total enrollment in all high schools		Grand total
	Total male	Total female	Total male	Total female	Total male	Total female	Total male	Total female	Males	Females	Males and females
Alameda	11,256	11,740	97	923	893	844			12,246	13,507	25,753
Alpine											
Amador	99	113		32					99	145	244
Butte	565	608	44	56	34	28	7	1	650	693	1,343
Calaveras	58	63							58	63	121
Colusa	140	161	45	57		2			185	220	405
Contra Costa	594	762	493	155	134	99			1,221	1,016	2,237
Del Norte	26	49							26	49	75
El Dorado	47	62							47	62	109
Fresno	2,346	2,351	2,181	2,023	233	205	81	75	4,841	4,654	9,495
Glenn	191	289	3	13					194	302	496
Humboldt	499	702	66	68	42	44	12	3	619	817	1,436
Imperial	532	568	1,401	1,234	2	1			1,935	1,803	3,738
Inyo	104	140							104	140	244
Kern	827	950	227	316			20	19	1,074	1,285	2,359
Kings	261	340	260	225	13	11			534	576	1,110
Lake	82	119	18	5	1	4			101	128	229
Lassen	79	138							79	138	217
Los Angeles	29,338	31,338	2,116	1,444	940	823	7	15	32,401	33,667	66,068
Madera	173	249			14				187	249	436
Marin	413	464	28	27	9	7			450	498	948
Mariposa	13	15							13	15	28
Mendocino	285	369							285	369	654
Merced	338	374	44	70	2	6			384	450	834
Modoc	92	127							92	127	219
Mono											
Monterey	518	517	37	184	24	37	8	14	587	752	1,339
Napa	240	295	37	56	22	34			299	385	684
Nevada	138	199							138	199	337
Orange	1,377	1,610	141	71			76	130	1,594	1,811	3,405
Placer	260	284	116	23	11				387	307	694
Plumas	22	26							22	26	48
Riverside	914	1,018	46	14	28	15	95	33	1,083	1,130	2,213
Sacramento	1,807	2,223	372	1,169	301	203	4	33	2,484	3,628	6,112
San Benito	101	145	102	36			14	36	217	217	434
San Bernardino	2,013	1,954	823	388	62	67	260	144	3,158	2,553	5,711
San Diego	2,045	2,016	1,747	3,308	73	57	78	94	3,943	5,475	9,418
San Francisco	6,294	5,284	326	283	664	29			7,284	5,596	12,880
San Joaquin	1,931	2,594		380	132	116			2,063	3,090	5,153
San Luis Obispo	295	442		42	14	11			309	495	804
San Mateo	813	769	97	26	21	14			931	809	1,740
Santa Barbara	744	681	141	140	49	34	28	36	962	891	1,853
Santa Clara	4,141	4,173	106	489	137	126			4,384	4,788	9,172
Santa Cruz	465	543	153	133					618	676	1,294
Shasta	142	227	35	50					177	277	454
Sierra	29	25							29	25	54
Siskiyou	243	277	116	9					359	286	645
Solano	446	496	168	36	111	35			719	567	1,286
Sonoma	869	962	573	605	94	86	7	17	1,543	1,670	3,213
Stanislaus	881	1,070	126	62	33	21	18	27	1,058	1,180	2,238
Sutter	59	99							59	99	158
Tehama	221	293							221	293	514
Trinity	26	31							26	31	57
Tulare	1,137	1,319	7	99	16	18			1,160	1,436	2,596
Tuolumne	126	111							126	111	237
Ventura	373	475	248	144	4	2			625	621	1,246
Yolo	242	252							242	252	494
Yuba	150	167	15	55	13	7			178	229	407
Totals	77,414	82,715	12,555	14,450	4,126	2,986	715	727	94,810	100,878	195,688

TABLE No. 16 -Continued.

Statistics of Secondary (High) Schools, Showing Enrollment in Regular High Schools, Special Day and Evening Classes, Evening Schools, Compulsory Part-time Classes, and Junior Colleges for the Year Ending June 30, 1922.

Counties	Regular high schools		Special day and evening classes		Compulsory part-time classes		Junior colleges		Evening schools		Total enrollment in all schools		Grand total, male and female
	Total male	Total female	Total male	Total female	Total male	Total female	Total male	Total female	Total male	Total female	Total male	Total female	
Alameda	6,462	6,636	218	341	930	753			4,805	4,489	12,415	12,219	24,634
Alpine													
Amador	112	127		41							112	168	280
Butte	607	622		101	40	28	11	3			658	754	1,412
Calaveras	77	70									77	70	147
Colusa	180	212	25	40		6					205	258	463
Contra Costa	761	950	323	89	150	122			280	150	1,514	1,311	2,825
Del Norte	30	58									30	58	88
El Dorado	114	98				4					114	102	216
Fresno	2,665	2,735	3,698	2,436	391	339	172	157			6,926	5,667	12,593
Glenn	229	274	3	6	3	6					235	286	521
Humboldt	487	630	34	8	77	47	36	19	207	155	841	859	1,700
Imperial	551	570	1,076	1,075					429	406	2,056	2,060	4,116
Inyo	136	166	35	78							171	244	415
Kern	1,057	1,123	689	516	11	5	29	36			1,786	1,680	3,466
Kings	326	377	494	150	24	26					844	553	1,397
Lake	99	125	8	2	1	7					108	134	242
Lassen	101	178	16								117	178	295
Los Angeles	18,436	20,499	317	1,924	4,014	1,871	26	37	16,376	15,606	39,169	39,937	79,106
Madera	259	290	7		26						272	290	562
Marin	449	480	118	52	10	9					577	541	1,118
Mariposa	21	15									21	15	36
Mendocino	351	429	82	69	12	4	6				451	502	953
Merced	405	434			1	7			89	70	495	511	1,006
Modoc	112	134									112	134	246
Mono													
Monterey	422	445	184	180	40	26	5	12	118	35	769	698	1,467
Napa	290	331	92	200	22	34					404	565	969
Nevada	159	235			7	2					166	237	403
Orange	1,711	1,871	176	167	10	4	121	176			2,018	2,218	4,236
Placer	296	310	128	97	17	7					441	414	855
Plumas	44	42									44	42	86
Riverside	1,067	1,136		28	97	128			140	3	1,304	1,295	2,599
Sacramento	1,510	1,630		1,056	342	235	66	66	852	569	2,770	3,556	6,326
San Benito	120	171	84	35			21	37			225	243	468
San Bernardino	1 575	1,688	445	295	131	113	212	279	1,200	949	3,563	3,324	6,887

San Diego	2,173	2,266	1	800	192	130	116	114	2,597	2,884	5,079	6,194	11,273
San Francisco	3,854	4,610			1,410	935			3,123	1,359	8,387	6,904	15,291
San Joaquin	1,070	1,295	880	1,836	270	230					2,220	3,361	5,581
San Luis Obispo	382	520	38	71	26	10					446	601	1,047
San Mateo	548	629	152	27	36	20			638	315	1,374	991	2,365
Santa Barbara	592	638	138	122	99	51	73	58	298	193	1,200	1,062	2,262
Santa Clara	2,031	2,050	2,649	2,581	310	313	47	42			5,037	4,986	10,023
Santa Cruz	541	591	106	53	75	36					722	680	1,402
Shasta	157	251	31	50							188	301	489
Sierra	22	31									22	31	53
Siskiyou	248	328	156	19							404	347	751
Solano	497	556	147	121	77	21					721	698	1,419
Sonoma	986	1,017		42	133	107	16	20	639	558	1,774	1,744	3,518
Stanislaus	1,015	1,162	382	179	57	19					1,454	1,360	2,814
Sutter	114	124									114	124	238
Tehama	247	288									247	288	535
Trinity	19	32									19	32	51
Tulare	1,298	1,440	468	154	95	47					1,861	1,641	3,502
Tuolumne	124	134									124	134	258
Ventura	436	516	232	151	1						669	667	1,336
Yolo	274	275									274	275	549
Yuba	91	63	88	121	9	8					188	192	380
Totals	57,920	63,916	13,720	15,313	9,146	5,710	957	1,056	31,791	27,741	113,534	113,736	227,270

TABLE No. 16—Continued.

Statistics of Secondary (High) Schools, Showing Enrollment of Students by Grades and by Sex for the State, in Regular High Schools, Special Day and Evening Classes, Compulsory Part-time Classes, Junior Colleges, and Grand Total in Such Schools; also Grand Total High School Enrollment and Enrollment in Post-graduate High School Classes.

Enrolled in Regular High Schools.	1920-21	1921-22
First year—		
Male	26,100	24,921
Female	25,267	25,192
Second year—		
Male	13,819	14,929
Female	15,619	16,397
Third year—		
Male	8,725	10,378
Female	10,220	11,842
Fourth year—		
Male	6,193	7,128
Female	8,220	8,928
Specials—		
Male	22,577	564
Female	23,389	1,557
Totals—		
Male	77,414	57,920
Female	82,715	63,916
Grand totals	160,129	121,836
Enrolled in Special Day Classes.		
Male	1,889	2,117
Female	4,972	6,007
Enrolled in Special Evening Classes.		
Male	10,666	11,603
Female	9,478	9,306
Enrolled in Part-time Classes.		
Male	4,126	9,146
Female	2,986	5,710
Grand total (special day and evening and part time classes)	34,117	43 889
Enrolled in Junior Colleges.		
Special—		
Female		149
First year—		
Male	610	748
Female	574	695
Second year—		
Male	105	209
Female	153	212
Totals—		
Male	715	957
Female	727	1,056
Grand totals	1,442	2,013
Enrolled in Evening Schools.		
Male		31,791
Female		27,741
Total		59,532
Grand Total High School Enrollment, including Regular, Special and Part-time Classes, Junior Colleges and Evening Classes.		
Male	94,810	113,534
Female	100,878	113,736
Grand totals	195,688	227,270
Enrollment in Post-graduate High School Classes.		
Boys	22	23
Girls	31	41
Totals	53	64

TABLE No. 17.

Statistics of Secondary (High) Schools, Showing Average Number of Days Schools Were Actually Open, Average Daily Attendance, and Number of Graduates for 1920-21 and 1921-22.

Counties	Average number of days schools were open		Average daily attendance		Total number of graduates					
					1920-21			1921-22		
	1920-21	1921-22	1920-21	1921-22	Boys	Girls	Total	Boys	Girls	Total
Alameda	179	183	10,083	11,520	636	792	1,428	744	873	1,617
Alpine										
Amador	183	173	187	220	15	15	30	11	24	35
Butte	178	178	950	1,091	73	104	177	68	89	157
Calaveras	183	174	103	122	6	10	16	7	11	18
Colusa	177	175	258	315	21	31	52	24	34	58
Contra Costa	173	183	1,191	1,454	51	80	131	72	117	189
Del Norte	196	190	63	64	4	4	8	1	6	7
El Dorado	180	174	104	171	13	11	24	8	6	14
Fresno	173	173	3,938	5,098	192	320	512	263	346	609
Glenn	182	185	408	442	26	50	76	30	50	80
Humboldt	186	187	852	1,045	50	75	125	39	74	113
Imperial	170	170	1,014	1,037	34	66	100	66	82	148
Inyo	179	173	215	244	16	11	27	11	26	37
Kern	165	176	1,505	1,903	66	147	213	121	129	250
Kings	171	169	542	625	22	36	58	29	44	73
Lake	155	169	198	217	13	21	34	7	21	28
Lassen	165	175	169	220	13	18	31	7	19	26
Los Angeles	184	185	28,893	34,763	1,815	2,352	4,167	1,971	2,568	4,539
Madera	178	178	350	429	9	24	33	22	32	54
Marin	184	185	684	845	39	56	95	51	66	117
Mariposa	189	186	22	28		5	5	1	2	3
Mendocino	180	173	572	684	35	66	101	47	43	90
Merced	168	174	625	750	35	58	93	39	52	91
Modoc	188	181	182	211	20	18	38	10	19	29
Mono										
Monterey	183	182	727	809	36	56	92	56	67	123
Napa	182	181	496	530	31	46	77	28	38	66
Nevada	182	172	302	342	23	30	53	14	39	53
Orange	171	175	2,634	3,172	154	221	375	222	252	474
Placer	171	165	469	516	30	33	63	40	46	86
Plumas	185	181	43	67	1	3	4	3	4	7
Riverside	170	168	1,798	1,973	124	171	295	149	176	325
Sacramento	170	176	2,296	2,715	113	149	262	126	147	273
San Benito	187	184	270	291	13	18	31	21	32	53
San Bernardino	168	168	2,902	3,179	194	232	426	175	255	430
San Diego	184	184	3,614	4,145	185	236	421	187	263	450
San Francisco	191	194	6,940	8,111	494	573	1,067	383	546	929
San Joaquin	177	169	2,015	2,316	92	138	230	91	135	226
San Luis Obispo	172	168	605	757	28	53	81	46	60	106
San Mateo	188	184	827	1,048	45	67	112	54	75	129
Santa Barbara	186	187	984	1,248	48	66	114	84	82	166
Santa Clara	176	175	3,388	3,875	225	326	551	178	249	427
Santa Cruz	188	181	899	1,004	72	80	152	59	67	126
Shasta	173	177	298	350	17	39	56	24	29	53
Sierra	174	175	41	41	5	3	8	0	2	2
Siskiyou	181	179	373	474	18	28	46	27	35	62
Solano	184	176	797	901	47	70	117	62	74	136
Sonoma	172	176	1,636	1,891	89	116	205	107	143	250
Stanislaus	173	176	1,679	1,940	92	149	241	114	172	286
Sutter	175	179	147	206	2	9	11	13	16	29
Tehama	174	174	436	462	21	43	64	36	36	72
Trinity	192	185	44	44	3	1	4	5	0	5
Tulare	169	167	2,039	2,441	118	173	291	166	222	388
Tuolumne	177	167	207	232	12	15	27	18	30	48
Ventura	187	185	737	847	38	61	99	53	90	143
Yolo	181	177	413	474	26	31	57	43	42	85
Yuba	174	175	279	307	11	17	28	15	24	39
Totals	* 180	* 180	93,443	110,206	5,611	7,623	13,234	6,248	8,181	14,429

*Averages.

TABLE No. 18.

Statistics of Secondary (High) Schools, Showing Amounts of State High School Money Apportioned, by County, to the Several High Schools of Each County for the Years Closing June 30, 1921 and June 30, 1922.

Counties	Apportionment Sept. 8, 1920	Apportionment Feb. 19, 1921	Total apportionment, 1920-21	Apportionment Sept. 8, 1921	Apportionment Feb. 20, 1922	Total apportionment, 1921-22
Alameda	$52,510 65	$52,688 25	$105,198 90	$29,700 00	$232,138 90	$261,838 90
Alpine						
Amador	2,822 04	2,855 34	5,677 38	6,600 00	4,011 15	10,611 15
Butte	6,433 05	6,477 45	12,910 50	8,800 00	21,177 50	29,977 50
Calaveras	1,695 99	1,718 19	3,414 18	4,400 00	2,209 35	6,609 35
Colusa	4,347 69	4,403 19	8,750 88	11,000 00	6,819 35	17,819 35
Contra Costa	9,215 01	9,292 71	18,507 72	15,400 00	30,986 95	46,386 95
Del Norte	850 50	861 60	1,712 10	2,200 00	1,351 35	3,551 35
El Dorado	1,025 85	1,036 95	2,062 80	2,200 00	2,230 80	4,430 80
Fresno	25,628 19	25,794 69	51,422 88	34,100 00	90,855 65	124,955 65
Glenn	3,468 33	3,501 63	6,969 96	6,600 00	7,872 15	14,472 15
Humboldt	6,857 70	6,913 20	13,770 90	8,800 00	20,953 95	29,753 95
Imperial	8,313 21	8,390 91	16,704 12	13,200 00	28,711 75	41,911 75
Inyo	3,361 92	3,406 32	6,768 24	8,800 00	4,611 75	13,411 75
Kern	9,523 02	9,578 52	19,101 54	11,000 00	36,595 05	47,595 05
Kings	3,899 19	3,932 49	7,831 68	6,600 00	12,842 40	19,442 40
Lake	3,211 62	3,256 02	6,467 64	6,600 00	5,184 20	11,784 20
Lassen	1,899 39	1,918 59	3,814 98	4,400 00	3,238 95	7,638 95
Los Angeles	144,063 66	144,563 16	288,626 82	92,400 00	653,230 50	745,630 50
Madera	3,242 88	3,276 18	6,519 06	6,600 00	8,270 40	14,870 40
Marin	4,735 86	4,769 16	9,505 02	6,600 00	15,773 85	22,373 85
Mariposa	700 20	711 30	1,411 50	2,200 00	471 90	2,671 90
Mendocino	7,445 28	7,534 08	14,979 36	18,700 00	12,269 40	30,969 40
Merced	6,430 65	6,497 25	12,927 90	13,200 00	16,431 20	29,631 20
Modoc	2,666 73	2,700 03	5,366 76	6,600 00	4,139 85	10,739 85
Mono						
Monterey	6,781 35	6,847 95	13,629 30	11,000 00	18,414 15	29,414 15
Napa	3,638 67	3,671 97	7,310 64	6,600 00	11,919 20	18,519 20
Nevada	3,343 08	3,376 38	6,719 46	6,600 00	6,477 90	13,077 90
Orange	13,510 98	13,566 48	27,077 46	11,550 00	56,920 75	68,470 75
Placer	3,864 12	3,897 42	7,761 54	6,600 00	11,558 60	18,158 60
Plumas	737 37	746 37	1,483 74	2,200 00	838 55	3,038 55
Riverside	14,731 23	14,853 33	29,584 56	24,200 00	40,007 10	64,207 10
Sacramento	12,557 88	12,624 48	25,182 36	11,000 00	52,398 75	63,398 75
San Benito	1,677 15	1,688 25	3,365 40	2,200 00	5,791 50	7,991 50
San Bernardino	17,703 36	17,814 36	35,517 72	19,800 00	70,687 90	90,487 90
San Diego	21,558 66	21,691 86	43,250 52	19,800 00	81,560 30	101,360 30
San Francisco	33,032 55	33,110 25	66,142 80	11,000 00	154,263 00	165,263 00
San Joaquin	11,846 46	11,913 06	23,759 52	12,100 00	46,942 90	59,042 90
San Luis Obispo	4,609 41	4,653 81	9,263 22	11,000 00	13,377 25	24,377 25
San Mateo	6,231 45	6,286 95	12,518 40	8,800 00	20,179 15	28,979 15
Santa Barbara	7,023 03	7,078 53	14,101 56	11,000 00	24,106 80	35,106 80
Santa Clara	20,248 44	20,359 44	40,607 88	17,600 00	77,632 60	95,232 60
Santa Cruz	5,848 08	5,881 38	11,729 46	6,600 00	21,183 55	27,783 55
Shasta	3,092 58	3,125 88	6,218 46	6,600 00	7,582 25	14,182 25
Sierra	805 41	816 51	1,621 92	2,200 00	965 25	3,165 25
Siskiyou	3,493 38	3,526 68	7,020 06	14,850 00	9,360 85	24,210 85
Solano	7,872 33	7,950 03	15,822 36	13,200 00	19,064 65	32,264 65
Sonoma	12,838 65	12,949 65	25,788 30	15,400 00	40,142 90	55,542 90
Stanislaus	11,904 18	11,992 98	23,897 16	17,600 00	37,374 55	54,974 55
Sutter	1,131 06	1,142 16	2,273 22	3,850 00	3,153 15	7,003 15
Tehama	3,829 05	3,862 35	7,691 40	6,600 00	9,352 20	15,952 20
Trinity	810 42	821 52	1,631 94	2,200 00	943 80	3,143 80
Tulare	13,905 78	14,016 78	27,922 56	22,000 00	41,476 75	63,476 75
Tuolumne	2,066 73	2,088 93	4,155 66	4,400 00	5,454 65	9,854 65
Ventura	7,101 99	7,168 59	14,270 58	12,650 00	17,088 65	29,738 65
Yolo	3,728 85	3,762 15	7,491 00	6,600 00	9,051 90	15,651 90
Yuba	3,232 86	3,266 16	6,499 02	4,400 00	6,544 55	10,944 55
Totals	$579,100 05	$582,629 85	$1,161,729 90	$658,900 00	$2,144,192 35	$2,803,092 35

TABLE No. 18—Continued.

Statistics of Secondary (High) Schools, Showing Receipts from All Sources for Year Ending June 30, 1921.

Counties	Balance on hand at beginning of school year	Amount received from state apportionment	Amount received from county apportionment	Amount received from district taxes for maintenance	Amount received from district taxes for building	Amount received from sale of bonds	Amount received from miscellaneous sources	Total receipts
Alameda	$188,694 51	$126,762 30	$562,426 33	$1,386,305 56	$4,868 78	$525,000 00	$25,900 99	$2,819,958 47
Alpine								
Amador	6,652 21	5,677 38	10,764 24	32,329 90		1,932 84	391 51	57,748 08
Butte	403,736 10	12,910 50	72,035 25	71,471 84	69,953 07	50,500 00	23,983 51	704,590 36
Calaveras	6,603 58	3,414 18	8,287 55	14,261 97				32,567 28
Colusa	16,794 17	8,750 88	22,017 86	69,828 58	2,873 29		348 09	120,612 87
Contra Costa	194,763 24	18,507 72	67,003 93	262,019 10	8,450 10	50,000 00	1,393 42	602,137 51
Del Norte	16,563 54	1,712 10	21,609 01				32 65	39,917 30
El Dorado	4,711 00	2,062 80	21,768 99					28,542 79
Fresno	1,429,611 34	51,422 88	377,061 07	733,938 17		268,115 30	42,362 26	2,902,511 02
Glenn	21,290 83	6,974 15	20,908 04	65,967 67	10,000 00		1,388 92	126,529 61
Humboldt	51,595 80	13,770 90	46,200 00	142,889 29	17,000 00		2,246 53	273,702 52
Imperial	*8,833 98	16,704 12	74,841 70	292,005 22		68,000 00	17,812 02	469,529 08
Inyo	7,678 03	6,768 24	13,404 88	28,228 30		310,000 00	1,889 07	367,968 52
Kern	87,421 37	19,101 54	78,337 00	590,077 56		235,000 00	8,517 70	1,018,455 17
Kings	349,638 26	7,831 68	17,592 33	127,817 14			1,915 27	504,794 68
Lake	13,285 62	5,166 36	11,868 80	24,491 66				54,812 44
Lassen	72,584 49	3,814 98	14,788 00		44,555 79		308 25	136,051 51
Los Angeles	717,575 72	311,055 85	1,484,818 47	5,117,190 47		1,722,000 00	515,333 23	9,867,973 74
Madera	73,266 10	6,519 06	18,014 00	65,519 72			1,556 06	164,874 94
Marin	8,064 42	9,505 02	62,544 55	36,236 78	13,159 94		6,529 26	136,039 97
Mariposa	462 24	1,411 50	7,008 44	109 02			808 36	9,799 56
Mendocino	41,858 72	14,979 36	37,290 00	63,080 11			248 16	157,456 35
Merced	20,179 54	12,927 90	36,679 50	148,361 78			18,089 01	236,237 73
Modoc	7,582 54	5,366 76	13,381 33	31,841 76			383 28	58,555 67
Mono								
Monterey	379,461 83	13,629 30	39,790 00	163,847 66	12,002 21		11,373 82	620,104 82
Napa	30,054 36	7,310 64	37,311 62	74,639 25			799 33	150,115 20
Nevada	2,476 04	6,719 46	21,367 80	19,999 20			237 41	50,799 91
Orange	286,762 48	27,077 46	216,307 75	564,083 43		60,000 00	8,668 09	1,162,899 81
Placer	24,845 15	7,761 54	39,816 17	59,705 58			2,485 04	134,613 48
Plumas	6,189 08	1,481 64	12,700 39				47 35	20,478 46
Riverside	112,383 96	29,584 56	220,226 62	170,836 39	70 79	13,500 00	4,640 32	551,242 64
Sacramento	75,861 70	25,182 36	186,654 12	283,776 72		854,000 00	7,211 55	1,432,686 45
San Benito	993 88	3,365 40	37,926 58				4 00	42,289 86
San Bernardino	301,799 03	35,517 72	365,921 44	259,451 51		202,000 00	43,307 41	1,207,997 11
San Diego	128,317 90	43,250 52	344,925 94	377,431 56		327,000 00	14,105 69	1,235,031 61
San Francisco		66,142 80	786,959 80	68,078 50		28,228 53	408 00	949,817 63

San Joaquin	87,119 69	27,762 52	104,062 85	280,520 08		149,000 00	4,422 70	652,907 84
S n Luis Obispo	17,852 94	9,263 22	53,382 00	98,710 55		200,000 00	8,533 01	387,741 72
San Mateo	25,884 23	12,518 40	40,370 00	137,839 86	95,674 79		2,022 30	314,309 58
Santa Barbara	34,589 40	15,617 42	90,813 00	211,200 00		400,000 00	19,890 75	772,110 57
Santa Clara	28,727 16	39,957 78	176,834 79	343,815 95		565,146 00	23,884 40	1,178,366 08
Santa Cruz	3,995 42	11,729 46	48,849 41	106,118 52			15,173 99	185,866 80
Shasta	13,487 03	6,218 46		77,150 76				96,856 25
Sierra	594 51	1,621 92		14,003 66				16,220 09
Siskiyou	30,073 05	7,020 06	112,271 01		31,550 80			180,914 92
Solano	39,828 03	15,822 36	47,466 28	128,104 11	15,458 63	250,000 00	16,540 49	513,219 90
Sonoma	45,434 99	29,163 30	135,655 27	176,698 48	18,872 24	10,000 00	15,960 53	431,784 81
Stanislaus	275,819 97	23,897 16	174,262 35	119,309 00	93,173 26	40,000 00	13,138 31	739,600 05
Sutter	4,144 62	2,273 22	27,987 77	25,257 84		100,000 00		159,663 45
Tehama	16,046 23	7,691 40	26,040 23	77,910 28			250 75	127,938 89
Trinity	1,841 76	1,631 94	10,066 41				39 98	13,580 09
Tulare	233,530 02	27,922 56	154,731 63	297,543 78		238,000 00	4,256 20	945,984 19
Tuolumne	12,896 87	4,155 66	12,418 55	16,656 78	26,798 84		878 96	73,805 66
Ventura	64,647 73	13,574 31	48,305 10	125,304 89		335,000 00	5,499 11	592,331 14
Yolo	5,596 99	7,491 00	42,841 16	35,692 52			1,384 97	93,006 64
Yuba	2,042 90	6,499 02	14,611 62	30,113 42			5,618 19	58,885 15
Totals	$6,015,078 43	$1,211,992 73	$6,731,588 93	$13,647,771 88	[1]$464,462 53	$7,002,422 67	$902,220 80	$35,975,537 97

*Deficit.

TABLE No. 18—Continued.

Statistics of Secondary (High) Schools, Showing Receipts from All Sources for the Year Ending June 30, 1922.

Counties	Balance on hand at beginning of school year	Amount received from state apportionment	Amount received from county apportionment	Amount received from district taxes for maintenance	Amount received from district taxes for building	Amount received from sale of bonds	Amount received from miscellaneous sources	Total receipts
Alameda	$719,349 97	$261,838 90	$608,656 15	$1,295,359 18	$32,245 04	$2,156,000 00	$48,130 29	$5,121,579 53
Alpine								
Amador	8,595 99	10,611 15	10,679 97	31,939 59		1,975 69	353 84	64,156 23
Butte	87,726 96	30,977 50	71,426 55	153,279 25	20,000 00	47,500 00	123,786 64	534,696 90
Calaveras	6,156 36	6,609 35	9,401 24	16,357 90				38,524 85
Colusa	10,377 38	18,296 53	24,652 28	60,090 99	5,178 02	85,000 00	432 93	204,028 13
Contra Costa	217,049 87	46,386 95	78,753 11	315,756 96		120,000 00	19,920 56	797,867 45
Del Norte	12,074 11	3,551 35	10,506 58		18,305 62		22 10	44,459 76
El Dorado	2,617 68	4,430 80	30,246 38				14 13	37,308 99
Fresno	559,400 36	124,955 65	448,817 02	849,678 81		830,000 00	83,984 70	2,896,836 54
Glenn	25,304 80	14,472 15	22,042 65	78,538 41		54,547 00	1,528 63	196,433 64
Humboldt	52,271 06	29,753 95	58,298 15	209,261 49			2,161 70	351,746 35
Imperial	36,759 22	41,911 75	72,342 48	179,443 13		161,500 00	11,376 09	503,332 67
Inyo	220,904 65	13,411 75	13,475 05	50,359 61		35,000 00	2,705 76	335,856 82
Kern	476,471 51	47,402 00	96,230 00	666,722 93			5,115 23	1,291,941 67
Kings	127,668 06	19,442 40	47,180 39	139,499 62			4,442 66	338,233 13
Lake	8,916 37	11,526 80	13,791 00	32,635 91				66,870 08
Lassen	13,970 75	7,638 95	15,590 00	50,520 36			708 24	88,428 30
Los Angeles	1,836,295 74	745,630 50	1,777,768 45	5,269,940 03		4,826,000 00	548,327 45	15,003,962 17
Madera	20,652 97	14,870 00	18,942 40	88,921 61			835 02	143,622 00
Marin	4,587 31	22,373 85	75,052 92	47,731 56	19,342 64	30,000 00	2,174 50	201,262 78
Mariposa	541 89	2,671 90	8,558 89	94 55			325 07	12,192 30
Mendocino	48,711 66	30,969 40	36,756 12	83,497 35		25,265 00	634 16	225,833 69
Merced	42,134 73	36,631 20	46,004 36	142,292 34			1,030 53	268,093 16
Modoc	3,225 94	10,739 85	11,918 91	35,252 83			1,177 47	62,315 00
Mono								
Monterey	31,043 04	29,414 15	44,577 50	189,356 60	3 05	40,000 00	10,059 92	344,454 26
Napa	45,505 17	18,519 20	32,776 13	66,516 37		366,988 12	635 38	530,940 37
Nevada	1,623 45	13,077 90	17,513 83	17,187 80			269 14	49,672 12
Orange	193,659 74	68,470 75	250,565 67	583,745 61		535,000 00	5,982 74	1,637,424 51
Placer	17,926 48	20,040 04	47,543 16	70,343 79			872 93	156,726 40
Plumas	156 26	3,036 55	23,176 38				287 38	26,656 77
Riverside	105,426 62	64,207 10	171,390 70	226,195 69	239 39	150,000 00	13,453 88	730,913 38
Sacramento	899,492 18	63,398 75	237,042 46	169,053 60		126,000 00	7,921 50	1,502,908 49
San Benito	62 66	7,991 50	38,363 44				76 02	46,493 62
San Bernardino	249,315 19	90,487 90	219,263 97	364,878 24		320,000 00	43,433 08	1,287,378 38
San Diego	376,219 20	101,380 30	265,606 25	573,746 04		810,000 00	110,476 56	2,237,408 35
San Francisco		165,263 00	996,979 29		136,029 00	228,750 50	3,000 00	1,530,021 79

San Joaquin	88,333 62	59,042 90	123,202 45	320,986 98		636,000 00	9,858 92	1,237,424 87
San Luis Obispo	166,746 25	24,377 25	45,315 00	161,363 36		61,097 95	2,716 19	461,616 00
San Mateo	80,224 11	28,979 15	53,962 50	179,243 72	28,308 12	660,000 00	3,504 05	1,034,221 65
Santa Barbara	466,959 08	37,179 54	64,556 00	296,042 00		510,000 00	15,105 08	1,389,841 70
Santa Clara	233,919 66	95,232 60	217,479 29	374,847 90		25,000 00	15,596 21	962,075 66
Santa Cruz	2,981 53	27,783 55	53,265 78	105,969 77	9,942 23		28,038 04	227,980 90
Shasta	20,097 78	14,182 25	19,874 17	58,595 16			2,015 38	114,764 74
Sierra	2,087 17	3,165 25	2,460 00	7,295 74				15,008 16
Siskiyou	47,101 50	24,210 85	23,017 40	76,743 33	35,836 70		653 39	207,563 17
Solano	254,199 54	32,264 65	52,066 99	142,888 03	14,677 06		22,353 96	518,450 23
Sonoma	65,573 99	55,542 90	142,138 61	192,878 70		365,000 00	74,150 74	895,284 94
Stanislaus	59,927 52	54,974 55	121,826 28	248,486 91	61,214 80	85,238 80	7,514 04	639,182 90
Sutter	92,226 89	7,003 15	11,466 00	34,777 01			1,341 30	146,814 35
Tehama	19,107 79	15,952 20	25,339 94	72,810 51			2,964 45	136,174 89
Trinity	764 02	3,143 80	11,349 54				109 55	15,366 91
Tulare	166,906 71	63,476 75	176,907 96	381,003 76		762,000 00	5,638 89	1,555,934 07
Tuolumne	25,504 93	9,854 83	45,162 70		8,422 09			88,944 55
Ventura	286,582 07	29,738 65	51,133 75	93,815 61	40,491 47		7,422 43	509,183 98
Yolo	2,394 03	15,651 90	49,313 08	37,775 33			2,108 99	107,243 33
Yuba	644 13	11,898 89	24,568 05	18,155 47			5,552 45	60,818 99
Totals	$8,543,877 65	$2,816,027 78	$7,266,294 92	$14,861,877 44	$430,235 23	$14,053,863 06	$1,262,300 49	$49,234,476 57

TABLE NO. 18—Continued.

Statistics of Secondary (High) Schools, Showing Expenditures for All Purposes for Year Closing June 30, 1921.

Counties	General control	Teachers' salaries	Other expenses of instruction	Library	Operation of school plant	Maintenance of school plant	Fixed charges	Capital outlays	Auxiliary agencies and sundry activities	Laboratory supplies	Totals	Balance on hand
Alameda	$61,561 84	$1,504,170 16	$119,459 96	$33,427 51	$124,930 29	$44,102 57	$13,647 80	$367,696 33	$66,293 66	$2,466 45	$2,337,756 57	$482,201 90
Alpine												
Amador	304 94	30,979 67	2,561 43	1,405 40	6,506 22	700 97	504 27	3,124 22	2,457 59	607 38	49,152 09	8,595 99
Butte	3,372 36	108,931 17	9,743 19	7,258 91	11,336 65	3,322 61	2,036 32	463,580 05	5,966 25	2,438 98	617,986 49	86,603 87
Calaveras		18,080 00	781 36	1,661 77	1,628 46	197 79	829 53	512 47	2,668 32	51 22	26,410 92	6,156 36
Colusa	194 49	56,093 79	4,484 93	3,368 44	7,301 28	1,229 02	1,597 98	32,388 18	2,936 98	640 33	110,235 42	10,377 45
Contra Costa	429 01	170,828 26	7,805 01	10,415 90	20,167 97	23,609 85	4,000 11	126,449 41	17,554 51	3,842 94	385,102 97	217,034 54
Del Norte	72 89	11,295 00	1,662 52	427 49	1,768 38	93 98	246 85	10,510 81	1,266 13	499 14	27,843 19	12,074 11
El Dorado	65 36	15,674 75	89 08	1,307 16	2,162 18	616 87	100 00	4,520 82	1,147 85	241 04	25,925 11	2,617 68
Fresno	3,626 17	709,892 09	93,608 46	45,385 35	70,737 77	35,818 17	12,555 07	1,310,533 66	62,805 95	7,148 02	2,343,110 71	559,400 31
Glenn	1,131 48	55,506 82	5,662 02	3,171 38	8,912 94	5,588 17	2,567 56	12,599 89	5,474 50	606 30	101,221 06	25,308 55
Humboldt	2,875 95	114,218 13	4,088 20	6,587 27	17,656 10	13,705 14	1,425 94	39,479 34	19,146 03	2,251 36	221,431 46	52,271 06
Imperial	3,144 39	175,701 38	9,406 01	7,526 80	28,811 30	8,137 31	4,859 79	131,617 00	54,565 88		423,769 86	36,759 22
Inyo	1,422 36	35,554 91	1,647 42	2,419 32	2,922 96	746 81	530 77	99,133 18	1,558 77	1,127 37	147,063 87	220,994 65
Kern	5,486 58	234,160 74	24,091 55	8,249 97	36,728 42	13,026 82	5,513 27	140,004 64	74,803 28	716 38	542,781 65	475,673 52
Kings	835 47	90,175 55	5,650 97	4,499 15	11,758 32	11,254 90	1,244 01	246,603 11	4,312 78	792 36	377,126 62	127,668 06
Lake	171 55	30,305 76	2,967 31	1,994 85	2,198 77	1,955 73	317 00	4,026 11	1,213 13	755 07	45,905 28	8,907 16
Lassen	131 14	26,849 24	1,766 98	996 09	3,986 73	1,357 06	546 00	84,069 70	1,384 78	1,021 47	122,110 09	13,941 42
Los Angeles	255,593 62	4,440,473 61	454,259 87	362,853 45	535,622 78	260,013 01	184,944 47	1,441,129 47	75,427 89	21,489 78	8,031,807 95	1,836,165 79
Madera		51,269 48	6,282 74	3,517 46	9,427 58	8,279 47	1,435 18	47,300 35	16,087 67	1,222 04	144,821 97	20,052 97
Marin	113 39	78,997 05	6,048 64	3,713 93	10,046 73	969 97	1,823 02	23,307 63	5,590 02	847 28	131,457 66	4,582 31
Mariposa	81 32	5,560 00	245 63	134 78	715 09	513 57	70 00	174 28	1,763 00		9,257 67	541 89
Mendocino	1,170 16	77,105 97	3,169 55	5,333 32	6,428 39	4,476 55	1,076 47	4,358 53	4,915 66	710 09	108,744 69	48,711 66
Merced	891 78	89,082 76	3,405 46	6,011 48	22,636 03	18,148 56	3,627 66	33,623 67	13,482 50	2,993 10	193,903 00	42,334 73
Modoc	511 87	34,752 50	4,128 67	1,808 42	5,317 60	1,737 38	636 13	2,638 57	1,110 00	2,078 02	54,719 16	3,836 51
Mono												
Monterey	2,462 03	123,444 67	7,406 31	5,647 99	14,733 61	2,029 75	4,750 24	410,339 58	15,376 59	2,581 72	588,772 49	31,332 33
Napa	2,687 72	63,781 37	5,561 01	5,008 56	6,728 09	3,866 79	394 86	14,130 28	1,987 67	463 68	104,610 03	45,505 17
Nevada	620 09	36,113 37	1,569 79	2,554 54	3,162 03	274 25	3,351 16	665 05	333 34	532 84	49,176 46	1,623 45
Orange	7,948 42	331,673 85	48,265 00	33,567 09	46,382 21	26,807 89	9,061 02	412,858 72	49,450 84	3,225 03	969,240 07	193,659 74
Placer	790 52	62,865 61	7,139 82	4,356 64	11,193 14	1,562 87	559 14	20,899 34	5,044 58	2,275 34	116,687 00	17,926 48
Plumas	74 50	8,610 00	898 07	694 38	2,693 75	431 00	853 15	4,985 33	301 07	780 95	20,322 20	156 26
Riverside	6,154 05	271,227 38	6,560 86	13,615 37	32,941 19	15,027 07	3,900 43	70,182 31	23,574 24	2,633 12	445,816 02	105,426 62
Sacramento	26,525 24	308,480 68	32,789 38	6,284 32	27,743 05	16,532 93	2,910 93	44,781 58	22,750 73	632 68	489,431 52	943,254 93
San Benito		29,885 00	2,380 37	3,078 41	2,306 34	804 25	604 87	246 75	2,506 16	415 05	42,227 20	62 66
San Bernardino	8,285 33	426,322 29	22,646 45	15,762 12	92,918 72	9,684 25	7,935 04	344,973 12	21,865 60	8,289 00	958,681 92	249,315 19
San Diego	23,752 71	589,367 65	29,583 90	27,433 51	49,068 33	16,474 07	4,210 50	85,007 95	30,366 08	3,547 71	858,812 41	376,219 20
San Francisco		682,937 80	5,193 68	91,636 92	52,940 61	900 88	68,078 50	40,128 62	2,906 29	5,094 33	949,817 63	
San Joaquin	4,371 60	263,088 74	17,040 93	23,492 91	32,808 61	9,449 05	6,132 04	200,172 89	5,185 28	2,866 07	564,608 12	88,299 72

San Luis Obispo	748 53	31,214 71	5,131 64	4,202 69	8,238 24	2,069 26	842 03	98,677 77	14,463 04	1,689 59	217,277 50	170,464 22
San Mateo	1,365 75	116,292 95	4,576 52	6,639 68	18,009 22	17,525 21	2,170 74	57,652 16	9,262 64	590 60	234,085 47	80,224 11
Santa Barbara	6,389 42	188,545 29	6,712 20	10,266 82	20,392 39	7,525 94	4,159 73	40,101 61	15,830 18	5,227 91	305,151 49	466,959 08
Santa Clara	8,747 73	357,560 54	14,491 20	23,521 97	50,984 07	14,745 54	6,553 56	447,569 10	17,553 54	2,719 17	944,446 42	233,919 66
Santa Cruz	5,940 50	106,362 36	6,468 35	8,789 07	17,351 71	4,131 51	2,427 09	13,660 06	16,806 56	948 06	182,885 27	2,981 53
Shasta	350 34	47,542 69	1,033 94	1,609 42	6,650 07	6,029 90	694 84	783 66	12,063 61	----------	76,758 47	20,097 78
Sierra	151 20	12,000 00	442 38	415 05	549 70	142 11	----------	376 09	----------	29 21	14,105 74	2,114 35
Siskiyou	2,754 96	72,527 65	6,036 76	4,188 25	9,606 17	2,386 39	2,007 31	27,124 77	7,468 52	800 71	134,901 49	46,013 43
Solano	1,924 99	133,225 70	7,021 80	5,338 27	21,868 97	5,906 30	3,090 58	73,433 03	6,436 96	773 76	259,020 36	254,199 54
Sonoma	6,365 04	203,708 16	26,242 68	15,436 40	22,566 09	19,893 65	4,567 50	30,450 69	21,138 91	3,473 93	353,843 05	77,941 76
Stanislaus	5,983 91	224,767 23	7,612 54	22,704 08	30,727 37	9,927 51	4,339 62	344,329 72	21,080 54	8,201 01	679,673 53	59,926 52
Sutter	594 26	26,233 31	3,996 51	2,197 78	3,250 55	715 00	540 63	26,668 18	4,049 10	470 44	68,715 76	90,947 09
Tehama	277 58	58,298 55	7,470 04	3,671 74	9,552 33	10,930 61	192 65	7,846 50	10,422 10	189 00	108,851 10	19,087 79
Trinity	85 56	10,050 00	469 36	150 00	997 93	113 20	217 88	636 86	32 99	62 29	12,816 07	764 02
Tulare	6,242 12	246,175 08	33,430 52	12,958 33	37,683 13	14,217 59	7,836 04	375,167 49	41,492 13	3,875 05	779,077 48	166,906 71
Tuolumne	171 83	27,199 96	581 29	2,386 15	6,133 09	1,346 50	347 80	4,160 34	5,836 41	630 91	48,794 28	25,011 38
Ventura	594 43	114,872 87	9,353 36	7,493 57	20,776 84	4,924 69	2,258 04	134,599 24	9,608 38	1,267 62	305,749 04	286,582 10
Yolo	----------	51,742 45	5,374 76	4,381 74	7 807 05	1 036 69	363 23	12,924 86	6,891 85	89 98	90,612 61	2,394 03
Yuba	119 61	40,171 01	3,434 53	3,397 97	4,534 02	1,941 18	991 32	1,692 74	1,399 44	559 20	58,241 02	644 13
Totals	$475,668 09	$13,472,947 71	$1,109,932 91	$896,358 24	$1,623,007 56	$ 688,956 11	$402,475 67	$7,976,607 81	$847,418 50	$119,482 08	$27,612,854 68	$8,362,683 29

TABLE No. 18

Statistics of Secondary (High) Schools, Showing Expendi

Counties	General control	Teachers' salaries	Other expenses of instruction	Library	Operation of school plant
Alameda	$74,530 63	$1,617,678 24	$91,600 51	$34,090 70	$142,408 04
Alpine					
Amador	299 34	36,740 00	1,557 84	967 52	6,717 36
Butte	5,341 66	138,518 31	11,140 52	4,799 14	15,249 05
Calaveras		17,602 50	1,409 36	402 28	1,457 80
Colusa	489 44	65,123 84	4,899 25	2,142 71	8,713 78
Contra Costa	1,471 25	201,198 24	5,615 42	7,475 24	36,606 99
Del Norte	125 57	11,600 63	1,390 64	315 85	2,125 78
El Dorado	274 52	20,070 00	275 19	1,567 11	1,862 68
Fresno	16,951 28	832,802 93	99,564 61	23,434 75	75,249 68
Glenn	1,628 99	63,969 08	7,559 86	1,252 00	9,106 93
Humboldt	2,397 91	141,392 55	7,754 88	4,869 25	15,768 37
Imperial	21,731 45	157,456 58	11,704 00	752 59	35,835 30
Inyo	992 98	39,177 86	2,664 51	2,024 43	5,207 37
Kern	5,088 29	284,617 18	43,591 50	10,958 59	45,833 50
Kings	325 73	92,598 83	5,106 52	3,164 08	24,124 81
Lake	440 70	42,239 39	3,776 79	2,202 69	3,063 98
Lassen	131 75	33,809 70	6,736 58		6,972 21
Los Angeles	354,824 91	5,420,064 05	501,793 87	226,277 32	570,404 48
Madera	103 50	58,637 53	6,110 02	2,726 27	12,947 46
Marin	221 33	99,294 46	8,341 10	3,975 08	11,726 45
Mariposa	124 25	7,200 00	594 76	92 71	754 77
Mendocino	1,685 14	98,630 83	4,761 00	3,484 45	7,464 24
Merced	1,331 85	101,804 86	7,355 08	5,176 30	14,170 91
Modoc	534 34	38,882 50	2,460 48	678 68	5,961 01
Mono					
Monterey	6,380 42	137,926 32	17,904 46	3,658 43	18,506 55
Napa	2,179 84	74,378 22	3,538 15	1,879 22	10,257 33
Nevada	531 11	42,188 34	1,832 39	637 26	3,782 00
Orange	11,779 40	421,569 36	52,997 76	28,179 26	61,392 63
Placer	381 24	81,021 62	4,533 87	2,653 96	14,297 02
Plumas		15,120 00	1,727 07	879 68	3,469 50
Riverside	8,532 39	292,697 89	10,621 16	7,853 24	32,817 71
Sacramento	20,638 31	378,785 52	16,718 88	15,075 52	29,059 73
San Benito		35,668 00	3,061 37	27 03	3,099 42
San Bernardino	14,128 07	456,724 06	20,640 11	10,183 76	105,204 51
San Diego	28,126 47	634,336 72	29,300 77	20,133 56	52,289 60
San Francisco		897,070 55	8,759 32		71,033 92
San Joaquin	6,682 33	314,735 34	22,590 34	13,015 81	36,715 41
San Luis Obispo	2,060 51	119,673 23	7 755 26	3,822 40	11,809 54
San Mateo	2,628 00	152,325 25	14,882 81	4,553 41	22,915 90
Santa Barbara	7,863 87	215,648 46	7,167 85	8,348 61	22,319 58
Santa Clara	9,146 61	421,857 70	20,101 20	17,984 29	57,927 42
Santa Cruz	7,941 07	126,902 08	6,772 28	11,109 23	20,613 76
Shasta	1,332 25	51,856 79	1,873 40	1,277 81	5,714 78
Sierra	112 00	12,733 50	623 72	218 12	532 65
Siskiyou	2,385 16	86,035 10	3,581 07	2,808 63	10,633 51
Solano	4,049 78	163,302 38	6,489 04	3,945 41	25,497 90
Sonoma	7,080 95	261,513 91	20,327 18	8,912 95	27,204 52
Stanislaus	7,354 04	258,525 79	5,158 80	13,649 92	35,872 69
Sutter	1,114 22	28,461 69	3,852 27	1,707 03	3,882 83
Tehama	309 10	73,515 96	4,893 28	2,653 00	14,842 62
Trinity	186 27	11,000 00	201 85	224 00	768 85
Tulare	7,727 78	282,140 54	22,235 51	9,094 23	42,229 73
Tuolumne	24 75	28,310 00	508 79	844 13	5,055 01
Ventura	9,096 43	115,135 03	11,373 02	4,301 15	17,547 53
Yolo	108 27	70,013 65	3,366 46	2,816 42	7,626 59
Yuba	665 30	43,033 50	2,688 80	1,522 17	5,203 32
Totals	$661,592 75	$15,925,322 59	$1,175,840 53	$546,703 07	$1,839,797 01

—Continued.

tures for All Purposes for Year Closing June 30, 1922.

Maintenance of school plant	Fixed charges	Capital outlays	Auxiliary agencies and sundry activities	Laboratory supplies	Totals	Balance on hand
$48,917 91	$15,523 76	$1,087,485 78	$45,857 24	$6,626 66	$3,164,719 47	$1,956,860 06
504 77	218 90	8,333 53	277 45	152 75	55,769 46	8,386 77
1,942 21	6,039 75	224,273 31	6,449 99	4,463 89	418,217 83	116,479 07
545 05	608 20	3,578 62	3,038 87	37 07	28,679 75	9,845 10
2,845 07	1,607 89	83,914 11	4,188 43	677 45	174,601 97	29,426 16
22,892 27	3,056 25	238,596 30	22,944 60	2,396 56	542,253 12	255,614 33
98 65			3,237 50	275 16	19,169 78	25,289 98
316 17	36 00	7,637 94	3,123 92	1,413 27	36,576 80	732 19
33,568 10	29,370 17	694,064 42	51,123 95	5,882 51	1,862,012 40	1,034,824 14
7,138 60	206 11	14,135 86	4,918 72	1,290 49	111,206 64	85,227 00
9,410 17	2,334 01	90,035 75	32,612 56	1,440 00	308,015 45	43,730 90
8,443 87	11,641 89	45,886 55	36,143 29	1,160 59	330,756 11	172,576 56
2,197 26	1,016 59	233,438 43	1,025 60	1,115 80	288,860 83	46,995 99
14,395 41	4,794 31	365,197 94	94,417 90	2,863 79	871,758 41	420,183 26
6,463 32	2,969 13	141,007 33	22,904 92	927 78	299,592 45	38,640 68
744 23	426 50	7,549 85	2,302 84	252 93	62,939 90	3,930 18
3,997 30	1,884 12	16,618 01	1,664 84	1,651 39	73,465 90	14,962 40
302,530 58	264,328 67	3,132,863 17	129,271 21	29,466 67	10,931,824 93	4,072,137 24
4,203 04	961 32	19,563 70	22,942 96	914 51	129,114 31	14,507 69
1,565 37	2,210 02	64,699 90	6,477 14	1,254 93	199,765 78	1,497 00
214 47	38 35	118 39	2,025 25		11,162 95	1,029 35
2,190 48	1,229 77	28,166 47	8,916 57	1,357 58	157,886 53	67,947 16
14,269 12	2,654 92	44,468 32	22,667 52	264 38	214,161 26	53,931 90
1,090 06	1,509 97	2,089 64	874 40	901 41	53,982 49	8,332 51
3,794 75	3,013 45	46,000 05	16,392 13	1,362 64	254,939 20	89,515 06
4,677 24	1,472 74	73,516 77	2,235 24	249 11	174,383 96	356,556 41
755 54	286 30	17 75	731 53	798 76	51,560 98	*1,888 86
31,529 03	9,003 53	497,502 26	39,096 44	12,718 66	1,165,768 33	471,656 18
1,762 43	931 87	18,984 66	7,348 91	1,373 41	133,186 99	23,539 41
424 02	311 46	2,552 33	724 70	240 60	25,449 36	1,207 41
18,891 32	4,654 18	88,170 78	43,560 18	3,825 99	511,624 84	219,288 54
22,685 57	3,228 70	730,344 60	40,197 61	1,747 17	1,258,981 61	243,926 88
291 05	332 03		3,376 98	545 76	45,406 64	86 98
12,971 48	6,147 96	176,392 32	25,450 40	8,300 00	836,142 67	451,235 71
18,088 38	7,371 23	687,335 88	51,123 49	1,976 23	1,530,082 33	707,326 02
41,890 61	91,323 70	409,402 47	923 32	9,611 90	1,530,021 79	
11,946 20	5,957 15	310,554 54	5,651 99	3,928 73	731,777 84	505,647 03
16,072 05	3,117 70	168,714 86	23,916 57	2,148 18	359,090 30	102,525 70
5,870 09	3,085 95	184,261 56	12,806 28	3,050 06	406,379 31	627,842 34
13,614 46	5,782 95	267,602 27	20,947 96	6,557 91	574,313 92	815,527 78
17,212 16	9,838 45	206,154 01	12,566 81	7,399 84	780,188 49	181,887 17
9,751 69	583 99	10,250 79	17,830 73	1,292 25	213,047 87	14,933 03
1,832 86	801 00	3,065 89	13,075 18	472 92	81,302 88	33,461 86
72 23	100 00	227 00	40 00		14,659 22	348 94
7,301 82	295 74	29,971 89	5,295 91	1,104 18	149,413 01	58,150 16
8,298 63	3,315 77	213,361 95	7,579 97	903 08	436,743 91	81,706 32
19,753 28	3,898 70	210,272 94	31,151 98	7,637 84	597,754 25	297,530 69
15,409 86	5,637 65	93,061 92	25,862 05	10,122 91	470,655 63	168,527 27
1,388 23	1,192 22	85,097 72	5,447 24	905 48	133,048 93	13,765 42
3,227 22	993 44	12,705 00	13,414 08		126,559 39	9,615 50
11 61	119 60	190 25		69 41	12,771 84	2,595 07
24,308 84	8,403 30	409,525 86	41,259 84	45,312 60	892,238 23	663,695 84
2,041 80	362 00	16,014 69	14,953 31	150 10	68,264 58	20,679 97
4,607 79	3,472 43	236,015 02	21,656 15	1,714 78	424,919 33	84,264 65
3,314 04	1,004 14	7,191 86	7,895 81	268 56	103,605 80	3,637 53
1,897 50	337 70	1,843 43	46 07	820 50	58,058 29	2,760 70
$816,177 26	$540,028 63	$11,749,926 64	$1,041,070 63	$203,377 13	$34,499,836 24	$14,734,640 33

*Deficit.

TABLE No. 18—Continued.

Statistics of Secondary (High) Schools, Showing Valuation of Property, Outstanding Bonded Debts, Number of Books in High School Libraries for School Year Closing June 30, 1921.

Counties	Valuation of lots and school houses	Laboratories, furniture, apparatus and equipment	Library books	Total valuation of school property	Total outstanding bonded debt	Number of volumes in high school library
Alameda	$2,631,494	$300,960	$76,237	$3,008,691	$1,519 000	59,175
Alpine						
Amador	84,700	20,150	3,615	108,465	18,000	2,280
Butte	697,900	29,010	16,095	743,005	602,000	10 398
Calaveras	8,700	5,015	3,375	17,090		2,348
Colusa	106,500	15,175	7,430	129,105	30,000	8,140
Contra Costa	544,250	93,081	18,289	655,620	298,000	18,195
Del Norte	20,000	9,700	3,500	33,200		2,465
El Dorado	40,000	8,500	3,800	52,300		2,527
Fresno	2,913,175	327,464	49,134	3,289,773	1,934,000	37,591
Glenn	253,000	24,000	5,350	282,350	112,000	4,500
Humboldt	355,500	56,800	15,100	427,400	198,000	15,161
Imperial	693,500	109,762	11,782	815,044	680,500	5,901
Inyo	146,670	14,300	5,548	166,518	319,000	6,818
Kern	688,000	183,525	20,470	891,995	428,000	7,823
Kings	310,000	51,550	12,429	373,979	395,000	11,344
Lake	81,500	17,990	6,000	105,490		3,534
Lassen	118,000	10,300	3,275	131,575	75,000	2,103
Los Angeles	10,389,033	2,130,099	456,671	12,975,803	7,249,750	181,545
Madera	260,150	7,650	6,170	273,970	150,000	
Marin	156,500	70,500	9,480	236,480	38,000	6,081
Mariposa	18,876	3,410	1,710	23,996	9,600	760
Mendocino	99,800	37,370	14,759	151,929	1,000	13,914
Merced	408,500	52,400	19,215	480,115	177,500	10,956
Modoc	83,500	15,300	4,563	103,363	9,000	4,558
Mono						
Monterey	638,000	80,250	14,350	732,600	401,000	12,063
Napa	119,300	26,775	10,600	156,675	35,500	5,673
Nevada	35,500	12,980	5,004	53,484	22,500	5,184
Orange	1,598,369	234,309	48,921	1,881,599	761,000	29,458
Placer	172,000	24,300	8,800	205,100	52,000	7,120
Plumas	52,500	7,700	3,000	63,200		2,700
Riverside	641,800	112,470	29,981	784,251	280,500	18,197
Sacramento	615,000	110,935	16,504	742,439	1,105,000	10,148
San Benito	80,000	6,000	4,850	90,850	3,000	3,400
San Bernardino	1,512,500	219,625	54,574	1,786,699	939,000	30,907
San Diego	1,512,200	129,215	47,786	1,689,201	1,440,500	26,164
San Francisco	2,648,193	197,437	88,041	2,933,671	1,324,400	13,126
San Joaquin	1,185,748	87,657	12,469	1,285,874	397,000	8 477
San Luis Obispo	364,700	50,215	11,640	426,555	221,500	4,930
San Mateo	574,500	52,385	15,973	642,858	194,000	10,240
Santa Barbara	272,000	80,345	19,900	372,245	405,400	14,640
Santa Clara	1,329,207	172,719	36,228	1,538,154	903,500	25,577
Santa Cruz	540,000	385,440	11,485	936,925	235,000	5,636
Shasta	118,000	17,100	4,650	139,750	35,000	6,895
Sierra		2,345	1,150	3,495		925
Siskiyou	260,000	14,304	6,180	280,484	88,000	7,290
Solano	373,800	51,225	13,238	438,263	438,000	6,686
Sonoma	587,100	103,695	11,852	702,647	335,000	13,112
Stanislaus	868,750	75,300	14,720	958,770	610,500	10,012
Sutter	87,500	14,880	2,675	105,055	102,000	2,110
Tehama	224,000	22,770	1,845	248,615	126,000	4,850
Trinity	10,000	850	400	11,250		800
Tulare	732,400	187,260	25,692	945,352	743,750	28,970
Tuolumne	83,800	17,015	6,015	106,830	13,000	4,797
Ventura	429,100	59,315	12,259	500,674	469,000	14,396
Yolo	181,300	31,350	4,250	216,900	110,000	4,350
Yuba	115,000	12,249	4,250	131,499	27,000	4,468
Totals	$39,071,515	$6,193,976	$1,323,729	$46,589,220	$26,058,400	761,416

TABLE No. 18—Continued.

Statistics of Secondary (High) Schools, Showing Valuation of Property, Outstanding Bonded Debts, Number of Books in High School Libraries for School Year Closing June 30, 1922.

Counties	Lots and school houses	Laboratories, furniture, apparatus and equipment	Library books	Total valuation of school property	Total outstanding bonded debt	Number of volumes in school library
Alameda	$3,358,394	$441,814	$87,943	$3,888,151	$3,666,750	58,843
Alpine						
Amador	86,000	24,600	3,900	114,500	17,000	2,146
Butte	790,695	75,075	9,594	875,364	576,500	8,689
Calaveras	8,700	5,015	3,375	17,090		
Colusa	186,400	19,475	7,050	212,925	106,500	4,303
Contra Costa	729,079	127,849	28,432	885,360	412,000	28,069
Del Norte	20,000	10,960	3,360	34,260		2,470
El Dorado	40,000	5,950	2,200	48,150		3,579
Fresno	3,203,612	551,799	64,396	3,819,807	2,711,000	71,830
Glenn	257,300	35,600	4,700	297,600		4,166
Humboldt	406,000	66,500	14,900	487,400	188,000	11,088
Imperial	896,000	136,519	14,263	1,046,782	669,500	5,438
Inyo	339,870	26,800	7,244	373,914	345,000	3,552
Kern	890,000	326,050	24,040	1,240,090	805,000	9,921
Kings	506,500	62,335	14,773	577,608	395,000	14,400
Lake	87,750	22,690	7,117	117,557	56,000	2,922
Lassen	120,000	20,450	3,800	144,250	75,000	2,683
Los Angeles	13,871,008	2,569,762	605,995	17,046,765	11,507,000	684,457
Madera	256,740	42,095	11,165	310,000	145,000	4,253
Marin	203,400	95,050	10,006	308,456	64,000	8,400
Mariposa	18,876	3,324	1,800	24,000	3,000	1,020
Mendocino	136,800	37,370	14,759	188,929	25,000	11,178
Merced	379,000	63,325	22,053	464,378	170,500	17,165
Modoc	96,500	14,721	6,250	117,471	3,000	4,902
Mono						
Monterey	642,000	74,600	16,200	732,800	420,000	15,159
Napa	197,000	28,750	10,226	235,976	394,000	11,019
Nevada	184,000	6,115	4,772	194,887	158,750	5,502
Orange	2,432,800	320,624	68,744	2,822,168	1,277,250	33,731
Placer	194,800	40,600	9,550	244,950	51,000	8,049
Plumas	52,500	10,900	3,000	66,400		3,000
Riverside	637,300	131,480	28,601	797,381	404,000	17,975
Sacramento	1,514,140	135,855	12,540	1,662,535	1,214,000	10,392
San Benito	80,000	10,900	5,500	96,400		3,835
San Bernardino	1,715,435	224,430	62,627	2,002,542	1,252,000	63,367
San Diego	1,070,900	124,715	74,465	1,270,080	1,417,550	19,069
San Francisco	2,828,911	230,355	144,422	3,203,688	1,976,200	106,548
San Joaquin	1,368,998	117,305	32,256	1,518,559	1,078,000	10,027
San Luis Obispo	383,450	64,755	15,356	463,561	276,097	10,260
San Mateo	606,000	65,300	19,375	690,675	842,000	12,913
Santa Barbara	481,000	77,880	23,950	582,830	901,600	14,076
Santa Clara	1,540,129	211,550	42,839	1,794,518	891,000	19,215
Santa Cruz	562,000	66,100	16,581	644,681	225,000	6,637
Shasta	118,500	22,900	8,318	149,718	34,000	3,939
Sierra		2,250	1,150	3,400		1,725
Siskiyou	281,875	21,500	9,650	313,025	79,000	13,032
Solano	577,800	57,864	15,824	651,488	424,000	12,011
Sonoma	508,300	91,150	29,766	629,216	621,500	13,045
Stanislaus	915,150	159,050	40,719	1,114,919	679,800	10,520
Sutter	174,365	117,653	3,902	295,920	92,000	1,881
Tehama	227,500	31,800	5,725	265,025	115,000	2,200
Trinity	10,000	400	850	11,250		800
Tulare	998,800	235,000	31,695	1,265,495	1,378,500	39,296
Tuolumne	107,500	16,510	3,950	127,960		7,326
Ventura	633,683	76,093	12,713	722,489	453,000	7,773
Yolo	190,200	26,550	8,700	225,450	106,000	4,900
Yuba	115,000	11,575	4,620	131,195	25,000	5,585
Totals	$48,232,710	$7,597,577	$1,741,701	$57,571,988	$38,726,997	1,460,272

TABLE No. 19.

Statistics of Secondary (High) Schools, Showing Rate of County Tax, and Average Rate per Pupil for School Years Ending June 30, 1921 and 1922.

Counties	Rate of county tax for high school		Average cost per pupil, not including cost of buildings, on average attendance	
	1920-21	1921-22	1920-21	1921-22
Alameda	0.21	0.221	$195 38	$180 22
Alpine				
Amador	.18	.18	246 13	215 61
Butte	.20	.20	162 53	177 77
Calaveras	.10	.10	251 44	205 74
Colusa	.10	.12	301 73	287 90
Contra Costa	.10	.10	217 17	220 04
Del Norte	.25	.115	275 12	299 52
El Dorado	.10	.06	205 81	168 25
Fresno	.25	.28	262 14	229 10
Glenn	.10	.11	217 20	219 61
Humboldt	.119	.132	213 55	209 00
Imperial	.086	.20	288 11	274 70
Inyo	.13	.13	222 93	227 14
Kern	.075	.06	267 62	266 19
Kings	.13	.13	240 81	253 74
Lake	.18	.22	211 51	263 76
Lassen	.12	.14	225 09	258 40
Los Angeles	.14	.15	228 11	224 34
Madera	.10	.10	278 62	255 36
Marin	.17	.17	151 11	154 89
Mariposa		.18	412 88	394 44
Mendocino	.135	.14	182 49	189 64
Merced	.14	.14	256 44	226 25
Modoc	.15	.13	286 16	245 93
Mono				
Monterey	.12	.12	245 44	258 27
Napa	.17	.15	182 41	190 32
Nevada	.30	.25	160 63	150 71
Orange	.22	.22	211 23	210 61
Placer	.32	.35	204 23	221 32
Plumas	.08	.20	393 25	341 75
Riverside	.60	.45	208 91	216 93
Sacramento	.167	.21	193 66	194 52
San Benito	.30	.23	155 47	159 49
San Bernardino	.72	.40	211 47	207 53
San Diego	.19	.30	214 11	203 32
San Francisco	.059	.068	131 08	138 16
San Joaquin	.108	.13	180 86	181 88
San Luis Obispo	.15	.145	196 02	250 82
San Mateo	.118	.158	213 34	211 94
Santa Barbara	.20	.13	269 36	246 24
Santa Clara	.193	.23	146 65	148 13
Santa Cruz	.24	.258	188 23	201 98
Shasta	.11	.12	254 95	223 53
Sierra		.11	334 87	352 00
Siskiyou	.11	.11	288 94	251 98
Solano	.16	.17	214 04	224 80
Sonoma	.313	.31	197 07	204 90
Stanislaus	.40	.24	199 72	194 64
Sutter	.09	.10	286 04	232 77
Tehama	.15	.15	231 66	246 43
Trinity	.28	.35	276 80	285 94
Tulare	.31	.214	198 09	197 75
Tuolumne	.156	.16	215 62	211 53
Ventura	.12	.12	232 22	223 02
Yolo	.164	.19	188 10	203 40
Yuba	.12	.15	202 68	183 11
Averages	0.185	0.178	$210 14	$206 40

TABLE No. 20.

Statistics of Secondary (High) Schools, Showing Number of Principals, Teachers and Average Annual Salary Paid Each Class for School Year Ending June 30, 1921.

Counties	Number and average salary paid principals				Number and average salary paid regular teachers			
	No.	Men	No.	Women	No.	Men	No.	Women
Alameda	29	$2,312 00	5	$2,916 00	158	$2,096 32	413	$1,995 59
Alpine								
Amador	3	2,466 66			2	2,150 00	11	1,684 09
Butte	4	3,400 00			15	2,000 00	31	1,832 26
Calaveras	2	2,500 00			2	2,000 00	5	1,716 00
Colusa	5	2,720 00			4	2,262 50	19	1,771 04
Contra Costa	6	3,320 66	1	3,000 00	15	2,296 00	52	1,871 25
Del Norte	1	2,750 00			1	2,200 00	3	1,866 66
El Dorado	1	2,500 00			4	1,900 00	3	1,666 66
Fresno	18	3,180 26	1	2,899 28	120	2,166 67	185	1,984 72
Glenn	2	3,000 00	1	2,700 00	5	2,180 00	19	1,815 79
Humboldt	5	2,510 00			13	2,167 31	37	1,822 98
Imperial	6	3,361 66			25	2,354 00	40	2,061 25
Inyo	3	2,626 66	1	2,000 00	2	1,850 00	13	1,732 69
Kern	5	3,250 00			33	2,459 46	57	2,260 70
Kings	3	3,566 66			13	2,242 30	24	1,916 67
Lake	3	2,433 33			3	1,866 66	10	1,636 66
Lassen	1	3,000 00	1	2,000 00	3	2,133 33	7	1,800 00
Los Angeles	38	3,634 86	3	3,716 67	627	2,334 04	1,247	2,300 82
Madera	3	3,100 00			5	2,000 00	17	1,865 29
Marin	3	3,250 00			9	2,466 66	21	1,858 57
Mariposa	1	2,400 00					2	1,600 00
Mendocino	9	2,600 00			4	2,075 00	26	1,692 69
Merced	6	2,926 33			7	2,114 28	30	1,811 33
Modoc	3	2,505 00			3	1,758 33	13	1,689 42
Mono								
Monterey	5	3,700 00			20	2,409 10	29	2,044 82
Napa	3	3,200 00			8	2,175 00	16	1,841 87
Nevada	3	2,666 66			3	1,933 33	10	1,600 00
Orange	6	3,383 33			58	2,228 50	95	1,919 58
Placer	3	2,966 67			12	2,143 33	16	1,720 00
Plumas	1	2,940 00					3	1,890 00
Riverside	11	2,865 45			42	2,033 57	71	1,780 54
Sacramento	6	2,873 33			37	2,438 92	92	2,141 09
San Benito	1	4,000 00			5	2,460 00	7	1,865 71
San Bernardino	9	3,353 33			59	2,344 00	104	1,801 75
San Diego	12	2,673 25			54	2,234 94	114	2,040 75
San Francisco	8	3,127 50			134	1,976 01	192	2,098 45
San Joaquin	7	3,146 85			43	2,248 02	67	2,138 20
San Luis Obispo	5	2,540 00			9	2,255 55	26	1,938 46
San Mateo	4	3,423 33			14	2,561 64	30	1,993 23
Santa Barbara	5	3,166 40	1	3,000 00	25	2,285 68	37	1,921 67
Santa Clara	9	2,690 77	2	2,033 25	63	1,696 02	121	1,749 84
Santa Cruz	4	3,214 00			11	2,243 63	34	1,883 58
Shasta	3	2,800 00			6	2,225 00	15	1,660 33
Sierra	1	3,000 00			2	1,800 00	3	1,800 00
Siskiyou	8	2,351 25	1	2,127 50	9	1,933 33	22	1,605 68
Solano	6	2,810 00			12	2,093 08	38	1,838 10
Sonoma	10	2,179 00			33	2,432 00	78	1,734 00
Stanislaus	9	3,088 88			26	2,224 23	71	1,810 84
Sutter	2	2,775 00			2	2,050 00	9	1,766 66
Tehama	3	2,900 00			8	2,203 12	18	1,844 44
Trinity	1	2,400 00			1	1,650 00	4	1,500 00
Tulare	10	2,910 00			31	2,188 55	68	1,784 56
Tuolumne	2	2,650 00			1	1,800 00	11	1,772 72
Ventura	6	3,004 58			14	1,968 22	30	1,848 67
Yolo	3	2,833 33			5	2 290 00	17	1,811 17
Yuba	2	2,950 00			7	2,370 00	10	1,826 00
	328	$2,959 68	17	$2,795 48	1,827	$2,200 59	3,743	$2,044 95

TABLE No. 20—Continued.

Statistics of Secondary (High) Schools, Showing Number of Principals, Teachers and Average Annual Salary Paid Each Class for School Year Ending June 30, 1922.

Counties	Number and average salary paid principals				Number and average salary paid regular teachers			
	No	Men	No.	Women	No.	Men	No.	Women
Alameda	29	$2,718 00	6	$2,948 00	178	$2,194 00	400	$2,192 00
Alpine								
Amador	3	2,733 33			2	2,300 00	13	1,768 46
Butte	5	3,260 00			21	2,383 33	38	1,892 17
Calaveras	2	2,500 00			2	2,050 00	5	1,720 00
Colusa	5	2,840 00			9	2,316 00	17	1,815 00
Contra Costa	6	3,473 66	1	3,500 00	18	2,431 81	61	1,976 22
Del Norte	1	2,950 00					4	1,925 00
El Dorado	1	2,800 00			3	2,133 33	6	1,800 00
Fresno	18	3,461 83	1	3,180 00	114	2,382 47	186	2,098 07
Glenn	2	3,050 00	1	2,700 00	7	2,157 15	20	1,852 50
Humboldt	4	3,600 00			16	2,337 50	44	1,913 84
Imperial	6	3,378 00			24	2,373 00	38	1,949 00
Inyo	3	2,793 33	1	2,000 00	4	1,993 75	13	1,750 00
Kern	5	3,675 45			37	2,620 05	65	2,390 61
Kings	3	3,660 00			14	2,296 42	24	1,954 94
Lake	4	2,525 00			5	1,946 00	12	1,800 00
Lassen	2	2,850 00			1	2,400 00	13	1,818 46
Los Angeles	46	3,741 10	5	3,500 00	650	2,436 16	1,406	2,317 59
Madera	3	3,240 00			5	2,240 00	20	1,961 25
Marin	3	3,000 00			10	2,770 00	25	1,924 00
Mariposa	1	2,400 00					3	1,600 00
Mendocino	9	2,745 33			9	2,361 11	29	1,782 75
Merced	6	3,066 00			8	2,273 50	34	1,883 00
Modoc	3	2,616 67			4	2,050 00	13	1,788 46
Mono								
Monterey	5	3,850 00			21	2,482 38	32	2,026 76
Napa	3	3,333 33			9	2,211 11	19	1,860 00
Nevada	3	2,666 66			4	2,125 00	12	1,850 00
Orange	8	3,537 50			69	2,302 31	113	1,971 87
Placer	3	3,300 00			14	2,320 00	18	1,952 00
Plumas	1	3,360 00					5	2,142 00
Riverside	11	3,018 00			48	2,097 00	73	1,830 00
Sacramento	6	2,948 33			53	2,344 18	103	2,198 01
San Benito	1	4,000 00			4	2,525 00	11	1,954 54
San Bernardino	8	3,713 00	1	2,700 00	68	2,363 00	103	1,938 00
San Diego	10	2,952 40			66	2,351 10	116	2,107 00
San Francisco	12	3,272 50			165	1,870 60	264	2,070 18
San Joaquin	7	3,301 00			44	2,537 00	75	2,178 00
San Luis Obispo	5	3,100 00			8	2,275 00	28	1,850 00
San Mateo	4	3,700 00			17	2,696 47	40	2,057 45
Santa Barbara	4	3,500 00	1	3,000 00	25	2,404 00	48	2,091 67
Santa Clara	8	3,200 00	1	2,500 00	58	2,107 65	121	1,978 78
Santa Cruz	3	3,450 00			16	2,442 75	35	1,995 60
Shasta	3	2,916 67			6	2,291 67	15	1,886 33
Sierra	1	3,333 50			2	1,900 00	3	1,866 67
Siskiyou	8	2,937 50			9	2,153 33	21	1,857 62
Solano	6	3,146 67			14	2,192 85	41	1,986 83
Sonoma	7	3,314 00			29	2,383 00	72	1,977 00
Stanislaus	10	3,170 00			32	1,883 12	83	1,788 97
Sutter	2	2,850 00			2	2,150 00	10	1,740 00
Tehama	3	3,266 66			9	2,288 88	21	1,957 00
Trinity	1	2,400 00			1	1,700 00	4	1,725 00
Tulare	10	3,165 00			45	2,227 49	77	1,835 06
Tuolumne	2	2,650 00			2	2,000 00	10	1,795 00
Ventura	6	3,058 75			14	2,078 21	36	1,863 75
Yolo	3	3,200 00			8	2,377 50	21	1,838 00
Yuba	2	3,168 00			6	2,315 00	12	1,828 33
Totals	336	*$3,233 00	18	*$3,059 00	2,009	*$2,311 00	4,131	*$2,123 00

*Average.

Section 5.

GENERAL SCHOOL STATISTICS.

Table No. 21. Showing Costs of Teachers' and Trustees' Institutes, Number of Books in County Teachers' Libraries and Amount of Money Paid for Books, Total Annual Expenses for County and City Superintendents' Offices, Total Annual Expenses for City and County Boards of Education, Number of Certificates Issued by County Boards of Education and Fees Collected for Same, Segregation of Schools According to Number of Teachers Employed, Number of Professionally Trained Teachers by Counties, Expenditures of Superintendent of Public Instruction and State Board of Education.

ABLE No. 21.

Miscellaneous School Statistics, Showing Cost of Teachers' and Trustees' Institutes for School Years Closing June 30, 1921 and 1922.

Counties	Cost of teachers' institutes				Total, 1921-22	Lecturers, 1920-21	Cost of trustees' institutes				Total, 1921-22
	Instructors, 1920-21	Other expenses, 1920-21	Total, 1920-21	Instructors, 1921-22	Other expenses, 1921-22			Other expenses, 1920-21	Total, 1920-21	Lecturers, 1921-22	Other expenses, 1921-22	
Alameda	$200 00		$200 00	$700 00	$250 00	$950 00						
Alpine												
Amador	257 50	$79 35	336 85	85 00		85 00						
Butte	408 98	50 00	458 98	85 00		85 00	$65 00		$65 00	$85 20		$85 20
Calaveras	283 20	29 86	313 06	85 00		85 00	283 20	$29 86	313 06			
Colusa	211 25	85 19	296 44	95 00		95 00				75 20	$43 00	118 20
Contra Costa	625 00	31 00	656 00	350 00		350 00	185 00	160 00	345 00	340 00	235 00	575 00
Del Norte					200 00	200 00						
El Dorado	211 04	85 75	296 79	85 00		85 00						
Fresno	375 17	45 00	420 17	152 90	200 54	353 44				50 00	8 00	58 00
Glenn	237 34	61 67	299 01	110 00		110 00	98 70	45 70	144 40	50 00	36 57	86 57
Humboldt	288 52	85 75	374 27	590 06	39 60	629 66	56 45		56 45	62 80		62 80
Imperial	375 00	64 60	439 60	400 00	61 55	461 55	205 86	11 50	217 36	100 00	17 25	117 25
Inyo	300 00	7 50	307 50	300 00		300 00				150 00		150 00
Kern	433 68	120 30	553 98	555 00	129 20	684 20	250 00		250 00	75 00		75 00
Kings	155 00	128 50	283 50	304 44	33 36	337 80	52 24	3 00	55 24	45 93		45 93
Lake	238 16	42 00	280 16	295 79	18 75	314 54						
Lassen	186 90		186 90	143 86		143 86						
Los Angeles	1,465 00	300 00	1,765 00	7 950 00	1,201 41	9,151 41	50 00	358 91	408 91	200 00	410 31	610 31
Madera	169 37		169 37	185 00	13 50	198 50				126 76		126 76
Marin				235 00	11 75	246 75		10 50	10 50			
Mariposa	286 50	12 80	299 30	280 00	5 60	285 60						
Mendocino	266 65	101 00	367 65		200 00	200 00						
Merced	270 74	129 26	400 00	341 25	78 75	420 00	65 00	15 00	80 00	80 35	39 65	120 00
Modoc	275 77	17 55	293 32	197 76	102 19	299 95						
Mono												
Monterey	200 00		200 00									
Napa	353 00	25 00	378 00	300 00	40 00	340 00				20 00	12 50	32 50
Nevada	272 00	28 00	300 00		85 00	85 00	97 00	40 18	137 18			
Orange	425 00	45 00	470 00	418 03	2 75	420 78						
Placer	137 04	48 65	185 69	80 00	10 00	90 00	105 00	45 00	150 00	27 74	39 00	66 74
Plumas	242 94	53 50	296 44	85 00	12 90	97 90						
Riverside	360 00	27 00	387 00	300 00	14 75	314 75	125 00	191 72	316 72	60 00	283 32	343 32
Sacramento	258 52	131 00	389 52		85 00	85 00						
San Benito	200 00		200 00	300 00		300 00						
San Bernardino	325 00	112 91	437 91	400 00	86 70	486 70						
San Diego	260 00	20 00	280 00	221 25		221 25	150 00	225 05	375 05	70 00	45 00	115 00

San Francisco	825 00	872 00	1,697 00	1,150 00	470 00	1,620 00						
San Joaquin	362 30	37 70	400 00	400 00		400 00						
San Luis Obispo	200 00	5 00	205 00	300 00		300 00						
San Mateo	420 00	48 00	468 00	300 00	30 10	330 10	105 00	17 90	122 90			
Santa Barbara	325 00	45 25	370 25	478 93	63 00	541 93				102 04	24 65	126 69
Santa Clara	475 00	99 55	574 55	325 00	165 43	490 43	100 00	11 74	111 74	221 50	4 36	225 86
Santa Cruz	300 00		300 00	300 00		300 00	75 00		75 00			
Shasta	280 42		280 42	156 64	15 00	171 64	91 94	5 53	97 47	65 00	9 50	74 50
Sierra												
Siskiyou	432 65	46 80	479 45	282 50	62 36	344 86				234 00		234 09
Solano	215 00	51 83	266 83	85 00		85 00						
Sonoma	530 00	35 00	565 00	200 00	63 30	263 30						
Stanislaus		200 00	200 00	365 36		365 36				81 18		81 18
Sutter	204 19	50 25	254 44	85 00		85 00				65 00	15 00	80 00
Tehama	187 00	150 97	337 97	240 00	63 36	303 36	100 00	241 41	341 41	200 00	212 53	412 53
Trinity	210 00	20 00	230 00	199 57		199 57						
Tulare	599 66	173 60	773 26	355 00	254 35	609 35				25 00	64 35	89 35
Tuolumne	371 62	5 35	376 97	279 43	17 25	296 68						
Ventura	475 00	12 00	487 00	750 00	80 04	830 04		3 25	3 25		3 25	3 25
Yolo	99 98	79 60	179 58	95 00		95 00						
Yuba	300 50	82 18	382 68									
Totals	$17,367 59	$3,983 22	$21,350 81	$21,977 77	$4,167 49	$26,145 26	$2,260 39	$1,416 25	$3,676 64	$2,612 70	$1,503 24	$4,115 94

TABLE No. 21—Continued.

Miscellaneous School Statistics, Showing Number of Books in County Teachers' Libraries and Amount of Money Paid for Books for Years Closing June 30, 1921 and 1922.

Counties	Number of books in teachers' libaries		Amount of money paid for books	
	1920-21	1921-22	1920-21	1921-22
Alameda	1,541		$782 00	$655 00
Alpine	50			
Amador			27 75	31 00
Butte			70 00	85 23
Calaveras	670	674	4 40	7 50
Colusa			39 00	41 00
Contra Costa	1,856			102 00
Del Norte	575	575	6 70	
El Dorado	605	700	42 06	26 40
Fresno			43 46	596 75
Glenn	1,020	1,050	62 25	49 77
Humboldt	2,000			
Imperial	400	200	174 00	160 00
Inyo				
Kern	1,553	1,786	300 05	391 80
Kings	189		142 00	100 00
Lake	410	426	9 55	25 93
Lassen			48 00	51 00
Los Angeles	10,318	10,278	1,004 00	1,072 14
Madera			173 94	47 71
Marin		545	28 31	27 06
Mariposa	925	975	18 54	
Mendocino	1,130	1,190	48 83	97 40
Merced			150 00	34 89
Modoc	600	650	35 79	211 42
Mono	100	100	4 80	15 00
Monterey			149 00	265 00
Napa	1,500	1,500	66 22	43 34
Nevada	422	437	120 00	147 07
Orange	6,052	6,092	264 45	313 83
Placer	981	995	89 83	68 54
Plumas	110		22 60	
Riverside		750	198 00	175 00
Sacramento			185 25	192 00
San Benito	475		15 00	17 00
San Bernardino	3,750		313 00	261 00
San Diego	2,282	2,508	84 03	417 64
San Francisco		892	313 12	320 48
San Joaquin	1,275	1,350	47 50	175 00
San Luis Obispo			67 38	16 00
San Mateo	2,722	2,800	64 63	57 98
Santa Barbara		500	70 66	144 81
Santa Clara		1,971	212 00	231 00
Santa Cruz	2,250	2,291	89 32	46 55
Shasta	991	1,003	64 15	53 27
Sierra	255	256	21 92	6 75
Siskiyou			79 00	86 00
Solano	535	520	20 17	11 00
Sonoma	2,242	2,329	293 22	58 30
Stanislaus	972	1,035	167 00	187 23
Sutter	223		334 50	
Tehama				
Trinity	125	125		
Tulare			256 00	10 59
Tuolumne	275			
Ventura				
Yolo			65 00	45 00
Yuba	413	449	14 71	45 13
Totals	51,792	46,952	$6,903 09	$7,224 51

TABLE No. 21—Continued.

Miscellaneous School Statistics, Showing County Expenses for Schools, Salary of County Superintendent and Deputies and Office Expenses for School Year Ending June 30, 1921.

Counties	Annual salary of superintendent and deputies	Traveling expenses	Postage and expressage	Other expenses	Total for year
Alameda	$11,640 00	$841 87	$239 54	$1,963 31	$14,684 72
Alpine	200 00	24 00	12 00	31 00	267 00
Amador	1,500 00	300 00	28 95	185 14	2,014 09
Butte	5,040 00	705 94	119 91	1,066 68	6,932 53
Calaveras	1,500 00	134 50	57 05	77 77	1,769 32
Colusa	2,400 00	514 11	67 50	1,380 91	4,362 52
Contra Costa	9,480 00	2,350 60	140 00	2,412 72	14,383 32
Del Norte	720 00	33 25	20 00	30 00	803 25
El Dorado	1,800 00	248 37	54 55	234 80	2,337 72
Fresno	15,680 00	6,050 70	233 68	3,261 38	25,225 76
Glenn	3,700 00	832 35	169 21	504 03	5,205 59
Humboldt	3,400 00	696 50	196 20	1,140 34	5,433 04
Imperial	7,600 00	646 56	128 42	289 27	8,664 25
Inyo	1,500 00	187 50	65 38	112 00	1,864 88
Kern	8,700 00	125 52	310 41	4,208 55	13,344 48
Kings	3,000 00	415 72	102 07	1,560 96	5,078 75
Lake	1,500 00		22 50	131 99	1,654 49
Lassen	1,800 00	437 00	160 00	83 00	2,480 00
Los Angeles	40,760 00	370 08	1,051 25	7,642 91	49,824 24
Madera	2,300 00	374 21	83 05	779 62	3,536 88
Marin	4,200 00	547 00	141 70	958 36	5,847 06
Mariposa	1,200 00	315 45	70 00	80 20	1,665 65
Mendocino	2,400 00	1,018 40	184 46	323 11	3,925 97
Merced	3,200 00	440 90	108 40	941 97	4,691 27
Modoc	1,500 00	269 68	136 42	221 33	2,127 43
Mono	400 00	112 20	18 40	102 28	632 88
Monterey	3,900 00	790 31	155 47	921 98	5,767 76
Napa	2,500 00	424 41	116 00	1,000 14	4,040 55
Nevada	2,000 00	400 00	41 09	131 85	2,572 94
Orange	3,450 00	222 95	71 08	1,342 99	5,087 02
Placer	2,400 00	244 74	97 73	1,131 00	3,873 47
Plumas	1,500 00	320 00	76 70	500 00	2,396 70
Riverside	3,600 00	646 94	125 00	902 25	5,274 19
Sacramento	6,900 00	496 68	120 00	1,124 49	8,641 17
San Benito	1,800 00	391 50	35 00		2,226 50
San Bernardino	4,380 00	615 85	125 00	1,168 58	6,289 43
San Diego	5,750 00	1,161 78	129 50		7,041 28
San Francisco	37,602 06	3,156 33	376 66	2,532 70	43,667 75
San Joaquin	4,900 00		215 00	320 00	5,435 00
San Luis Obispo	3,200 00	909 83	102 53	733 49	4,945 85
San Mateo	2,880 00	400 17	80 00	137 50	3,497 67
Santa Barbara	3,200 00	386 71	187 20	1,111 39	4,885 30
Santa Clara	7,112 50	1,011 77	157 91	1,202 60	9,484 78
Santa Cruz	2,820 00	423 89	71 66	619 84	3,935 39
Shasta	2,400 00	816 06	109 07	968 75	4,293 88
Sierra	625 00	186 48	48 42		859 90
Siskiyou	3,000 00	597 35	154 25	1,234 14	4,985 74
Solano	3,600 00	322 71	114 82	638 90	4,676 43
Sonoma	7,800 00	306 71	350 00	1,000 00	9,456 71
Stanislaus	5,480 00	702 82	95 00	1,211 87	7,489 69
Sutter	1,600 00	213 50	145 75	510 33	2,469 58
Tehama	2,300 00		100 00	2,139 59	4,539 59
Trinity	1,000 00	172 20	60 00	142 52	1,374 72
Tulare	5,499 92	1,544 02	234 56	1,753 23	9,031 73
Tuolumne	1,800 00	18 00	57 50	45 00	1,920 50
Ventura	3,100 00	539 64	134 75	1,245 57	5,019 96
Yolo	2,300 00	311 03	59 21	410 17	3,080 41
Yuba	1,800 00	194 52	36 31	176 02	2,206 85
Totals	$279,319 48	$35,921 31	$7,904 22	$56,080 52	$379,225 53

TABLE No. 21.—Continued.

Miscellaneous School Statistics, Showing County Expenses for Schools, Salary of County Superintendent and Deputies, and Office Expenses for School Year Ending June 30, 1922.

Counties	Annual salary of superintendent and deputies	Traveling expenses	Postage and expressage	Other expenses	Total for year
Alameda	$13,698 53	$592 15	$20 22	$982 48	$15,293 38
Alpine	200 00	24 00	10 00	40 00	274 00
Amador	1,500 00	298 40	58 10	427 58	2,284 08
Butte	5,040 00	770 48	160 84	661 01	6,632 33
Calaveras	1,500 00	134 00	43 27	73 83	1,751 10
Colusa	2,400 00	446 68	46 25	986 97	3,879 90
Contra Costa	9,850 00	2,643 59	130 00		12,623 59
Del Norte	720 00	119 50	20 00	101 00	960 50
El Dorado	1,800 00	185 77	60 50	371 69	2,417 96
Fresno	20,963 95	10,438 60	513 94	7,659 72	39,576 21
Glenn	2,900 00	967 09	189 90	374 70	5,431 69
Humboldt	7,300 00	963 09	195 00	421 36	8,879 45
Imperial	7,600 00	665 16		1,054 45	9,319 61
Inyo	1,500 00	279 00	50 00	436 35	2,265 35
Kern	19,350 00	227 82	202 24	1,989 20	21,769 26
Kings	3,250 00	309 06	94 50	484 73	4,138 29
Lake	1,500 00	102 00	38 56	212 19	1,852 75
Lassen	3,197 55	546 30	123 00	23 00	3,889 85
Los Angeles	42,863 08	611 83	1,466 57	7,642 08	52,583 56
Madera	2,700 00	367 87	90 00	1,881 64	5,039 51
Marin	6,700 00	501 31	105 03	806 93	8,113 27
Mariposa	2,560 00	199 50	68 00	74 00	2,901 50
Mendocino	2,400 00	1,029 20	420 74	983 31	4,833 25
Merced	4,700 00	398 90	140 01	168 25	5,407 16
Modoc	1,500 00	335 55	95 55	474 07	2,405 17
Mono	400 00	200 00	25 00	90 00	715 00
Monterey	5,100 00	798 09	267 92	1,724 56	7,890 57
Napa	2,800 00	375 08	116 00	898 05	4,189 13
Nevada	2,000 00	492 76	60 52	657 81	3,211 09
Orange	3,600 00	238 75	110 00	1,727 66	5,676 41
Placer	2,700 00	287 00	101 15	1,000 00	4,088 15
Plumas	1,500 00	310 00	62 00	500 00	2,372 00
Riverside	4,154 83	927 23	129 00	1,132 26	6,343 32
Sacramento	6,900 00	9 82	315 00	1,082 03	8,306 85
San Benito	1,800 00	335 00	30 00	200 00	2,365 00
San Bernardino	11,180 00	1,059 55	200 00	1,000 00	13,439 55
San Diego	11,992 90	761 71	303 29	1,591 54	14,649 44
San Francisco	45,258 11	2,997 07	379 11	6,172 01	54,806 30
San Joaquin	5,500 00		134 00	1,188 48	6,822 48
San Luis Obispo	7,053 60	1,119 75	176 40	1,071 42	9,431 17
San Mateo	2,900 00	462 30	46 00	25 00	3,433 30
Santa Barbara	6,773 39	1,122 54	285 00	1,889 15	10,070 08
Santa Clara	14,000 00	1,034 98	161 10	1,248 30	16,444 38
Santa Cruz	3,000 00	499 32	87 16	626 29	4,212 77
Shasta	2,700 00	841 95	167 27	1,204 08	4,913 30
Sierra	625 00	203 08	42 82	75 00	945 90
Siskiyou	3,000 00	504 49	137 50	651 94	4,293 93
Solano	3,600 00	267 47	145 62	1,591 44	5,604 53
Sonoma	8,240 00	287 42	400 00	1,500 00	10,427 42
Stanislaus	5,742 51	692 96	210 14	1,422 17	8,067 78
Sutter	1,600 00	207 85	42 70	612 37	2,462 92
Tehama					
Trinity	1,000 00	333 69	72 00	207 50	1,613 19
Tulare	7,811 79	1,223 29	217 92	3,277 63	12,529 63
Tuolumne	4,350 00	260 00	53 00	32 40	4,695 40
Ventura	7,088 93	592 99	190 00	2,877 01	10,748 93
Yolo	2,300 00	338 64	33 91	472 25	3,144 80
Yuba	1,800 00	333 87	46 00	319 70	2,499 57
Totals	$357,174 17	$42,274 50	$9,089 75	$66,398 59	$474,937 01

TABLE No. 21—Continued.

Miscellaneous Statistics, Showing County Expenses for Schools, Cost of County Board of Education for the School Year Ending June 30, 1921.

Counties	Total per diem paid members	Traveling expenses	Other expenses	Total expenses for year
Alameda	$2,060 00			$2,060 00
Alpine	125 00	$18 00		143 00
Amador	605 00	36 40	$25 05	666 45
Butte	490 00	182 16	414 99	1,087 15
Calaveras	530 00	38 40	292 08	860 48
Colusa	1,100 00	236 00	520 37	1,856 37
Contra Costa	1,230 00	1,096 00	344 05	2,670 05
Del Norte	300 00		20 00	320 00
El Dorado	657 50	29 80	232 50	919 80
Fresno	2,850 00	367 54	145 33	3,362 87
Glenn	725 00	86 20	140 00	951 20
Humboldt	535 00	93 60		628 60
Imperial	165 00	13 50	13 00	191 50
Inyo	575 00	124 80	205 87	905 67
Kern	790 00		1,901 07	2,691 07
Kings	1,005 00		664 90	1,669 90
Lake	315 00	28 10	5 76	348 86
Lassen	745 00	76 00	500 00	1,321 00
Los Angeles	1,600 00		1,590 21	3,190 21
Madera	860 00		305 00	1,165 00
Marin	400 00	142 40		542 40
Mariposa	435 80	32 70	79 00	547 50
Mendocino	737 50	182 80	218 60	1,138 90
Merced	1,075 00	225 00	10 80	1,310 80
Modoc	407 50			407 50
Mono	165 00	39 00		204 00
Monterey	1,292 00	673 40	1,759 75	3,725 15
Napa	1,200 00		530 00	1,730 00
Nevada	870 00	443 42	105 87	1,419 29
Orange	1,000 00	151 50		1,151 50
Placer	595 00	355 20	1,046 32	1,996 52
Plumas	796 00	230 00	25 00	1,051 00
Riverside	600 00	175 50	456 40	1,231 90
Sacramento	1,005 00	43 40	125 65	1,174 05
San Benito	750 00	61 60		811 60
San Bernardino	255 00	22 76		277 76
San Diego	880 00	208 35	2,189 23	3,277 58
San Francisco	62,118 85	3,826 67	27,277 64	93,223 16
San Joaquin	1,750 00	428 00	275 00	2,453 00
San Luis Obispo	1,295 00	16 60	253 32	1,564 92
San Mateo	1,175 00	261 50	87 00	1,523 50
Santa Barbara	785 00	426 20	189 00	1,400 20
Santa Clara	2,195 00	21 60	125 06	2,341 66
Santa Cruz	765 00	45 00	440 61	1,250 61
Shasta	760 00	52 05	105 00	917 05
Sierra	220 00	79 20		299 20
Siskiyou	1,420 00	342 00	1,466 42	3,228 42
Solano	745 00	126 90	432 69	1,304 59
Sonoma	1,245 00	165 20	500 00	1,910 20
Stanislaus	440 00	123 90	545 99	1,109 89
Sutter	935 00	115 20	653 98	1,704 18
Tehama	500 00	202 17	150 00	852 17
Trinity	325 00	89 80	8 00	422 80
Tulare	1,185 00	389 92	183 00	1,758 42
Tuolumne	910 00	48 00	250 12	1,208 12
Ventura	870 00	98 80	326 37	1,295 17
Yolo	460 00	60 00	162 00	682 00
Yuba	1,645 00	347 00		1,992 00
Totals	$111,470 15	$12,679 24	$47,298 50	$171,447 89

TABLE No. 21—Continued.

Miscellaneous School Statistics Showing County Expenses for Schools, Cost of County Board of Education for the School Year Ending June 30, 1922.

Counties	Total per diem paid members	Traveling expenses	Other expenses	Total expenses for year
Alameda	$2,410 00	$267 66		$2,677 66
Alpine	50 00	16 40		66 40
Amador	755 00	27 80	$46 00	828 80
Butte	250 00	126 26	526 70	902 96
Calaveras	505 00	29 20	29 87	564 07
Colusa	1,070 00	199 80		1,269 80
Contra Costa	1,015 00	646 60		1,661 60
Del Norte	220 00			220 00
El Dorado	497 50	17 20	28 00	542 70
Fresno	2,315 00	227 40	1,722 91	4,265 31
Glenn	880 00	83 00	275 00	1,238 00
Humboldt	695 00	117 00	684 00	1,496 00
Imperial	200 00	51 40	15 24	266 64
Inyo	220 00	83 70		303 70
Kern	695 00	786 40	1,010 00	2,491 40
Kings	1,170 00	71 84	400 00	1,641 84
Lake	165 00	27 30	32 77	225 07
Lassen	787 50	82 85	318 00	1,188 35
Los Angeles	',560 00		776 39	2,336 39
Madera	675 00			675 00
Marin	375 00	177 36	32 15	584 51
Mariposa	315 00	10 80	64 00	389 80
Mendocino	937 50	188 00	229 40	1,354 90
Merced	1,135 00	96 00	40 65	1,271 65
Modoc	215 00	67 50		282 50
Mono	170 00	42 60		212 60
Monterey	1,120 00	462 60	484 20	2,066 80
Napa	1,160 00		150 00	1,310 00
Nevada	630 00	109 50	48 00	787 50
Orange	955 00	118 45		1,073 45
Placer	315 00	261 20		576 20
Plumas	660 00	220 00		880 00
Riverside	710 00	235 40	290 30	1,235 70
Sacramento	1,470 40		265 85	1,736 25
San Benito	750 00	79 40		829 40
San Bernardino	255 00	52 15		307 15
San Diego	700 00	155 00	1,250 16	2,105 16
San Francisco	72,835 15	4,088 96	22,404 61	99,328 72
San Joaquin	1,600 00	340 60	169 55	2,110 15
San Luis Obispo	1,105 00	21 30	57 50	1,183 80
San Mateo	1,125 00	201 25	64 05	1,390 30
Santa Barbara	1,000 00	601 80	145 50	1,747 30
Santa Clara	2,370 00	23 52	493 00	2,886 52
Santa Cruz	980 00	129 00	70 44	1,179 44
Shasta	950 00	63 80	425 00	1,438 80
Sierra	295 00	81 20	127 00	503 20
Siskiyou	550 00	477 20	270 83	1,298 03
Solano	820 00	118 70	279 54	1,218 24
Sonoma	1,140 00	272 40	500 00	1,912 40
Stanislaus	450 00	105 30	719 36	1,274 66
Sutter	835 00	85 70	483 77	1,404 47
Tehama	325 00	98 80	300 00	723 80
Trinity	335 00	69 80		404 80
Tulare	1,005 00	258 88	1,515 90	2,779 78
Tuolumne	835 00	71 60	286 00	1,192 60
Ventura	925 00	71 20	206 77	1,202 97
Yolo	537 50	283 00	302 59	1,123 09
Yuba	1,250 00	418 50	412 25	2,080 75
Totals	$119,275 55	$13,020 28	$37,953 25	$170,249 08

TABLE No. 21—Continued.

Miscellaneous School Statistics, Showing Number of Certificates Issued by County Boards of Education and Fees Collected for Same, for the School Years Ending June 30, 1921 and 1922.

Counties	Certificates issued on examinations				Certificates issued on credentials				Amount of fees for examinations and certificates	
	To men		To women		To men		To women			
	1920–21	1921–22	1920–21	1921–22	1920–21	1921–22	1920–21	1921–22	1920–21	1921–22
Alameda	2	.....	21	19	161	122	596	608	$1,564	$1,512
Alpine	.....	.....	1	.....	.....	.....	3	1	6	2
Amador	.....	.....	1	5	3	4	14	21	42	62
Butte	.....	1	1	1	13	24	59	88	158	218
Calaveras	.....	1	2	.....	1	2	14	6	46	22
Colusa	.....	.....	1	.....	.....	8	21	21	42	12
Contra Costa	.....	.....	5	3	13	26	99	91	256	240
Del Norte	.....	.....	1	2	.....	.....	2	6	12	16
El Dorado	.....	1	3	6	3	4	8	16	48	68
Fresno	2	.....	7	7	75	105	364	448	880	962
Glenn	.....	.....	.....	.....	1	6	50	49	106	114
Humboldt	1	.....	2	3	11	16	53	71	134	6
Imperial	.....	1	1	.....	17	20	157	43	348	128
Inyo	.....	.....	2	.....	4	4	27	21	52	52
Kern	.....	.....	10	1	26	36	197	181	490	444
Kings	.....	1	2	.....	9	16	76	78	182	194
Lake	2	.....	.....	1	6	5	10	15	52	40
Lassen	.....	.....	3	1	1	4	29	40	68	102
Los Angeles	4	7	52	78	348	684	2,295	3,739	5,434	5,664
Madera	.....	.....	2	3	6	4	51	45	122	106
Marin	.....	.....	.....	.....	5	3	35	48	80	84
Mariposa	.....	1	2	3	.....	.....	9	12	26	32
Mendocino	1	.....	9	7	3	6	35	40	162	140
Merced	.....	.....	2	3	4	6	48	69	166	164
Modoc	.....	.....	7	2	2	4	31	19	82	60
Mono	.....	.....	.....	.....	1	5	5	9	12	20
Monterey	.....	.....	1	.....	19	13	60	62	170	200
Napa	1	2	6	5	8	5	24	22	78	94
Nevada	.....	1	4	5	6	2	31	13	98	60
Orange	1	1	2	2	29	48	197	236	452	574
Placer	.....	.....	.....	.....	7	14	42	43	98	114
Plumas	.....	.....	3	.....	1	.....	11	10	30	20
Riverside	.....	1	2	2	25	25	148	153	372	372
Sacramento	1	1	6	13	22	19	109	105	490	386
San Benito	.....	.....	.....	.....	1	1	26	13	54	34
San Bernardino	1	2	11	7	30	42	211	195	626	522
San Diego	2	2	3	2	39	64	249	310	584	706
San Francisco	.....	.....	2	.....	47	38	265	291	866	708
San Joaquin	.....	1	5	.....	28	35	86	133	334	332
San Luis Obispo	1	.....	.....	2	12	15	83	61	240	186
San Mateo	.....	.....	2	.....	13	11	51	71	166	164
Santa Barbara	.....	.....	1	.....	17	23	106	123	298	300
Santa Clara	.....	.....	.....	2	22	47	190	182	424	462
Santa Cruz	.....	.....	.....	5	9	12	39	54	134	146
Shasta	.....	.....	4	4	4	5	21	43	94	116
Sierra	.....	.....	.....	1	1	4	10	8	24	24
Siskiyou	1	.....	2	3	14	18	56	61	158	172
Solano	.....	2	6	5	15	23	58	72	188	226
Sonoma	2	2	8	3	14	13	102	74	320	214
Stanislaus	.....	.....	.....	.....	19	22	124	138	334	326
Sutter	.....	.....	2	.....	4	3	21	37	60	80
Tehama	.....	.....	.....	.....	7	7	44	32	102	78
Trinity	1	.....	.....	5	3	1	14	7	34	26
Tulare	2	3	22	23	18	32	134	156	416	498
Tuolumne	.....	.....	5	4	2	2	10	10	58	32
Ventura	.....	.....	.....	1	12	15	111	122	246	250
Yolo	.....	.....	.....	.....	5	7	36	38	112	90
Yuba	.....	.....	6	.....	4	5	29	27	84	64
Totals	25	31	239	241	1,169	1,681	6,988	8,687	$18,314	$18,040

TABLE No. 21—Continued.

Miscellaneous School Statistics, Showing City Expenses for Schools, Expenses of Office of City Superintendent, and Other Expenses for School Year Ending June 30, 1921.

Counties	Annual salary of superintendent and assistants	Traveling expenses of superintendent	Other expenses	Total for year
Alameda	$3,425 00		$18 75	$3,443 75
Alpine				
Amador				
Butte	10,882 00	$800 00		11,682 00
Calaveras				
Colusa				
Contra Costa	5,000 00	304 14	239 96	5,544 10
Del Norte				
El Dorado				
Fresno	10,754 76		2,954 23	13,708 99
Glenn				
Humboldt	5,700 00	221 00	269 04	6,190 04
Imperial				
Inyo				
Kern				
Kings				
Lake				
Lassen				
Los Angeles	356,131 52	732 45	39,795 25	396,659 22
Madera				
Marin	3,000 00	71 34	179 90	3,251 24
Mariposa				
Mendocino				
Merced				
Modoc				
Mono				
Monterey	3,900 00	99 54	216 16	4,215 70
Napa				
Nevada	2,800 00			2,800 00
Orange	6,900 00	46 41	320 00	7,266 41
Placer				
Plumas				
Riverside	5,100 00	360 00	256 00	5,716 00
Sacramento	18,780 00	351 50	2,164 76	21,296 26
San Benito				
San Bernardino	11,413 00	259 25	273 45	11,945 70
San Diego	12,700 00	511 49	237 87	13,449 36
San Francisco				
San Joaquin	15,640 00	82 25	773 95	16,496 20
San Luis Obispo	4,258 00	65 00	144 55	4,467 55
San Mateo				
Santa Barbara	11,300 00			11,300 00
Santa Clara	11,638 55	87 45	569 58	12,295 58
Santa Cruz	4,704 00	107 66	235 86	5,047 52
Shasta				
Sierra				
Siskiyou				
Solano	6,936 00	46 46	704 70	7,681 16
Sonoma	5,400 00	140 11	2,200 00	7,740 11
Stanislaus	7,000 00	362 59	932 56	8,295 15
Sutter				
Tehama				
Trinity				
Tulare	2,207 50	42 50	50 00	2,300 00
Tuolumne				
Ventura	3,000 00	40 00	50 00	3,090 00
Yolo				
Yuba				
Totals	$528,564 33	$4,731 14	$52,586 57	$585,882 04

TABLE No. 21—Continued.

Miscellaneous School Statistics, Showing City Expenses for Schools, Expenses of Office of City Superintendent, and Other Expenses for School Year Ending June 30, 1922.

Counties	Annual salary of superintendent and assistants	Traveling expenses of superintendent	Other expenses	Total for year
Alameda	$3,340 00			$3,340 00
Alpine				
Amador				
Butte	8,632 00	$850 00		9,482 00
Calaveras				
Colusa				
Contra Costa	7,820 00	255 56	$59 25	8 134 81
Del Norte				
El Dorado				
Fresno	14,089 78	917 95	2,320 37	17,328 10
Glenn				
Humboldt	5,750 00	263 00	82 97	6,095 97
Imperial				
Inyo				
Kern				
Kings				
Lake				
Lassen				
Los Angeles	466,139 23	2,370 28	95,482 94	563,992 45
Madera				
Marin	3,600 00	84 00	149 84	3,833 84
Mariposa				
Mendocino				
Merced				
Modoc				
Mono				
Monterey	3,900 00	88 45	153 69	4,142 14
Napa				
Nevada	3,300 00		19 20	3,319 20
Orange	7,800 00	50 00	750 00	8,600 00
Placer				
Plumas				
Riverside	5,100 00	360 00	174 00	5,634 00
Sacramento	26,100 00	361 58	3,502 19	29,963 77
San Benito				
San Bernardino	12,910 00	296 61	436 75	13,643 36
San Diego	12,700 00		334 85	13,034 85
San Francisco				
San Joaquin	15,640 00	93 80	533 14	16,266 94
San Luis Obispo	4,038 00		70 74	4,108 74
San Mateo				
Santa Barbara	12,200 00			12,200 00
Santa Clara	11,650 00	85 89	629 55	12,365 44
Santa Cruz	4,961 00	205 50	317 57	5,484 07
Shasta				
Sierra				
Siskiyou				
Solano	8,337 50	98 10	259 47	8,695 07
Sonoma	5,940 00	471 44	2,238 38	8,649 82
Stanislaus	7,000 00	418 89	1,421 80	8,840 69
Sutter				
Tehama				
Trinity				
Tulare	6,540 00	363 33	805 91	7,709 24
Tuolumne				
Ventura	3,300 00	50 00	50 00	3,400 00
Yolo				
Yuba				
Totals	$660,787 51	$7,684 38	$109,792 61	$778,264 50

TABLE No. 21—Continued.

Miscellaneous School Statistics, Showing Segregation of Schools According to Number of Teachers for the Years Ending June 30, 1921 and 1922.

Counties	Number of											
	One-teacher school districts		Two-teacher school districts		Three-teacher school districts		Four-teacher school districts		Five-teacher school districts		Six and over	
	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22
Alameda	17	15	4	2	3	4	5	.....	.....	4	13	14
Alpine	3	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Amador	32	28	1	.....	2	1	.....	2	1	1	1	1
Butte	50	50	7	8	2	2	.....	1	.....	.....	5	5
Calaveras	36	35	5	5	.....	.....	.....	.....	.....	.....	1	1
Colusa	25	18	2	3	3	2	2	.....	.....	1	1	2
Contra Costa	23	21	15	15	4	6	1	1	1	1	9	9
Del Norte	12	13	1	1	.....	.....	.....	.....	1	.....	.....	1
El Dorado	40	52	2	3	.....	.....	.....	.....	.....	.....	1	1
Fresno	50	37	34	38	27	29	12	14	7	9	14	19
Glenn	27	22	10	10	2	3	.....	.....	.....	.....	2	2
Humboldt	83	77	12	18	6	6	.....	1	2	1	3	4
Imperial	13	14	9	14	12	8	6	5	1	.....	7	7
Inyo	20	22	4	3	1	1	1	1	.....	.....	1	1
Kern	63	57	20	17	3	9	5	4	1	2	9	9
Kings	20	14	6	11	4	3	1	2	1	1	5	5
Lake	15	15	1	.....	2	2	.....	1	.....	.....	2	2
Lassen	40	39	.....	.....	.....	.....	.....	.....	.....	.....	2	2
Los Angeles	48	46	24	20	9	8	8	9	6	7	54	82
Madera	28	30	10	10	3	4	.....	1	.....	.....	2	2
Marin	31	30	3	4	2	1	2	2	2	2	4	5
Mariposa	28	26	1	1	.....	.....	.....	.....	.....	.....	.....	.....
Mendocino	99	96	3	6	8	4	.....	1	.....	.....	3	3
Merced	34	32	18	19	5	2	.....	3	3	1	5	7
Modoc	38	38	3	3	.....	.....	1	1	1	.....	.....	1
Mono	10	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Monterey	54	49	8	10	5	5	2	3	2	.....	4	6
Napa	43	34	1	8	.....	.....	.....	.....	1	1	2	2
Nevada	36	34	2	2	.....	.....	.....	.....	.....	.....	2	.....
Orange	9	7	5	7	7	7	11	6	.....	4	15	15
Placer	36	34	1	3	3	2	3	4	.....	.....	3	3
Plumas	25	26	3	3	1	1	1	1	.....	.....	.....	.....
Riverside	33	33	15	11	2	4	7	4	5	2	14	17
Sacramento	22	33	12	15	3	5	3	1	.....	4	6	5
San Benito	27	30	5	5	.....	.....	.....	.....	1	1	1	1
San Bernardino	44	43	4	1	7	6	1	3	1	3	12	11
San Diego	66	60	12	11	6	6	.....	2	1	1	9	9
San Francisco	2	.....	2	1	.....	1	1	3	3	2	92	100
San Joaquin	46	42	23	20	6	8	3	5	1	2	5	8
San Luis Obispo	66	63	13	13	2	2	1	.....	1	2	5	4
San Mateo	17	16	6	6	1	2	3	2	2	3	6	6
Santa Barbara	44	40	8	10	3	1	3	4	1	.....	5	6
Santa Clara	26	24	16	13	8	19	3	6	.....	1	21	16
Santa Cruz	39	40	5	9	3	2	.....	.....	.....	.....	3	3
Shasta	103	91	1	3	2	2	.....	1	1	1	1	1
Sierra	14	14	1	.....	.....	1	.....	.....	.....	.....	.....	.....
Siskiyou	69	67	6	7	4	5	1	1	.....	.....	5	5
Solano	39	36	5	7	.....	.....	1	1	2	1	4	5
Sonoma	107	99	16	19	10	13	4	4	.....	2	6	7
Stanislaus	15	15	19	17	6	7	4	3	2	1	8	10
Sutter	21	17	4	7	1	1	2	2	.....	.....	2	2
Tehama	44	39	6	9	1	1	1	2	.....	.....	2	2
Trinity	18	22	.....	.....	2	2	.....	.....	.....	.....	.....	.....
Tulare	63	62	34	33	11	11	9	10	.....	2	7	7
Tuolumne	23	24	3	2	2	2	.....	1	.....	.....	2	2
Ventura	27	29	9	9	2	3	4	2	1	3	6	6
Yolo	33	31	5	7	3	2	1	1	1	.....	2	3
Yuba	29	26	4	4	.....	.....	2	2	.....	.....	1	1
Totals	2,134	2,021	449	483	199	207	115	123	53	66	395	448

TABLE No. 21—Continued.

Miscellaneous School Statistics, Showing Professionally Trained Teachers in Elementary Schools for the Years Ending June 30, 1921 and 1922.

Counties	Number of teachers employed		Graduates of			
			College		Normal	
	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22
Alameda	1,507	1,556	269	320	1,131	1,141
Alpine	3	3	1		1	2
Amador	52	54	5	4	17	17
Butte	174	187	2	6	128	131
Calaveras	52	51	2		11	6
Colusa	59	59		3	37	38
Contra Costa	300	314	15	12	236	267
Del Norte	20	21	2	1	7	7
El Dorado	62	61	1	5	20	20
Fresno	721	788	48	61	586	627
Glenn	84	84	1	1	65	70
Humboldt	216	231	7	9	134	148
Imperial	257	223	34	19	186	204
Inyo	44	45	3	7	34	33
Kern	362	399	42	51	245	245
Kings	129	142	10	12	100	104
Lake	38	40	5	5	16	18
Lassen	63	70	2	8	21	24
Los Angeles	4,253	4,809	549	718	3 287	4,117
Madera	96	103	11	7	76	83
Marin	122	142	3	7	109	126
Mariposa	30	28	1	1	13	10
Mendocino	158	166	6	5	63	68
Merced	151	164	5	6	85	83
Modoc	53	54	1	2	17	14
Mono	10	11	3	1	4	6
Monterey	162	169	7	15	123	124
Napa	90	95	1	5	53	50
Nevada	68	68	3	4	25	25
Orange	360	415	52	65	292	326
Placer	98	107	3	10	70	64
Plumas	38	39	5	3	17	18
Riverside	271	282	35	26	194	215
Sacramento	446	476	10	13	225	260
San Benito	57	58	4	5	30	33
San Bernardino	379	429	74	36	284	376
San Diego	503	549	50	46	433	464
San Francisco	1,541	1,583	90	83	1,088	1,266
San Joaquin	378	416	7	21	146	192
San Luis Obispo	158	161	18	14	110	104
San Mateo	194	202	11	10	144	157
Santa Barbara	198	209	26	25	134	144
Santa Clara	470	510	26	22	431	478
Santa Cruz	138	151	4	9	102	112
Shasta	119	119			47	39
Sierra	14	17	2	2	4	10
Siskiyou	140	149	8	8	96	109
Solano	135	151	7	11	79	87
Sonoma	296	316	27	27	163	192
Stanislaus	254	283	14	21	179	181
Sutter	62	60	10	2	28	32
Tehama	95	97	2	7	69	71
Trinity	25	28	4	3	4	5
Tulare	341	374	23	34	252	260
Tuolumne	51	55	4	2	10	14
Ventura	170	184	21	43	140	120
Yolo	85	85	5	8	53	51
Yuba	64	63		3	34	31
Totals	16,416	17,707	1,581	1,854	11,688	13,219

TABLE No. 21—Continued.

Receipts and Expenditures of Superintendent of Public Instruction.

	1920-21	1921-22
Receipts fees—		
Dental fees		$1,550 00
Foreign language fees		652 00
Miscellaneous receipts—		
Sale of old paper		7 59
Refund from administration fund		181 00
Sale of school laws		493 80
Total		$2,884 39
Expenditures—salaries—		
Statutory—		
Superintendent public instruction	$5,000 00	$5,000 00
Deputy superintendent public instruction	3,000 00	3,000 00
*Statistician	2,400 00	*206 45
*Bookkeeper	2,100 00	*180 65
*Secretary	1,800 00	*154 85
Non-statutory—		
Sundry persons	3,463 62	
Clerical and office		15,183 07
Totals	$17,763 62	$23,725 02
Other expenditures—		
Printing	$12,638 96	$16,957 96
Travel	2,243 15	4,861 95
Postage	575 00	700 00
Telephone and telegraph	427 04	491 24
Freight, express and drayage	300 56	439 21
Orphans' textbooks	817 04	1,714 64
Furniture		541 18
Office supplies	214 82	196 77
**Sundries	96 48	**950 55
Migratory children		2,801 00
Totals	$17,313 05	$29,654 50

*Abolished.
**$600 00 of the $950 55 under Sundries in Revolving Fund.

TABLE No. 21—Continued.

Receipts and Expenditures of State Board of Education for Seventy-second and Seventy-third Fiscal Years.

	1920-21	1921-22
FEES.		
Life diploma and credential fees	$15,788 76	$14,702 19
Fees, high school textbooks	2,290 10	2,100 00
Total fees collected	$18,078 86	$16,802 19
EXPENDITURES.		
Support and salaries—		
Salaries	$27,517 61	$55,530 95
Postage	2,888 55	3,330 19
Telephone and telegraph	753 80	828 92
Miscellaneous	1,678 37	215 27
Per diem committee work	2,060 00	2,070 00
Office expense	1,504 52	2,731 15
Commissioners (travel)	5,994 58	8,550 39
Board members	6,133 30	6,535 33
Printing	8,407 00	6,055 05
Office fittings	1,661 68	965 46
Critic readers and miscellaneous expense	2,151 61	2,993 72
Totals	$60,751 02	$89,806 43
Salaries of Commissioners	$15,266 70	*$1,341 75
Textbook appropriations—		
Salaries	$750 00	
Advertising educational journals	54 50	
Miscellaneous expense	22 06	
Total	$826 56	
Physical education fund—		
Miscellaneous	$625 32	$258 32
Office fittings	221 09	64 03
Salaries	10,346 04	10,548 00
Printing	1,133 62	446 80
Supplies	198 04	136 37
Travel	3,458 38	2,843 70
Totals	$15,982 49	$14,297 22
Total expenditures—		
Salaries and support appropriation	$60,751 02	$89,806 43
Salaries of Commissioners	15,266 70	1,341 75
Textbook appropriation	826 56	
Physical education	15,982 49	14,297 22
Totals	$92,826 77	$105,445 40

Vocational Education Fund.

	1920-21	1921-22		
Vocational education—				
(A) Salaries of teachers, supervisors and directors of agricultural subjects			$45,989 40	$63,913 86
(B) Salaries of teachers of trade, home economics and industrial subjects			83,417 58	129,854 18
(C) Training of teachers:				
Agriculture	$15,021 74	$18,367 92		
Home economics	11,898 35	14,753 66		
Trade and industrial subjects	24,968 11	28,274 18		
Totals of Class C			51,888 20	61,395 76
Totals			$181,295 18	$255,163 80
(Of this sum, half is to be charged against the federal government, under the Smith-Hughes act.)				

*Since August, 1922, Commissioners' salaries have been paid out of the general appropriation.

Section 6.

STATE TEXTBOOKS.

Table No. 22. Showing Number of Textbooks Distributed Free, Number Sold to Individuals, Dealers, Orphan Asylums, Complete List of Textbooks, Cost of Manufacture, Royalty and Price, Summary of Textbooks Sold and Distributed Free Since 1887, Financial Statement Showing Cost of Manufacture and Distribution of Textbooks and the Amount of Money Appropriated for Such Purposes.

TABLE No. 22.

Number of Text Books Distributed Free to the Elementary Schools of the State, Cost per Copy of Royalty for Use of Plates and the Amount Paid on Royalty to Textbook Companies From July 1, 1920, to June 30, 1921.

Books	Number of books	Royalty	To royalty fund
Primer	28,101	.04	$1,124 04
First Reader	24,492	.045	1,102 15
Second Reader	25,924	.05	1,296 20
Third Reader	18,979	.0575	1,091 29
Fourth Reader	15,346	.085	1,304 41
Fifth Reader	16,145	.095	1,533 77
Sixth Reader	13,190		
Seventh Reader	12,557		
Eighth Reader	13,194		
Speller—I	55,932		
Speller—II	57,369		
Speller—Manual	3,309		
Arithmetic—First	27,531	.0525	1,445 37
Arithmetic—Advanced	24,644	.09	2,217 96
Studies in English—I	34,939	.045	1,572 25
Studies in English—II	68,888	.0675	4,649 95
Studies in English—III	48,657	.09	4,379 13
Beginner's History	20,395	.074	1,509 23
Advanced History	105,205	.29	30,509 45
Introductory Geography	30,740	.09	2,766 60
Advanced Geography	32,705	.15	4,905 75
Primer of Hygiene	11,998	.06	719 88
Civics	11,019	.125	1,377 36
Copy Book—I	20,062	.00875	175 55
Copy Book—II	18,500	.00875	161 87
Copy Book—III	19,930	.00875	174 38
Copy Book—IV	20,884	.00875	182 74
Copy Book—V	19,641	.00875	171 86
Copy Book—VI	19,841	.00875	173 61
Copy Book—VII	17,273	.00875	151 13
Copy Book—VIII	15,458	.00875	135 24
Music Reader—I	20,032	.06	1,201 92
Music Reader—II	22,504	.07	1,575 28
Music Reader—III	18,383	.08	1,470 64
Music Manual—I	1,285	.25	321 25
Music Manual—II	1,047	.25	261 75
Music Manual—III	871	.25	217 75
Totals	916,970		$69,879 76

TABLE No. 22—Continued.

Number of Textbooks Distributed Free to the Elementary Schools of the State, Cost per Copy of Royalty for Use of Plates and the Amount Paid on Royalty to Textbook Companies from July 1, 1921 to June 30, 1922.

Books	Number of books	Royalty	To royalty fund
Primer	29,117	.04	$1,164 68
First Reader	27,463	.045	1,235 83
Second Reader	28,599	.05	1,429 95
Third Reader	24,343	.0525	1,278 00
Fourth Reader	17,338	.085	1,473 73
Fifth Reader	15,002	.095	1,425 18
Sixth Reader	15,116		
Seventh Reader	14,868		
Eighth Reader	14,674		
Speller—I	78,728		
Speller—II	64,700		
Speller—Manual	294		
Arithmetic—I	162,357	.0925	15,018 03
Arithmetic—II	147,518	.1025	15,120 59
Arithmetic—III	126,656	.1125	14,248 79
Studies in English—I	21,705	.045	976 73
Studies in English—II	30,465	.0675	2,056 38
Studies in English—III	27,048	.09	2,434 32
Beginner's History	22,666	.074	1,677 28
Advanced History	22,854	.29	6,627 66
Introductory Geography	9,143	.09	822 87
Advanced Geography	3,931	.15	589 65
Primer of Hygiene	15,341	.06	920 46
Civics	13,821	.125	1,727 63
Copy Book—I	21,759	.00875	190 39
Copy Book—II	22,484	.00875	196 74
Copy Book—III	25,556	.00875	223 61
Copy Book—IV	24,805	.00875	217 04
Copy Book—V	21,733	.00875	190 16
Copy Book—VI	21,173	.00875	185 26
Copy Book—VII	18,971	.00875	166 01
Copy Book—VIII	17,756	.00875	155 63
Music Reader—I	29,602	.06	1,776 12
Music Reader—II	26,247	.07	1,837 29
Music Reader—III	19,188	.08	1,535 04
Music Manual—I	1,176	.25	294 00
Music Manual—II	1,009	.25	252 25
Music Manual—III	959	.25	239 75
Totals	1,186,195		$77,687 05

TABLE No. 22—Continued.

Number of Textbooks Sold to Dealers, Orphan Asylums, Private Schools and Individuals From July 1, 1920, to June 30, 1921, Amount of Money Paid into State Treasury From Sale of Books, etc.

Books	Number of books	To school book fund	To royalty fund	Amount of sales
Primer	3,196	$607 24	$127 84	$735 08
First Reader	2,388	518 05	107 45	625 50
Second Reader	2,055	472 65	102 75	575 40
Third Reader	1,595	418 70	91 70	510 40
Fourth Reader	1,058	301 53	89 93	391 46
Fifth Reader	648	184 67	61 57	246 24
Sixth Reader	676	148 72	.....	148 72
Seventh Reader	612	165 24	.....	165 24
Eighth Reader	680	204 00	.....	204 00
Speller—I	6,014	240 56	.....	240 56
Speller—II	4,423	221 15	.....	221 15
Speller—Manual	196	29 40	.....	29 40
Arithmetic—First	1,224	289 62	64 25	353 87
Arithmetic—Advanced	739	218 14	66 51	284 65
Studies in English—I	1,651	230 88	74 30	305 18
Studies in English—II	1,623	449 95	109 54	559 49
Studies in English—III	1,542	490 08	138 78	628 86
Beginner's History	1,442	527 78	106 70	634 48
Advanced History	282	200 22	81 78	282 00
Introductory Geography	1,028	416 13	92 52	508 65
Advanced Geography	799	571 63	119 85	691 48
Primer of Hygiene	600	126 82	36 00	162 82
Civics	504	147 13	63 01	210 14
Copy Book—I	618	13 13	5 41	18 44
Copy Book—II	612	13 02	5 34	18 36
Copy Book—III	555	11 79	4 86	16 65
Copy Book—IV	572	12 16	5 00	17 16
Copy Book—V	537	11 42	4 69	16 11
Copy Book—VI	606	12 87	5 31	18 18
Copy Book—VII	445	9 45	3 90	13 35
Copy Book—VIII	402	8 53	3 53	12 06
Music Reader—I	502	95 70	30 12	125 82
Music Reader—II	510	100 92	35 70	136 62
Music Reader—III	320	72 92	25 60	98 52
Music Manual—I	50	20 00	12 50	32 50
Music Manual—II	34	15 30	8 50	23 80
Music Manual—III	39	15 60	9 75	25 35
Writing—Book I (Old)	150	4 50	1 50	6 00
Writing—Book II (Old)	214	6 42	2 14	8 56
Writing—Book III (Old)	299	8 97	2 99	11 96
Writing—Book IV (Old)	328	9 84	3 28	13 12
Writing—Book V (Old)	256	7 68	2 56	10 24
Totals	42 024	$7 630 51	$1.707 16	$9,337 67

TABLE No. 22—Continued.

Number of Textbooks Sold to Dealers, Orphan Asylums, Private Schools and Individuals From July 1, 1921, to June 30, 1922. Amount of Money Paid into State Treasury From Sale of Books, etc.

Books	Number of books	To school book fund	To royalty fund	Amount of sales
Primer	2,914	$815 92	$116 56	$932 48
First Reader	1,997	486 00	89 86	575 86
Second Reader	1,631	554 54	81 55	636 09
Third Reader	1,424	416 34	74 76	491 10
Fourth Reader	975	394 88	82 87	477 75
Fifth Reader	702	232 54	66 69	299 23
Sixth Reader	562	241 66		241 66
Seventh Reader	643	192 48		192 48
Eighth Reader	506	151 80		151 80
Speller—I	5,057	233 54		233 54
Speller—II	3,985	258 58		258 58
Speller—Manual	201	30 15		30 15
Arithmetic—I	2,959	1,217 42	273 70	1,491 12
Arithmetic—II	2,308	967 86	236 58	1,204 44
Arithmetic—III	1,767	829 42	198 80	1,028 22
Studies in English—I	978	210 28	44 00	254 28
Studies in English—II	1,357	478 34	91 60	569 94
Studies in English—III	1,183	508 69	106 47	615 16
Beginner's History	1,176	583 29	87 03	670 32
Advanced History	1,275	905 25	369 75	1,275 00
Introductory Geography	42	21 42	3 78	25 20
Advanced Geography	42	37 80	6 30	44 10
Primer of Hygiene	563	163 27	33 78	197 05
Civic	624	297 97	77 99	375 96
Copy Book—I	605	12 85	5 30	18 15
Copy Book—II	473	10 05	4 14	14 19
Copy Book—III	428	9 10	3 74	12 84
Copy Book—IV	411	8 73	3 60	12 33
Copy Book—V	325	6 91	2 84	9 75
Copy Book—VI	524	11 14	4 58	15 72
Copy Book—VII	454	9 66	3 96	13 62
Copy Book—VIII	509	10 83	4 44	15 27
Music Reader—I	328	78 72	19 68	98 40
Music Reader—II	193	48 25	13 51	61 76
Music Reader—III	285	74 10	22 80	96 90
Music Manual—I	42	16 80	10 50	27 30
Music Manual—II	32	14 40	8 00	22 40
Music Manual—III	19	7 60	4 75	12 35
Writing—Book I (Old)	140	4 20	1 40	5 60
Writing—Book II (Old)	169	5 07	1 69	6 76
Writing—Book III (Old)	181	5 43	1 81	7 24
Writing—Book IV (Old)	190	5 70	1 90	7 60
Writing—Book V (Old)	214	6 42	2 14	8 56
Totals	40,393	$10,575 40	$2,162 85	$12,738 25

TABLE No. 22—Continued.

Complete List of State Textbooks, June, 1922, Cost of Manufacture per Book, Royalty, and Price f. o. b. Sacramento.

Books	Cost of manufacture	Royalty	Price
Primer	.28	.04	32 cents
First Reader	.255	.045	30 cents
Second Reader	.34	.05	39 cents
Third Reader	.3375	.0525	39 cents
Fourth Reader	.405	.085	49 cents
Fifth Reader	.455	.095	55 cents
Sixth Reader	.43	.....	43 cents
Seventh Reader	.44	.....	44 cents
Eighth Reader	.30	.....	30 cents
Speller—I	.06	.....	6 cents
Speller—II	.08	.....	8 cents
Speller—Manual	.15	.....	15 cents
Arithmetic—I	.3575	.0925	45 cents
Arithmetic—II	.3675	.1025	47 cents
Arithmetic—III	.3875	.1125	51 cents
Studies in English—I	.215	.045	26 cents
Studies in English—II	.3525	.0675	42 cents
Studies in English—III	.43	.09	52 cents
Beginner's History	.496	.074	57 cents
Advanced History	.71	.29	$1 00
Introductory Geography	.51	.09	60 cents
Advanced Geography	.90	.15	$1 05
Primer of Hygiene	.29	.06	35 cents
Civics	.365	.125	49 cents
Copy Book—I	.02125	.00875	3 cents
Copy Book—II	.02125	.00875	3 cents
Copy Book—III	.02125	.00875	3 cents
Copy Book—IV	.02125	.00875	3 cents
Copy Book—V	.02125	.00875	3 cents
Copy Book—VI	.02125	.00875	3 cents
Copy Book—VII	.02125	.00875	3 cents
Copy Book—VIII	.02125	.00875	3 cents
Music Reader—I	.24	.06	30 cents
Music Reader—II	.25	.07	32 cents
Music Reader—III	.26	.08	34 cents
Music Manual—I	.40	.25	65 cents
Music Manual—II	.45	.25	70 cents
Music Manual—III	.40	.25	65 cents
Writing—Book I (Old)	.03	.01	4 cents
Writing—Book II (Old)	.03	.01	4 cents
Writing—Book III (Old)	.03	.01	4 cents
Writing—Book IV (Old)	.03	.01	4 cents
Writing—Book V (Old)	.03	.01	4 cents

Summary of Textbooks Sold and Distributed Free, 1887-1922.

Period	Number of books sold column (a)	Number of books distributed free column (b)	School book fund column (c)	Royalty fund column (d)	Amount column (e)
Prior to July 1, 1904	4,052,327	.....	$1,429,297 52	$10,821 75	$1,440,119 27
July 1, 1904, to June 30, 1906	857,749	.....	310,105 09	87,471 36	395,272 38
July 1, 1906, to June 30, 1908	1,072,575	.....	292,748 67	101,880 05	394,628 72
July 1, 1908, to June 30, 1910	1,178,594	.....	247,944 36	75,859 56	323,803 92
July 1, 1910, to June 30, 1911	683,079	.....	152,341 82	41,922 60	194,264 42
July 1, 1911, to June 30, 1912	683,527	.....	159,113 15	42,100 08	201,213 23
July 1, 1912, to June 30, 1913	476,341	477,933	78,352 70	55,321 72	106,037 84
July 1, 1913, to June 30, 1914	13,526	1,379,154	1,045 48	86,140 38	2,919 56
July 1, 1914, to June 30, 1915	35,957	493,159	4,628 53	30,188 87	6,761 68
July 1, 1915, to June 30, 1916	32,766	491,970	4,331 32	26,493 15	6,370 06
July 1, 1916, to June 30, 1917	41,463	902,554	5,141 63	34,891 05	7,352 99
July 1, 1917, to June 30, 1918	31,431	651,238	4,358 21	32,677 05	6,141 85
July 1, 1918, to June 30, 1919	26,630	926,089	4,040 02	49,366 80	5,469 82
July 1, 1919, to June 30, 1920	41,201	1,150,281	6,238 47	54,015 04	7,840 95
July 1, 1920, to June 30, 1921	42,024	916,970	7,630 51	71,586 92	9,337 67
July 1, 1921, to June 30, 1922	40,393	1,186,195	10,575 40	79,849 90	12,738 25
Totals	9,309,483	8,575,543	$2,718,492 88	$880,586 28	$3,119,627 61

Columns (a) and (b) are self-explanatory.

Column (c) is the total amount of money paid into the school book fund as a result of the sale of books listed in column (a).

Column (d) is the amount of money paid to the textbook companies for the use of plates in the manufacture of all state text books. This includes both books sold and books distributed free.

Column (e) is the total amount of money paid into the state treasury as the result of sales, column (a).

TABLE No. 22—Continued.

Financial Statement of School Book Fund from July 1, 1920, to June 30, 1921.

Month	Expenditures						Receipts			
	Royalty	Printing	Freight and postage	Salary	Miscellaneous	Total	Sales	Refund	Total	Balance
Balance from seventy-first fiscal year										$152,947 65
July	$3,255 15	$49,654 08	$1,898 43	$265 00	$30 74	$55,103 40	$535 30		$535 30	
August		5,254 10	1,808 19	265 00	1 00	7,328 29	414 19	$147 30	561 49	
September		15,605 99	1,094 71	205 00	109 38	17,015 08	2,907 72		2,907 72	
October	53,078 33	25,459 68	717 27	185 00	10 23	79,450 51	1,945 17		1,945 17	
November		12,063 61	475 72	185 00	20 82	12,745 16	414 28	*20,038 75	20,453 03	
December		6,400 61	531 38	185 00	99 48	7,216 47	376 97	5 00	381 97	
January			272 76	190 00	47 05	509 81	65 60	53 35	118 95	
Deficiency appropriation—ch. 7, 1921										255,000 00
February	7,103 42	147,785 15	503 64	190 00	*20,000 00	175,582 21	1,152 47		1,152 47	
March			357 57	190 00		$547 57	721 97		721 97	
April	10,931 19	17,344 31	224 14	190 00	349 20	29,038 84	219 99	5 00	224 99	
May		12,380 85	10 67	190 00	14 93	12,596 45	417 32		417 32	
June	473 97	36,142 88	350 13	230 00	37 95	37,234 93	120 89		120 89	
Totals	$74,842 06	$328,091 26	$8,244 62	$2,470 00	$20,720 78	$434,368 72	$9,291 87	$20,249 40	$29,541 27	$29,541 27
Grand total										$437,488 92
Expenditures										434,368 72
Balance										$3,120 20

*On November 23, 1920, the State Board of Control loaned the Schoolbook Fund $20,000.00 by Emergency Resolution No. 42. This was paid back on February 3, 1921, from deficiency appropriation.

TABLE No. 22—Continued.

Financial Statement of School Book Fund from July 1, 1921, to June 30, 1922.

Seventy-third fiscal year	Expenditures						Receipts			
	Royalty	Printing	Freight and postage	Salary	Miscellaneous	Total	Sales	Refund	Total	Balance
Balance from seventy-second fiscal year										$3,120 20
Schoolbook appropriation										527,000 00
Total amount in school book fund										$530,120 20
July		$3,120 19	$1,211 69	$270 00		$4,601 88	$3,218 74	$653 88	$3,872 62	
August		12,493 72	3,521 88	253 23	$33 55	16,302 38	1,559 13		1,559 13	
September		4,969 39	1,267 43	213 33		6,450 15	1,588 21		1,588 21	
October	$58,775 84	33,773 06	1,089 24	185 00		93,823 14	2,833 83		2,833 83	
November		20,011 07	475 00	185 00	108 70	20,779 77	1,948 89		1,948 89	
December		12,432 40	182 88	181 76	28 30	12,825 34	902 66	19 50	922 16	
January	9,036 77	3,429 27	376 68	165 00	53 00	13,060 72	249 37		249 37	
February		25,567 68	685 04	165 00	15 45	26,433 17	688 43		688 43	
March		14,148 43	400 67	165 00	13 30	14,727 40	497 44		497 44	
April	11,273 01	10,124 88	154 88	165 00		21,717 77	1,023 50		1,023 50	
May		34,553 89	131 36	165 00	162 00	35,012 25	619 26		619 26	
June	764 28	26,451 82	270 72	177 50	56 05	27,720 37	827 53	17 24	844 77	
Totals	$79,849 90	$201,075 80	$9,767 47	$2,290 82	$470 35	$293,454 34	$15,956 99	$690 62	$16,647 61	16,647 61
Grand total										$546,767 81
Expenditures										293,454 34
Balance										$253,313 47

Section 7.

STATE TEACHERS COLLEGES.

Table No. 23. Showing Teachers Employed in State Teachers Colleges; Students Enrolled in Teachers Colleges and Pupils in Training Schools Connected Therewith; Number of Graduates from Teachers Colleges; Receipts and Expenditures; Extent and Valuation of Property; Number of Books in Libraries.

TABLE No. 23.

Statistics of State Teachers Colleges, Showing Number of Teachers and Supervisors Employed (Full Time) for the Years Ending June 30, 1921 and 1922.

Name of school	Men		Women		Total	
	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22
Chico	11	11	17	17	28	28
Fresno	9	15	20	20	29	35
Humboldt (Arcata)	6	6	9	8	15	14
San Diego	8	13	22	20	30	33
San Francisco	9	12	39	35	48	47
San Jose	9	12	47	50	56	62
Santa Barbara	8	8	12	12	20	20
Totals	60	77	166	162	226	239

Statistics of State Teachers Colleges, Showing Total Number of Students Enrolled for the Years Ending June 30, 1921 and 1922. Regular Sessions.

(Includes Teacher Training and General Collegiate Students Only).

Name of school	Men		Women		Total	
	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22
Chico	40	69	297	271	337	340
Fresno	34	200	483	713	517	913
Humboldt (Arcata)	2	23	59	101	61	124
San Diego	9	127	254	407	263	534
San Francisco	1	2	583	662	584	664
San Jose	20	98	557	905	577	1,003
Santa Barbara	25	86	149	183	174	269
Totals	131	605	2,382	3,242	2,513	3,847

Statistics of State Teachers Colleges, Showing Number of Students Enrolled in Summer Sessions 1920 and 1921 and in Extra-hour and Off-campus Classes, 1921-22.

Name of school	Summer session, 1920	Summer session, 1921	Extra-hour and off-campus classes, 1921-22
Chico	175	192	214
Fresno	118	200	
Humboldt (Arcata)	51	91	15
San Diego	429	513	64
San Francisco	396	330	296
San Jose		379	134
Santa Barbara	166	162	68
Totals	1,335	1,867	791

TABLE No. 23—Continued.

Statistics of State Teachers Colleges, Showing Number of Graduates for the Years Ending June 30, 1921 and 1922.

Name of school	Number of graduates in													
	Regular courses						Special courses						Total graduates	
	Men		Women		Total		Men		Women		Total			
	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22
Chico	5	11	76	62	81	73	.....	.....	7	12	7	12	88	85
Fresno	3	1	90	100	93	101	.....	.....	9	26	9	26	102	127
Humboldt (Arcata)	.....	1	18	33	18	34	.....	.....	.....	.....	.....	.....	18	34
San Diego	5	3	104	132	109	135	.....	1	3	9	3	10	112	145
San Francisco	.....	.....	151	155	151	155	.....	.....	17	.....	17	.....	168	155
San Jose	2	11	186	177	188	188	4	.....	43	69	47	69	235	257
Santa Barbara	1	1	18	21	19	22	6	6	31	28	37	34	56	56
Totals	16	28	643	680	659	708	10	7	110	144	120	151	779	859

Statistics of State Teachers Colleges, Showing Total Number of Training School Pupils Enrolled for the Years Ending June 30, 1921 and 1922.

Name of school	Elementary						Kindergarten					
	Boys		Girls		Total		Boys		Girls		Total	
	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22
Chico	169	127	175	137	344	264	25	9	13	13	38	22
Fresno	162	152	171	185	333	337	.....	.....	.....	.....	.....	.....
Humboldt (Arcata)	29	38	36	43	65	81	.....	.....	.....	.....	.....	.....
San Diego	194	178	188	184	382	362	.....	.....	.....	.....	.....	.....
San Francisco	268	235	296	234	564	469	.....	59	.....	57	.....	116
San Jose	303	228	335	249	638	477	35	33	48	55	83	88
Santa Barbara	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals	1,125	958	1,201	1,032	2,326	1,990	60	101	61	125	121	226

TABLE No. 23—Continued.

Statistics of State Teachers Colleges, Showing Number of Graduates from Special Courses for Year Ending June 30, 1921.

Name of School	Agriculture			Art			Home economics			Kindergarten			Manual arts			Music			Physical Education			Special summer session		
	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total
Chico								2	2		5	5												
Fresno					2	2		4	4								1	1		2	2			
Humboldt (Arcata)								3	3															
San Diego											17	17												
San Francisco								7	7		34	34	4		4		2	2						
San Jose													7		7		1	1		1	1			
Santa Barbara					4	4		24	24															
Totals					6	6		40	40		56	56	11		11		4	4		3	3			

TABLE No. 23—Continued.

Statistics of State Teachers Colleges, Showing Number of Graduates from Special Courses for Year Ending June 30, 1922.

Name of School	Agriculture			Art			Home economics			Kindergarten			Manual arts			Music			Physical education			Special summer session		
	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total
Chico								4	4		8	8					4	4						
Fresno					3	3		8	8		11	11												
Humboldt (Arcata)																								
San Diego					2	2		7	7				1		1									
San Francisco											9	9												
San Jose					1	1		17	17		43	43					5	5		3	3			
Santa Barbara					1	1		25	25				6		6					2	2			
Totals					7	7		61	61		71	71	7		7		9	9		5	5			

TABLE No. 23—Continued.

State Department of Education. Financial Statements.—State Teachers Colleges.

RECEIPTS.

	1920-21	1921-22
Chico State Teachers College:		
Income from appropriations	$95,065 30	$107,076 40
Departmental income	14,288 89	14,614 29
Totals	$109,354 19	$121 690 69
Fresno State Teachers College:		
Income from appropriations	$95,905 00	$142,103 76
Departmental income	2,856 00	15,210 38
Totals	$98,761 00	$157,314 14
Humboldt State Teachers College:		
Income from appropriations	$165,166 02	$96,289 41
Departmental income	114 50	647 90
Totals	$165,280 52	$96,937 31
San Diego State Teachers College:		
Income from appropriations	$94,307 10	$150,015 66
Departmental income	6,581 94	21,939 23
Totals	$100,889 04	$171,954 89
San Francisco State Teachers College:		
Income from appropriations	$91,796 50	$140,545 60
Departmental income	220 60	6,459 89
Totals	$92,017 10	$147,005 49
San Jose State Teachers College:		
Income from appropriations	$252,477 62	$224,817 93
Departmental income	1,328 12	4,147 25
Totals	$253,805 74	$228,965 18
Santa Barbara State Teachers College:		
Income from appropriations	$65,572 85	$102,744 12
Departmental income	3,943 53	6,341 36
Totals	$69,516 38	$109,085 48
Grand totals	$889,623 97	$1,032,953 18

TABLE No. 23—Continued.

State Teachers College of Chico—Statement of Expenditures for Seventy-second Fiscal Year, July 1, 1920, to June 30, 1921.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Instruction	$4,497 20	$48,552 88	$1,058 80	$799 99	$54,908 87
Administration	140 47	7,089 00	309 66	196 00	7,735 13
General			1,582 57		1,582 57
Summer session	6,194 89	1,690 00	48 41	805 43	8,738 73
Maintenance and operation	3,215 84	5,916 48	1,585 76	70 47	10,788 55
Total ordinary expenditures	$14,048 40	$63,248 36	$4,585 20	$1,871 89	$83,753 85
Cafeteria	2,695 22	$28 00	31 00	340 82	3,895 04
Additions and betterments		11,409 06	16,134 80		27,543 86
Total expenditures	$16,743 62	$75,485 42	$20,751 00	$2,212 71	$115,192 75

State Teachers College of Fresno—Statement of Expenditures for Seventy-second Fiscal Year, July 1, 1920, to June 30, 1921.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Instruction	$1,768 51	$66,134 09	$159 82	$705 12	$68,767 54
Administration	35 31	11,431 25	483 35		11,949 91
General	249 78		1,598 02		1,847 80
Maintenance and operation	3,155 76	8,622 77	1,387 35	253 02	13,418 90
Total ordinary expenditures	$5,209 36	$86,188 11	$3,628 54	$958 14	$95,984 15
Additions and betterments	1,061 39			972 54	2,033 93
Total expenditures	$6,270 75	$86,188 11	$3,628 54	$1,930 68	$98,018 08

Humboldt State Teachers College—Statement of Expenditures for Seventy-second Fiscal Year, July 1, 1920, to June 30, 1921.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Instruction	$429 47	$23,198 84	$152 34	$374 12	$24,154 77
Administration	58 97	5,745 05	721 48	160 75	$6,686 25
General	48 72		1,229 47		1,278 19
Maintenance and operation	4,071 05	8,382 77	1,339 63	420 10	14,213 55
Total ordinary expenditures	$4,608 21	$37,326 66	$3,442 92	$954 97	$46,332 76
Additions and betterments	42,672 24	43,358 16	30,528 92	667 18	117,226 50
Total expenditures	$47 280 45	$80,684 82	$33,971 84	$1,622 15	$163,559 26

TABLE No. 23—Continued.

State Teachers College of San Diego—Statement of Expenditures for Seventy-second Fiscal Year, July 1, 1920, to June 30, 1921.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Instruction	$3,600 09	$59,458 18	$592 06	$327 13	$63,977 46
Administration	118 75	11,362 28	1,025 76	98 50	12,605 29
General			1,535 06		1,535 06
Maintenance and operation	1,671 63	13,711 17	1,311 35	146 31	16,840 46
Total ordinary expenditures	$5,390 47	$84,531 63	$4,464 23	$571 94	$94,958 27
Additions and betterments	368 26			71 40	439 66
Cafeteria	3,916 14	994 80	91 56		5,002 50
Total expenditures	$9,674 87	$85,526 43	$4,555 79	$643 34	$100,400 43

State Teachers College of San Francisco—Statement of Expenditures for Seventy-second Fiscal Year, July 1, 1920, to June 30, 1921.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Instruction	$4,748 89	$71,568 17	$2,018 59	$2,387 56	$80,723 21
Administration	54 81	12,200 00	476 07		12,730 88
General			643 75		643 75
Maintenance and operation	2,351 47	7,464 35	2,639 77	273 85	12,729 44
Total expenditures	$7,155 17	$91,232 52	$5,778 18	$2,661 41	$106,827 28

State Teachers College of San Jose—Statement of Expenditures for Seventy-second Fiscal Year, July 1, 1920, to June 30, 1921.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Instruction	$4,065 33	$108,781 22	$1,850 32	$2,975 91	$117,672 78
Administration	85 67	18,653 18	539 19	88 32	18,766 36
General			2,013 52		2,013 52
Maintenance and operation	2,124 05	16,137 98	9,353 59	619 24	28,234 86
Total ordinary expenditures	$6,275 05	$142,972 38	$13,756 62	$3,683 47	$166,687 52
Additions and betterments			88,639 42		88,639 42
Total expenditures	$6,275 05	$142,972 38	$102,396 04	$3,683 47	$255,326 94

State Teachers College of Santa Barbara—Statement of Expenditures for Seventy-second Fiscal Year, July 1, 1920, to June 30, 1921.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Instruction	$4,693 93	$41,989 58	$41 80		$46,725 31
Administration	348 88	10,079 93	985 94		11,414 75
General	165 00		1,754 19		1,919 19
Maintenance and operation	2,213 60	7,221 76	490 42		9,925 78
Total ordinary expenditures	$7,421 41	$59,291 27	$3,272 35		$69,985 03
Additions and betterments	199 95			336 50	536 45
Total expenditures	$7,621 36	$59,291 27	$3,272 35	$336 50	$70,521 48

TABLE No. 23—Continued.

State Teachers College of Chico—Statement of Expenditures for Seventy-third Fiscal Year, July 1, 1921, to June 30, 1922.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Instruction	$3,054 87	$67,899 96	$1,434 82	$1,691 50	$74,081 15
Administration	165 14	8,199 96	1,402 25	30 65	9,798 00
General			1,763 14		1,763 14
Summer session	4,683 96	4,830 22	230 76	1,138 57	10,883 51
Maintenance and operation	3,556 44	9,388 68	2,175 27	215 93	15,336 32
Total ordinary expenditures	$11,460 41	$90,318 82	$7,006 24	$3,076 65	$111,862 12
Cafeteria	2,903 02	$16 00	102 86	147 23	3,969 11
Additions and betterments			224 37	5,266 56	5,490 93
Total expenditures	$14,363 43	$91,134 82	$7,333 47	$8,490 44	$121,322 16

State Teachers College of Fresno—Statement of Expenditures for Seventy-third Fiscal Year, July 1, 1921, to June 30, 1922.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Instruction	$2,645 69	$94,274 84	$70 86	$4,475 64	$101,467 03
Administration	48 08	13,386 00	306 49	*83 90	13,824 47
General			1,212 22		1,212 22
Maintenance and operation	2,844 06	9,940 01	1,586 90	48 74	14,419 71
Total ordinary expenditures	$5,537 83	$117,600 85	$3,176 47	$4,608 28	$130,923 43
Additions and betterments	144 45		11,890 00	288 90	12,323 35
Prior year expense	34 68				34 68
Total expenditures	$5,716 96	$117,600 85	$15,066 47	$4,897 18	$143,281 46

Humboldt State Teachers College—Statement of Expenditures for Seventy-third Fiscal Year, July 1, 1921, to June 30, 1922.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Instruction	$164 79	$27,324 88	$183 50	$5,052 99	$32,726 16
Administration	49 79	6,600 17	489 04	517 76	7,656 76
General	48 24		1,152 39	125 03	1,325 66
Maintenance and operation	1,540 55	3,270 26	739 28	1,347 89	6,897 98
Total ordinary expenditures	$1,803 37	$37,195 31	$2,564 21	$7,043 67	$48,606 56
Additions and betterments	15,751 49	19,322 45	2,870 15	10,221 94	48,166 03
Total expenditures	$17,554 86	$56,517 76	$5,434 36	$17,265 61	$96,772 59

TABLE No. 23—Continued.

State Teachers College of San Diego—Statement of Expenditures for Seventy-third Fiscal Year, July 1, 1921, to June 30, 1922.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Instruction	$5,453 14	$94,946 84	$414 53	$696 97	$101,511 48
Administration	205 30	11,943 75	1,707 93	80 90	13,937 88
General	685 96		1,781 43		2,467 39
Maintenance and operation	1,639 99	13,777 57	1,487 18	192 67	17,097 41
Total ordinary expenditures	$7,984 39	$120,668 16	$5,391 07	$970 54	$135,014 16
Cafeteria	4,009 28	1,110 42	178 99	163 73	5,462 42
Additions and betterments	246 27		10,618 04	7,271 63	18,135 94
Total expenditures	$12,239 94	$121,778 58	$16,188 10	$8,405 90	$158,612 52

State Teachers College of San Francisco—Statement of Expenditures for Seventy-third Fiscal Year, July 1, 1921, to June 30, 1922.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Instruction	$4,565 18	$95,561 83	$2,576 16	$3,896 23	$106,599 40
Administration		13,299 96	1,844 46		15,144 42
General			1,866 47		1,866 47
Maintenance and operation	2,908 93	8,786 05	3,607 32	319 95	15,622 25
Total ordinary expenditures	$7,474 11	$117,647 84	$9,894 41	$4,216 18	$139,232 54
Additions and betterments	127 20		72 00	2,947 75	3,146 95
Total expenditures	$7,601 31	$117,647 84	$9,966 41	$7,163 93	$142,379 49

State Teachers College of San Jose—Statement of Expenditures for Seventy-third Fiscal Year, July 1, 1921, to June 30, 1922.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Instruction	$5,927 38	$144,621 92	$2,046 57	$3,667 39	$156,263 26
Administration		18,504 96	2,549 27	92 25	21,146 48
General			3,377 44		3,377 44
Maintenance and operation	4,705 19	16,189 72	4,855 36	661 04	26,411 31
Total ordinary expenditures	$10,632 57	$179,316 60	$12,828 64	$4,420 68	$207,198 49
Additions and betterments			17,619 44		17,619 44
Total expenditures	$10,632 57	$179,316 60	$30,448 08	$4,420 68	$224,817 93

TABLE No. 23—Continued.

State Teachers College of Santa Barbara—Statement of Expenditures for Seventy-third Fiscal Year, July 1, 1921, to June 30, 1922.

Function	Material and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Instruction	$3,414 56	$62,248 07	$389 13	$1,285 82	$67,337 58
Administration	128 10	10,579 89	2,324 50	365 55	13,698 04
General			1,313 86		1,313 86
Maintenance and operation	2,194 31	8,100 00	948 90	7 25	11,250 46
Total ordinary expenditures	$5,736 97	$81,227 96	$4,976 39	$1,658 62	$93,599 94
Additions and betterments	971 38		8,775 43	5,424 68	15,171 49
Total expenditures	$6,708 35	$81,227 96	$13,751 82	$7,083 30	$108,771 43

Statistics of State Teachers Colleges, Showing Valuation of Property for Year Ending June 30, 1921.

Name of School	Valuation of grounds	Valuation of buildings	Valuation of of furniture	Valuation of library books	Valuation of apparatus	Total valuation
Chico	$66,360	$242,687	$13,010	$17,350	$2,422	$341,829
Fresno	50,000	380,000	15,000	9,500	11,000	465,500
Humboldt (Arcata)	20,606	223,594	4,086	5,330	1,951	255,567
San Diego	100,000	215,000	25,400	18,500	18,500	377,400
San Francisco	110,000	130,000	29,113	16,500	4,655	290,268
San Jose	50,000	520,000	45,000	40,000	12,000	667,000
Santa Barbara	25,000	135,650	35,000	6,000	5,000	206,650
Totals	$421,966	$1,846,931	$166,609	$113,180	$55,528	$2,604,214

Statistics of State Teachers Colleges, Showing Valuation of Property for Year Ending June 30, 1922.

Name of School	Valuation of grounds	Valuation of buildings	Valuation of furniture	Valuation of library books	Valuation of apparatus	Total valuation
Chico	$67,600	$242,687	$13,010	$17,350	$2,422	$343,069
Fresno	50,000	380,000	15,000	10,500	13,000	468,500
Humboldt (Arcata)	21,784	263,717	16,873	5,530	6,817	314,721
San Diego	100,000	216,200	26,000	19,300	23,000	384,500
San Francisco	300,400	130,000	31,113	20,550	5,662	487,725
San Jose	50,000	500,000	45,000	40,000	12,000	647,000
Santa Barbara	35,000	135,000	40,000	6,000	5,500	221,500
Totals	$624,784	$1,867,604	$186,996	$119,230	$68,401	$2,867,015

Statistics of State Teachers Colleges, Showing Area and Valuation of Grounds for Years Ending June 30, 1921 and 1922.

Name of School	Area of grounds		Valuation of grounds	
	1920-21	1921-22	1920-21	1921-22
	Acres	Acres		
Chico	17.25	18.25	$66,360	$67,600
Fresno	25.00	25.00	50,000	50,000
Humboldt (Arcata)	51.00	51.00	20,606	21,784
San Diego	16.50	16.50	100,000	100,000
San Francisco	1.73	4.38	110,000	300,400
San Jose	18.30	18.30	50,000	50,000
Santa Barbara	13.00	13.00	25,000	35,000
Totals	142.78	146.43	$421,966	$624,784

TABLE No. 23—Continued.

Statistics of State Teachers Colleges, Showing Number of Books in Libraries for Years Ending June 30, 1921 and 1922.

Name of School	On hand		Purchased		Donated		Lost or destroyed		Total on hand	
	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22
Chico	21,850	21,850	375	375	256	256	...	...	22,481	22,481
Fresno	8,912	10,232	1,350	729	...	30	30	30	10,232	10,961
Humboldt (Arcata)	5,439	5,586	89	175	80	89	20	6	5,588	5,844
San Diego	20,292	20,936	669	906	18	46	43	190	20,936	21,698
San Francisco	28,335	30,814	2,835	3,000	22	25	378	511	30,814	33,328
San Jose	19,904	20,828	967	948	...	...	73	293	20,828	21,483
Santa Barbara	4,469	4,578	103	280	30	1,196	24	7	4,578	6,047
Totals	109,291	114,824	6,328	6,413	406	1,642	568	1,037	115,457	121,842

Section 8.

CALIFORNIA POLYTECHNIC SCHOOL.

Table No. 24. Showing Number of Teachers Employed, Number of Pupils Enrolled, Number of Graduates, Receipts and Expenditures and Valuation of Property.

TABLE No. 24.

Statistics of California Polytechnic School at San Luis Obispo.

	1920-21			1921-22		
	Men	Women	Total	Men	Women	Total
Number of teachers employed	8	10	18	12	7	19
Enrollment analyzed by grades:						
First year	77	11	88	79	11	90
Second year	31	5	36	40	5	45
Third year	24	7	31	21	6	27
Fourth year	11	9	20	12	9	21
Totals	143	32	175	152	31	183
Enrollment analyzed by courses:						
Engineering mechanics	89	.....	89	106	.....	106
Agriculture	23	.....	23	18	.....	18
Household arts	.....	18	18	.....	16	16
College preparatory	24	9	33	20	8	28
Commercial	7	5	12	8	7	15
Totals	143	32	175	152	31	183
Graduates	9	7	16	11	7	18

California Polytechnic School—Statement of Income and Expenditures and Valuation of Property for Seventy-second and Seventy-third Fiscal Years.

	Seventy-second fiscal year (1920-21)	Seventy-third fiscal year (1921-22)
INCOME—		
Departmental revenues:		
Agricultural departments	$6,105 22	$4,071 28
Mechanical departments	93 29	1 45
Domestic science departments	122 82	97 02
Cafeteria	18,039 72	14,130 19
Dormitory and laundry	2,926 53	2,884 42
Breakage, junk sales, etc.	99 05	80 71
Rehabilitation tuition receipts	.....	24,558 97
Total departmental revenues	27,386 63	45,824 04
Withdrawals from appropriations	84,105 18	103,084 42
Total incomes	$111,491 81	$148,908 46
EXPENDITURES—		
Function:		
Instruction (including rehabilitation students*)	$61,313 21	$101,894 44
Administrative and general	16,762 74	19,929 69
Maintenance and operation	13,205 06	11,237 84
Subsistence departments	20,777 86	14,292 22
Additions and betterments	67 71	368 67
Prior year expenses	201 60	55 46
Total expenditures	$112,328 18	$147,778 32
Excess income over expenditures	.....	$1,130 14
Excess expenditures over income	$836 37	
VALUATION OF PROPERTY—		
Area of grounds	928.24	928.24
(Also has 699 acres on which control water rights only.)		
Value of land, buildings and permanent equipment	$448,883 00	$475,000 00

*Instruction of trainees of U. S. Veterans' Bureau etc. not included in accounts of seventy-second fiscal year.

Section 9.

CALIFORNIA SCHOOLS FOR THE DEAF AND THE BLIND.

Table No. 25. Showing Number of Teachers Employed, Number of Pupils Enrolled, Number of Graduates, Receipts and Expenditures and Valuation of Property.

TABLE No. 25.

California Schools for the Deaf and the Blind.

	1920-21		1921-22	
Number of teachers employed	40		40	
The enrollment of pupils for the two years ending June 30, 1922, has been as follows:				
Deaf boys	117		113	
Deaf girls	71		66	
		188		179
Blind boys	43		44	
Blind girls	49		51	
		92		95
Total enrollment, both classes		280		274

California Schools for the Deaf and the Blind—Statement of Income and Expenditures and Valuation of Property for the Seventy-second and Seventy-third Fiscal Years.

	Seventy-second fiscal year (1920-21)	Seventy-third fiscal year (1921-22)
INCOME—		
Departmental revenues:		
Board and tuition	$4,930 00	$4,153 44
Commissary sales	505 89	1,242 72
Farm sales	2,946 49	2,847 67
Trust fund revenues	3,444 16	1,804 80
Trust fund contributions	16 05	10 00
Miscellaneous	723 72	1,176 00
Total departmental revenues	$12,566 31	$11,234 63
Withdrawals from appropriations	161,806 05	175,639 22
Total income	$174,372 36	$186,873 85
EXPENDITURES—		
Function:		
Instruction	$60,727 89	$69,860 71
Care and welfare	13,981 75	16,403 37
Support and subsistence	44,085 84	38,822 60
Administrative and general	16,518 92	16,548 35
Maintenance and operation	29,035 87	30,896 17
Farming	15,854 09	9,712 56
Total expenditures	$180,204 36	$182,243 76
Excess income over expenditures		$4,630 09
Excess expenditures over income	$5,832 00	
VALUATION OF PROPERTY—		
Area of grounds, acres	131.35	131.35
Value of grounds, buildings and permanent equipment	$1,335,000 00	$1,335,000 00

(Note: Chapter 899, 1921, provides for division of land for the separate School for the Blind. The division made leaves all present structures on the property reserved for the use of the Deaf, but the buildings are now used jointly by the two schools. For this reason no division of the valuation of the property is submitted.)

Section 10.

UNIVERSITY OF CALIFORNIA.

Table No. 26. Number of Professors Employed, Number of Students Enrolled, Number of Graduates, Receipts and Expenditures, Valuation of Property.

TABLE No. 26.

By JAMES SUTTON, Recorder of the Faculties.

Number of Professors, Lecturers and Instructors in the University of California.

(Includes officers holding these titles in all departments of the University excepting the Lick schools and the California School of Fine Arts.)

1920-21		1921-22	
Men	609	Men	620
Women	63	Women	66
Total	672	Total	686

Enrollment of Students.

Number of students enrolled in—	1920-21				1921-22			
	Graduate students*.	Undergraduate students.	Unclassified students.	Total.	Graduate students*.	Undergraduate students.	Unclassified students.	Total.
College of Letters and Science:								
Men	333	2,155			333	2,062		
Women	556	4,096			494	3,835		
Totals	889	6,251		7,140	827	5,897		6,724
College of Engineering and Chemistry:								
Men	78	1,368			80	1,358		
Women	1	15			10	12		
Totals	79	1,383		1,462	90	1,370		1,460
College of Commerce:								
Men	8	994			10	1,227		
Women	7	219			7	208		
Totals	15	1,213		1,228	17	1,435		1,452
College of Agriculture:								
Men	41	573			83	496		
Women	4	35			3	34		
Totals	45	608		653	86	530		616
School of Jurisprudence:								
Men	103	152			125	167		
Women	11	23			15	15		
Totals	114	175		289	140	182		322
Medical School:								
In Berkeley—								
Men	36	46			52	30		
Women	13	13			11	4		
Totals	49	59		108	63	34		97
Medical School:								
In San Francisco—								
Men	81	26			76	47		
Women	8	2			16	8		
Totals	89	28		117	92	55		147
Medical Department, Los Angeles:								
Men			34				86	
Women			3				10	
Totals			37	37			96	96
School of Architecture—								
Men	5				9			
Women	2				0			
Totals	7			7	9			9

TABLE No. 26—Continued.

Enrollment of Students—Continued.

Number of students enrolled in—	1920-21				1921-22			
	Graduate students*	Undergraduate students	Unclassified students	Total	Graduate students*	Undergraduate students	Unclassified students	Total
College of Dentistry:								
Men			308				367	
Women			20				15	
Totals			328	328			382	382
College of Pharmacy:								
Men			95				154	
Women			24				30	
Totals			119	119			184	184
Hastings College of the Law:								
Men			79				101	
Women			10				13	
Totals			89	89			114	114
Southern Branch, Los Angeles: Junior College Department—								
Men		473				808		
Women		437				671		
Totals		910		910		1,497		1,497
Grand totals				12,487				13,100

Summer Sessions, 1920-1921.

	1920-21	1921-22
Men	2,058	2,502
Women	4,378	5,369
Totals	6,436	7,871
Total number of students, deducting duplicates†	17,599	19,234

Graduated During the Year.

	1920-21	1921-22
Men	874	1,134
Women	778	849
Totals	1,652	1,983

Total number of degrees conferred since the establishment of the university, 22,128.

*Graduate students are classified by schools or by major departments, not by colleges. The graduate students herein credited to the Colleges of Agriculture, Commerce, Engineering and Chemistry are students in the Graduate Division who have their major work in the respective *departments* or fields of study designated Agriculture, Commerce, etc. Graduate students in departments of study not otherwise specified herein are, for the purposes of this table, classified as students in the College of Letters and Science.

†Summer session students also registered in the fall session next ensuing and graduate students who received their degrees as undergraduates in December.

Summary of Additional Enrollment.

(See note.)

	1920-21	1921-22
Lick-Wilmerding Trade School	483	470
Lick-Lux School	226	244
Agricultural Extension	2,407	1,837
University Extension	16,227	17,681
Correspondence Courses	4,110	4,483
University Farm School, Davis, Calif.	601	473
California School of Fine Arts	854	777
Southern Branch, University of California (Teachers Curricula)	1,236	1,456
Totals	26,144	28,198

NOTE.—Instruction in the departments herein referred to does not, generally speaking, lead to University degrees.

Recorder's Office,
University of California,
Berkeley, California,
November 31, 1922

ATTEST:

JAMES SUTTON,
Recorder of the Faculties.

UNIVERSITY OF CALIFORNIA, FINANCIAL STATEMENT.

By ROBERT G. SPROUL, Comptroller.

Summary of Income, Expenditure, and Assets for the Year Ending June 30, 1921.

INCOME.

From United States		$174,620 49
From State of California		3,154,751 54
From students' fees and deposits		721,012 38
From hospitals, infirmary and professional colleges		602,257 07
From departmental sales and miscellaneous receipts		540,618 28
From income and endowment investments:		
For current use	$348,234 25	
For additions to endowments	5,651 22	
For payments on trust funds	5,913 56	359,799 03
From gifts from current use	$137,063 56	
From gifts for buildings and equipment	406,447 59	
From gifts for endowment	773,361 00	
		$1,316,872 15
Withdrawals from endowment funds used as income		2,020 62
Total		$6,871,951 56

EXPENDITURES.

Administration	$264,666 00
General maintenance, operation, etc.	401,789 09
Land, buildings, improvements, alterations, etc.	103,872 11
Education and research	4,640,456 93
Scholarships, fellowships, and prizes	56,733 29
Miscellaneous expenditures not classified	389,232 89
Payments to beneficiaries of trust funds, etc.	11,199 71
Additions to endowment funds	826,638 48
Total	$6,694,588 50

ASSETS.

Real estate in Berkeley	$1,604,822 44	
Buildings and improvements in Berkeley	5,804,725 09	
Real estate and improvements not in Berkeley	4,152,094 46	
		$11,561,641 99
Equipment		3,522,104 06
Investments (bonds, stocks, notes, real estate, etc.)		7,517,474 16
Cash, accounts receivable, stores on hand, etc.		1,782,797 00
Total		$24,384,017 21

UNIVERSITY OF CALIFORNIA, FINANCIAL STATEMENT.

By Robert G. Sproul, Comptroller.

Summary of Income and Expenditure, and Assets for the Year Ending June 30, 1922.

Income.

From United States		$198,666 16
From State of California		4,307,937 30
From students' fees and deposits		1,365,862 66
From hospitals, infirmary and professional colleges		573,946 81
From departmental sales and miscellaneous receipts		513,858 63
From income from endowment investments:		
For current use	$321,728 11	
For additions to endowments	7,229 41	
For payments on trust funds	7,953 39	
		$336,910 91
From gifts for current use	$144,010 53	
From gifts for buildings and equipment	1,297,664 03	
From gifts for endowment	316,651 01	
		$1,758,325 57
Withdrawals from endowment funds used as income		33,909 15
Total		$9,089,417 19

Expenditures.

Administration	$276,327 98
General maintenance, operation, etc.	411,484 15
Land, buildings, improvements, alterations, etc.	845,897 02
Education and research	5,164,328 76
Scholarships, fellowships, and prizes	60,778 64
Miscellaneous expenditures not classified	403,615 52
Payments to beneficiaries of trust funds, etc.	13,334 41
Additions to endowment funds	365,044 13
Total	$7,540,810 61

Assets.

Real estate in Berkeley	$1,782,905 59	
Buildings and improvements in Berkeley	5,976,128 17	
Real estate and improvements not in Berkeley	4,509,184 87	
		$12,268,218 63
Equipment		3,631,877 94
Investments (bonds, stocks, notes, real estate, etc.)		8,407,775 78
Cash, accounts receivable, stores on hand, etc.		3,286,975 40
Total		$27,594,847 75

Section 11.

STATISTICAL SUMMARY.

Table No. 27. Showing Statistical Summary of All Public Schools and Educational Institutions in the State of California.

TABLE No. 27.

Statistical Summary of 1920-21 and 1921-22.

(Kindergarten, Elementary, High and Normal Schools, Institutions for the Deaf and the Blind, California Polytechnic School and the University of California.)

(1) Kindergarten Schools.

	1920-21	1921-22
Number of counties maintaining	41	42
Number of separate kindergartens	569	597
Number of teachers employed (women)	790	832
Grade of certificate held by teachers—		
Kindergarten, primary	728	764
Kindergarten, special	62	68
Totals	790	832
Average salary paid teachers—		
Supervisors	$2,050 86	$2,401 00
Principals	1,422 24	1,546 00
Regular teachers	1,333 66	1,399 00
Number of pupils enrolled—		
Boys	18,201	19,714
Girls	18,595	20,061
Totals	36,796	39,775
Average daily attendance	18,700	20,779
Average number of days school was open for year	176	175
Number of visits made by—		
County superintendents	652	825
School trustees	564	561
Number of books in libraries	4,570	6,625
FINANCIAL STATEMENT.		
Receipts from—		
Balance on hand	$189,148 07	$309,779 34
Taxes for maintenance	1,674,323 19	1,880,265 79
Special tax for buildings		
Donations, etc	2,074 10	1,606 71
Totals	$1,865,545 36	$2,191,651 84
Expenditures for—		
Salaries of teachers	$1,102,541 79	$1,240,079 30
*Contingent expenses	409,017 31	484,492 55
Sites, buildings and furniture	36,964 77	72,138 80
Library books	222 40	342 26
Apparatus	7,918 65	5,246 34
Totals	$1,556,664 92	$1,802,299 25
Balance unexpended	$308,880 44	$389,352 59
Average cost per pupil in average daily attendance for all expenses excepting buildings	$81 27	$83 26
Valuation of property—		
Sites and buildings	$181,264 00	$325,274 00
Library books	3,357 00	19,610 00
Furniture, apparatus, and equipment	116,900 00	128,913 00
Totals	$301,521 00	$473,967 00

*Including supplies, rents, repairs, etc.

TABLE No. 27—Continued.

(2) Elementary (Primary and Grammar, Including Evening, Day and Deaf) Schools.

	1920-21	1921-22
Number of school districts—		
Regular active	3,401	3,376
Joint	67	76
Active union	101	131
Suspended	141	130
Number of pupils enrolled in districts maintaining school—		
Less than 80 days	109	45
Between 81 and 100 days	36	58
Between 101 and 120 days	413	53
Between 121 and 140 days	3,001	40
Between 141 and 160 days	31,802	20,247
Between 161 and 180 days	237,705	256,712
Between 181 and 200 days	270,487	294,488
Over 200 days	38	35
Number of teachers, estimated on average daily attendance (for apportionment)	14,619	16,371
Number of teachers employed—		
Men	1,158	1,314
Women	15,258	16,393
Totals	16,416	17,707
Grade of certificate held by teachers—		
High school	599	553
Elementary	14,774	16,072
Primary	216	89
Special	827	993
Totals	16,416	17,707
Enrollment of pupils—		
First year—		
Boys	63,082	62,314
Girls	55,862	55,796
Second year—		
Boys	37,774	39,452
Girls	33,902	35,363
Third year—		
Boys	33,960	37,374
Girls	31,495	35,190
Fourth year—		
Boys	32,456	34,489
Girls	30,263	32,140
Fifth year—		
Boys	32,153	33,053
Girls	29,735	30,469
Sixth year—		
Boys	29,726	31,209
Girls	28,006	29,018
Seventh year—		
Boys	27,206	29,539
Girls	26,159	27,904
Eighth year—		
Boys	25,845	29,303
Girls	25,919	29,065
Ungraded—		
Girls	48	
Total boys	282,202	296,733
Total girls	261,389	274,945
Grand totals	543,591	571,678

TABLE No. 27—Continued.

(2) **Elementary Schools**—Continued.

	1920-21	1921-22
Number of pupils enrolled in post-graduate elementary schools—		
First year—		
Boys	76	91
Girls	65	71
Second year—		
Boys	15	14
Girls	21	9
Total boys	91	105
Total girls	86	80
Grand totals	177	185
Number of graduates from elementary schools—		
Boys	18,767	20,915
Girls	20,452	21,850
Totals	39,219	42,765
Number of graduates from postgraduate schools—		
Boys	7	1
Girls	14	3
Totals	21	4
Average daily attendance	429,316	459,324
Average number of days schools were actually open	172	179
Number of visits made by—		
County superintendents	19,161	21,710
School trustees and members of boards of education	16,524	18,486
Number of books in school libraries	2,827,682	2,855,830
Number of books in county teachers' libraries	51,792	46,503
FINANCIAL STATEMENT.		
Receipts from—		
Balance on hand	$7,918,593 99	$11,535,669 02
State apportionment	7,473,264 19	12,907,802 12
County apportionment	16,454,956 87	16,378,614 97
Special tax for maintenance	8,241,222 18	7,741,855 92
Special tax for buildings	3,215,262 77	4,404,350 44
Sale of bonds	10,806,226 74	19,441,987 94
Miscellaneous	1,073,732 76	1,336,395 01
Total resources for year	$55,183,259 50	$73,836,675 42
Expenditures for—		
General control	$540,513 03	$638,237 41
Teachers' salaries	24,274,390 60	28,231,496 89
Other expenses of instruction	1,263,804 19	1,436,980 24
Library	314,989 32	437,474 03
Operation of school plant	2,937,183 69	3,102,428 62
Maintenance of school plant	1,324,121 44	1,562,549 48
Fixed charges	860,978 20	1,045,631 39
Capital outlays	12,056,587 75	18,549,257 05
Auxiliary agencies	568,120 86	760,855 64
Total expenditures	$44,140,689 08	$55,764,910 75
Balance on hand at close of year	$11,042,570 42	$18,071,764 67

(2) **Elementary Schools**—Continued.

	1920-21	1921-22
Valuation of property—		
Sites and buildings	$78,581,599 00	$94,961,454 00
School libraries	1,296,539 00	1,337,390 00
Furniture, apparatus and equipment	6,518,823 00	7,960,196 00
Total valuation	$86,396,961 00	$104,259,040 00
Total amount of outstanding bonds	$42,497,593 00	$58,025,914 00
Cost per pupil on average daily attendance	74 73	81 02
Average rate per pupil apportioned on average daily attendance, by counties, after giving $800 per teacher	30 21	14 24

Average annual salary paid teachers	1920-21		1921-22	
	Number	Amount	Number	Amount
District superintendents—				
Men	225	$2,883 80	245	$2,965 52
Women	226	2,508 62	250	2,684 41
Principals—				
Men	366	1,883 18	401	1,958 98
Women	1,052	1,513 14	1,125	1,612 05
Regular teachers—				
Men	275	1,377 63	337	1,656 45
Women	13,138	1,479 21	14,139	1,568 73
Special—				
Supervisors of subjects—				
Men	52	2,429 10	47	2,522 90
Women	137	2,302 80	134	2,394 80
Teachers of subjects—				
Men	248	1,806 15	285	1,745 02
Women	701	1,620 72	743	1,713 51

(3) **High Schools.**	1920-21	1921-22
Number and kind of school—		
County	14	7
City	89	80
District	42	33
Union	182	195
Joint union	26	27
Totals	353	342
Number, sex, and position of teachers:		
Regular—		
Men	2,139	2,325
Women	3,763	4,149
Special—		
Men	270	354
Women	371	448
Teachers in junior colleges, exclusively:		
Regular—		
Men	2	2
Women	1	4
Special—		
Men	3	2
Women		
Total men	2,414	2,683
Total women	4,135	4,601
Grand totals	6,549	7,284

(3) **High Schools**—Continued.

	1920-21	1921-22
Number and grade of certificate held by teachers:		
Regular high school	4,026	4,398
Special high school	2,521	2,879
Totals	6,547	7,277
Total number of pupils enrolled by year and by sex:		
In regular high schools—		
First year—		
Male	26,100	24,921
Female	25,267	25,192
Second year—		
Male	13,819	14,929
Female	15,619	16,397
Third year—		
Male	8,725	10,378
Female	10,220	11,842
Fourth year—		
Male	6,193	7,128
Female	8,220	8,928
Special—		
Male	22,577	564
Female	23,389	1,557
Total male	77,414	57,920
Total female	82,715	63,916
Grand totals	160,129	121,836
In special day and evening and part-time classes—		
Special day classes—		
Male	1,889	2,117
Female	4,972	6,001
Special evening classes—		
Male	10,666	11,603
Female	9,478	9,306
Total male	12,555	13,720
Total female	14,450	15,313
Part-time, 16-18—		
Male	4,023	8,923
Female	2,680	5,555
Part-time, 18-21—		
Male	103	223
Female	306	155
Total male	4,126	9,146
Total female	2,986	5,710
Grand totals, special day and evening and part-time	34,117	43,889
In junior college:		
First year—		
Male	610	748
Female	574	695
Second year—		
Male	105	209
Female	153	212
Special (female)		149
Total male	715	957
Total female	727	1,056
Grand totals	1,442	2,013
In evening schools—		
Male		31,791
Female		27,741
Total		59,532
Total enrollment—all types:		
Total male	94,810	113,534
Total female	100,878	113,736
Grand totals	195,688	227,270
Average daily attendance	93,443	110,206
Average number days school was actually open	180	180
Number of volumes in libraries	761,416	1,460,272

(3) **High Schools**—Continued.

	1920-21	1921-22
FINANCIAL STATEMENT.		
Receipts from—		
Balance on hand	$6,015,078 43	$8,543,877 65
State apportionment	1,211,992 73	2,816,037 78
County apportionment	6,731,588 93	7,266,294 92
Special taxes for maintenance	13,647,771 88	14,861,877 44
Special taxes for buildings	464,462 53	430,235 23
Sale of bonds	7,002,422 67	14,053,863 06
Miscellaneous sources	902,220 80	1,262,300 49
Total receipts	$35,975,537 97	$49,234,476 57
Expenditures for—		
General control	$475,668 09	$661,592 75
Teachers' salaries	13,472,947 71	15,925,322 59
Other expenses of instruction	1,109,932 91	1,175,840 53
Library	896,358 24	546,703 07
Operation of school plant	1,623,007 56	1,839,797 01
Maintenance of school plant	688,956 11	816,177 26
Fixed charges	402,475 67	540,028 63
Capital outlays	7,976,607 81	11,749,926 64
Auxiliary agencies and sundry activities	847,418 50	1,041,070 63
Laboratory supplies	119,482 08	203,377 13
Total expenditures	$27,612,854 68	$34,499,836 24
Balance on hand at close of year	$8,362,683 29	$14,734,640 33
Average cost per pupil on average daily attendance	$210 14	$206 40
Total outstanding bonds	$26,058,400 00	$38,726,997 00
Valuation of all property—		
Sites and buildings	39,071,515 00	48,232,710 00
Laboratories, furniture, apparatus and equipment	6,193,976 00	7,597,577 00
Library books	1,323,729 00	1,741,701 00
Total valuation	$46,589,220 00	$57,571,988 00
Average salary paid teachers:		
Principals—		
Men	$2,959 68	$3,233 00
Women	2,795 48	3,059 00
Regular teachers—		
Men	2,200 59	2,311 00
Women	2,044 95	2,123 00

(4) Miscellaneous School Statistics.

	1920-21	1921-22
Cost of teachers' institutes—		
Instructors	$17,367 59	$21,977 77
Incidental expenses	3,983 22	4,167 49
Totals	$21,350 81	$26,145 26
Cost of trustees' institutes—		
Lecturers	$2,260 39	$2,612 70
Incidental expenses	1,416 25	1,503 24
Totals	$3,676 64	$4,115 94
Number of certificates issued by county boards of education:		
On examination to—		
Men	25	31
Women	239	241
On credentials to—		
Men	1,169	1,681
Women	6,988	8,687
Amount of fees collected for examination and issuance and renewal of certificates	$18,314 00	$18,040 00
Total average daily attendance in kindergarten, elementary and high schools	541,459	590,309
Miscellaneous county expenses—		
Total cost of county superintendents and deputies—		
Annual salaries	$279,319 48	$357,174 17
Traveling expenses	35,921 31	42,274 50
Postage and expressage	7,904 22	9,089 75
Other expenses—office supplies, etc	56,080 52	66,398 59
Totals	$379,225 53	$474,937 01
Total cost of county boards of education—		
Annual salaries of members	$111,470 15	$119,275 55
Traveling expenses of members	12,679 24	13,020 28
Other office expenses	47,298 50	37,953 25
Totals	$171,447 89	$170,249 08
Total cost of city superintendents and deputies—		
Annual salaries	$528,564 33	$660,787 51
Traveling expenses	4,731 14	7,684 38
Other office expenses	52,586 57	109,792 61
Totals	$585,882 04	$778,264 50

(5) State Teachers Colleges.

	1920-21	1921-22
Number of schools	7	7
Number of teachers employed—		
Men	60	77
Women	166	162
Totals	226	239
Number of students enrolled—		
Men	131	605
Women	2,382	3,242
Totals	2,513	3,847
Number of pupils enrolled:		
Training schools—		
Boys	1,125	958
Girls	1,201	1,032
Totals	2,326	1,990
Number of graduates for year—		
Men	26	35
Women	753	824
Totals	779	859
FINANCIAL STATEMENT.		
Receipts from—		
Appropriations	$860,290 39	$963,592 88
Departmental collections	29,333 58	69,360 30
Totals	$889,623 97	$1,032,953 18
Expenditures for—		
Material and supplies	$101,021 27	$74,817 42
Salaries and wages	621,380 95	765,224 41
Service and expense	174,353 74	98,188 71
Property and equipment	13,090 26	57,727 04
Totals	$909,846 22	$995,957 58
Valuation of property—		
Grounds	$421,966 00	$624,784 00
Buildings	1,846,931 00	1,867,604 00
Furniture	166,669 00	186,996 00
Library books	113,180 00	119,230 00
Apparatus	55,528 00	68,401 00
Total valuation	$2,604,214 00	$2,867,015 00
Number of acres in grounds	142.78	146.43
Number of books in libraries—		
At beginning of year	109,291	114,824
Purchased	6,328	6,413
Donated	406	1,642
Lost or destroyed	568	1,037
Total at close of year	115,457	121,842

	1920-21	1921-22
Number of regular active elementary school districts	3,401	3,376
Number of high schools	353	342
Number of teachers employed in all schools—		
Kindergartens	790	832
Elementary schools	16,416	17,707
High schools	6,549	7,284
Teachers' colleges	226	239
California Polytechnic	18	19
Schools for the Deaf and the Blind	40	40
University of California	672	686
Totals	24,711	26,807
Students enrolled in all schools—		
Kindergartens	36,796	39,975
Elementary schools	543,591	571,678
High schools	195,688	227,270
Teachers' colleges	2,513	3,847
California Polytechnic	175	183
Schools for the Deaf and the Blind	280	274
University of California	17,599	19,234
Totals	796,642	862,461
Receipts—		
Kindergartens	$1,865,545 36	$2,191,651 84
Elementary schools	55,183,259 50	73,836,675 42
High schools	35,975,537 97	49,234,476 57
Teachers' colleges	889,623 97	1,032,953 18
California Polytechnic	111,491 81	148,908 46
Schools for the Deaf and the Blind	174,372 36	186,873 85
University of California	6,871,951 56	9,089,417 19
Totals	$101,071,782 53	$135,720,956 51
Expenditures—		
Kindergartens	$1,556,664 92	$1,802,299 25
Elementary schools	44,140,689 08	55,764,910 75
High schools	27,612,854 68	34,499,836 24
Teachers' colleges	909,846 22	995,957 58
California Polytechnic	112,328 18	147,778 32
Schools for the Deaf and the Blind	180,204 36	182,243 76
University of California	6,694,588 50	7,540,810 61
Totals	$81,207,175 94	$100,933,836 51
Valuation of property—		
Kindergartens	$301,521 00	$473,967 00
Elementary schools	86,396,961 00	104,199,049 00
High schools	46,589,220 00	57,571,988 00
Teachers' colleges	2,604,214 00	2,867,015 00
California Polytechnic	448,883 00	475,000 00
Schools for the Deaf and the Blind	1,335,000 00	1,335,000 00
University of California	24,384,017 00	29,508,086 00
Totals	$162,059,816 00	$196,430,096 00
Number of graduates—		
Elementary schools	39,219	42,765
High schools	13,234	14,429
Teachers' colleges	779	859
California Polytechnic	16	18
Schools for the Deaf and the Blind	11	11
University of California	1,652	1,983
Totals	54,911	60,035
Total amount expended for salaries—		
Elementary schools	$42,497,593 00	$58,016,614 00
High schools	26,058,400 00	38,726,997 00
Totals	$68,555,993 00	$96,743,611 00

(E) Recapitulation—Continued.

	1920-21	1921-22
TOTAL EXPENDITURES FOR ALL SCHOOL PURPOSES.		
Kindergartens	$1,556,664 92	$1,802,299 25
Elementary schools	44,140,689 08	55,764,910 75
High schools	27,612,854 68	34,499,836 24
Totals	$73,310,208 68	$92,067,046 24
Overhead expenses—		
Offices of county superintendents of schools	$379,225 53	$474,937 01
Expenses of county boards of education	171,447 89	170,249 08
Expenses of city offices	585,882 04	778,264 50
Totals	$1,136,555 46	$1,423,450 59
Office of Superintendent of Public Instruction	$17,313 05	$29,654 50
Total cost of State Board of Education	92,826 77	105,445 40
Entire cost of textbooks—manufacture, royalty, cost of shipment, etc.	434,368 72	293,454 34
Totals	$544,508 54	$428,554 24
State teachers' colleges	$909,846 22	$995,957 58
California Polytechnic School	112,328 18	147,778 32
Schools for the Deaf and the Blind	180,204 36	182,243 76
University of California	6,694,588 50	7,540,810 61
Totals	$7,896,967 26	$8,866,790 27
GRAND TOTAL EXPENDITURES.		
Kindergartens, elementary and high schools	$73,310,208 68	$92,067,046 24
Offices of county superintendents, county boards of education and city boards of education	1,136,555 46	1,423,450 59
Offices of Superintendent of Public Instruction, State Board of Education, and entire cost of textbooks	544,508 54	428,554 24
State teachers' colleges, California Polytechnic School, schools for the Deaf and Blind, and University of California	7,896,967 26	8,866,790 27
Totals	$82,888,239 94	$102,785,841 34

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Twentieth Biennial Report

OF THE

Bureau of Labor Statistics

OF THE

State of California

1921-1922

WALTER G. MATHEWSON, Commissioner.
948 Market Street, San Francisco



California State Printing Office
FRANK J. SMITH, Superintendent
Sacramento, 1923

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LETTER OF TRANSMITTAL.

STATE BUREAU OF LABOR STATISTICS,
SAN FRANCISCO, December 22, 1922.

His Excellency, WILLIAM D. STEPHENS,
Governor of California.

SIR: I have the honor of submitting to you the Twentieth Biennial Report of this Bureau.

Respectfully,

WALTER G. MATHEWSON,
Commissioner.

ACKNOWLEDGMENT.

I desire to express my appreciation of the efficient serv ces rendered by the members of my staff, all of whom have, in their respective positions, loyally and unselfishly devoted their full time to the work of th's Bureau.

WALTER G. MATHEWSON,
Commissioner.

PERSONNEL

OF THE

BUREAU OF LABOR STATISTICS

WALTER G. MATHEWSON ..... Commissioner

SAN FRANCISCO:

James M. Murphy	Chief Deputy Commissioner
Albert T. Roche	Attorney
Louis Bloch	Statistician and Chief Examiner
Katherine Kelly	Bookkeeper-Stenographer
J. P. Denehy	Deputy
Harry Gorman	Field Agent
Hannah A. Nolan	Deputy
William H. Urmy	Deputy
E. F. Gallatin	Agent
David McLennan	Special Agent
J. P. O'Connell	Agent
Florence Burns	Stenographer
Sarah H. Byrne	Stenographer
Evelyn Corbett	Stenographer
Ruth Long	Stenographer
Nora O'Callaghan*	Stenographer

*Deceased.

LOS ANGELES:

William E. Steineck	Deputy Commissioner
Thomas Barker	Deputy
Mrs. M. M. Lyon	Deputy
Raymond Shively	Deputy
Harry V. Tibbet	Assistant Deputy
Flora Fromm	Agent
W. J. Kroggel	Agent
Louise Willems	Stenographer

SACRAMENTO:

Arthur L. Johnson	Deputy Commissioner
Francis H. White	Agent
Anna E. Purdy	Stenographer

SAN DIEGO:

B. H. Taylor	Deputy Commissioner
Martha Moore	Stenographer

FRESNO:

L. B. Mallory	Deputy Commissioner
Lois G. Frisbee	Stenographer

PUBLIC EMPLOYMENT BUREAUS.

C. B. Sexton	Director of Employment

SAN FRANCISCO:

Walter L. Juri	Manager
Mrs. L. M. Hall	Manager
Aileen Casey	Placement Clerk
Loretta Connors	Placement Clerk
Mary A. Dempsey	Placement Clerk
J. J. Lane	Placement Clerk
J. H. Manning	Placement Clerk
J. P. McLaughlin, Jr.	Placement Clerk
A. A. Rosborough	Placement Clerk

OAKLAND:

Mrs. Helen Power	Manager
R. H. Finnell	Placement Clerk
William J. Quigley	Placement Clerk
George F. Ryan	Placement Clerk
May L. Harrington	Stenographer

LOS ANGELES:

E. H. Hancock	District Superintendent
Blanche Halbert	Manager
Ruby Bell	Placement Clerk
L. W. Burdette	Placement Clerk
Ruth Byers	Placement Clerk
I. K. Carr	Placement Clerk
John A. Greene	Placement Clerk
Alice L. Hogan	Placement Clerk
Lucy Malin	Placement Clerk
S. L. Mayer, Jr.	Placement Clerk
B. N. Olin	Placement Clerk
A. O. Sanchez	Placement Clerk
Maude C. Wilkie	Placement Clerk
Florence Thurman	Telephone Operator and Clerk

SACRAMENTO:

F. W. Chapman	Manager
A. G. Anderson	Placement Clerk

FRESNO:

William G. Maas	Manager
J. J. Maher	Placement Clerk

SAN JOSE:

George F. Moody	Manager
T. F. Graham	Placement Clerk

STOCKTON:

F. W. Waterman	Placement Clerk

BAKERSFIELD:

R. A. Mathewson	Placement Clerk

MODESTO, CHICO, LODI, MARYSVILLE (Seasonal Offices):

David W. Reidy	Placement Clerk
C. S. Casey	Placement Clerk
Wm. P. O'Callaghan	Placement Clerk

BUREAU OF LABOR STATISTICS—STATEMENT OF INCOME AND EXPENDITURES FOR THE SEVENTY-SECOND AND SEVENTY-THIRD FISCAL YEARS AS AT JUNE 30, 1 22.

Seventy-second Fiscal Year.

INCOME:	
Appropriated:	
Statutory salaries, Chapter 645—1919	$16,537 05
Salaries of assistants, etc. Chapter 645—1919	27,569 79
Printing, Chapter 645—1919	3,007 65
Rent, Chapter 645 1919	2,710 00
Free public employment, Chapter 441—1919	75,410 28
Deficiency	35,000 00
Total	$160,234 77
Departmental:	
License fees—Private employment agencies:	
Cities—First, first and one-half and second class	$14,700 00
Cities—Third and fourth class	3,100 00
All other cities and towns	410 00
Fines:	
Violation of Eight Hour Law	250 00
Violation of Child Labor Law	200 00
Total	$18,660 00
Total income	$178,894 77
EXPENDITURES:	
Administrative and executive	$26,300 07
Enforcement of labor laws	50,018 98
Free public employment	95,643 22
Total expenditures	$171,962 27
Excess income over expenditures	$6,932 50

Seventy-third Fiscal Year.

INCOME:	
Appropriated:	
Statutory salaries, Chapter 905—1921	$15,825 20
Traveling and contingent, Chapter 905 1921	40,857 98
Free employment bureaus, Chapter 905 1921	88,992 74
Total	$145,675 92
Departmental:	
License fees—Private employment agencies:	
Cities—First, first and one-half and second class	$14,000 00
Cities third and fourth class	2,450 00
All other cities and towns	450 00
Fines:	
Violation of Eight Hour Law	200 00
Sale—Ford car	100 00
Court refund	21 00
Total	$17,221 00
Total income	$162,896 92
EXPENDITURES:	
Administrative and executive	$22,396 93
Enforcement of labor laws	53,962 56
Free public employment	89,843 09
Special surveys	703 19
Total expenditures	$166,905 77
Excess expenditures over income	$4,008 85

PART I.

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INTRODUCTION.

The Bureau of Labor Statistics is the oldest governmental body in the state charged with the administration and enforcement of laws pertaining to the promotion of social well-being. It was created in 1883, thirty-nine years ago, during the state's thirty-fourth fiscal year. The bureau came into existence in response to a widespread demand for a governmental body to enforce the humane and progressive laws of the state and to collect needed statistical information. The functions delegated to the Bureau of Labor Statistics by the organic law which created it, reveal the multitudinous needs for information then felt by the state legislators. Sections 3 and 4 of the act creating the bureau provide:

SEC. 3. The duties of the commissioner shall be to collect, assort, systematize, and present, in biennial reports to the legislature, statistical details, relating to all departments of labor in the state, such as the hours and wages of labor, cost of living, amount of labor required, estimated number of persons depending on daily labor for their support, the probable chances of all being employed, the operation of labor-saving machinery in its relation to hand labor, etc. Said statistics may be classified as follows:

First—In agriculture.

Second—In mechanical and manufacturing industries.

Third—In mining.

Fourth—In transportation on land and water.

Fifth—In clerical and all other skilled and unskilled labor not above enumerated.

Sixth—The amount of cash capital invested in lands, buildings, machinery, material, and means of production and distribution generally.

Seventh—The number, age, sex, and condition of persons employed; the nature of their employment; the extent to which the apprenticeship system prevails in the various skilled industries; the number of hours of labor per day; the average length of time employed per annum, and the net wages received in each of the industries and employments enumerated.

Eighth—The number and condition of the unemployed, their age, sex, and nationality, together with the cause of their idleness.

Ninth—The sanitary condition of lands, workshops, dwellings; the number and size of rooms occupied by the poor, etc., the cost of rent, fuel, food, clothing, and water in each locality of the state; also the extent to which labor-saving processes are employed to the displacement of hand labor.

Tenth—The number and condition of the Chinese in the state; their social and sanitary habits; number of married and of single; the number employed, and the nature of their employment; the average wages per day at each employment, and the gross amount yearly; the amounts expended by them in rent, food, and clothing, and in what proportion such amounts are expended for foreign and home productions, respectively; to what extent their employment comes in competition with the white industrial classes of the state.

Eleventh—The number, condition and nature of the employment of the inmates of the state prisons, county jails, and reformatory institutions, and to what extent their employment comes in competition with the labor of mechanics, artisans and laborers outside of these institutions.

Twelfth—All such other information in relation to labor as the commissioner may deem essential to further the object sought to be obtained by this statute, together with such strictures on the condition of labor and the probable future of the same as he may deem good and salutary to insert in his biennial reports.

SEC. 4. It shall be the duty of all officers of state departments, and the assessors of the various counties of the state, to furnish, upon the written request of the commissioner, all the information in their power necessary to assist in carrying out the objects of this act; and all printing required by the bureau in the discharge of its duty shall be performed by the state printing department, and at least three thousand (3,000) copies of the printed report shall be furnished the commissioner for free distribution to the public.

At no time during its existence has the bureau been able to comply in all details with the provisions of the law creating it. A much larger staff of assistants would be needed by the commissioner than he ever had in order to "collect, assort and systematize" all the information enumerated in the law. The industrial development of the state since the inception of the Bureau of Labor Statistics has necessitated the successive enactment of protective labor legislation, thereby enlarging the scope of the bureau's activities.

The Bureau of Labor Statistics has been continually hampered and harassed in the performance of its functions by the lack of sufficient appropriations. But in spite of this, it is proud of its achievements. Within the means afforded us by the legislature, the bureau has performed real and indispensable service to the people of the state, especially to the employers and wage earners of the state. This, the twentieth biennial report of the bureau covering the fiscal years ended June 30, 1921, and 1922, describes the work of the bureau during the last two years. In addition, it also embodies statistical information on subjects of general interest and importance.

SUMMARY OF FACTS.

The following is a brief summary of the outstanding facts contained in this report:

Payment of Wages.

1. During the two fiscal years covered by this report, 22,718 wage claims were filed with the bureau. Of these, the bureau collected 10,538 wage claims or 46.4 per cent of the total claims filed (Table 3).

2. During the same two years the bureau collected $450,164 in wages from delinquent employers. In fact, for every dollar in wage claims collected by the bureau in 1913, it collected six dollars and twenty-five cents in 1922 (Table 3).

3. It is estimated that, in addition to the wages collected, the bureau saves the workers of the state in legal fees on the average of from $55,000 to $85,000 annually.

Wages of Alaska Cannery Hands.

Owing to the bureau's supervision over the paying of the Alaska salmon cannery hands, the net average earnings of these workers have steadily risen from their former low level (Table 6).

Misrepresentations by Employment Agencies.

During the fiscal period covered by this report, the bureau has investigated 1352 misrepresentation cases. As a result of these investigations, $5,096.71 were returned by private employment agencies to applicants for employment (Table 8).

The Eight Hour Law.

Eight hundred seventy complaints against violations of the eight hour law were investigated by the bureau in 1920-1921 and in 1921-1922. The largest number of violations against this law takes place in restaurants. Hotels, apartment houses and boarding houses are next highest in the rank of industries against which complaints were filed with the bureau (Table 9).

Child Labor.

1. During the school year of 1921-1922, 2395 working permits were issued to children under 16 years of age. Of this number, 1423, or 59 per cent, were issued to children between 14 and 15 years of age. The remaining permits were issued to children between 15 and 16 years of age. In 1920-1921, only 1203 permits were issued, which is 99 per cent less than in 1921-1922.

2. In 1910 there were in California 11,251 gainfully employed children. In 1920 this number declined to 9057, a decrease of 2194, or 19.5 per cent (Table 10).

Other Labor Law Violations.

Among the other labor laws enforced by the bureau are:

1. The licensing of private employment agencies.
2. The semi-monthly pay day.
3. The weekly day of rest.
4. Advertising for help without mentioning strike conditions where such conditions exist.
5. Seats for female employees.
6. Discharging men for joining union.
7. The eight hour law on public works and underground work.
8. The medical cabinet law.
9. The pay check law, etc., etc.

Inspections.

Owing to lack of adequate appropriations, the bureau's factory inspection activities have not been adequate. There are in the State of California approximately 12,000 industrial establishments. During the two fiscal years ending June 30, 1922, the bureau has made 2267 inspections of factories and of mercantile establishments. During the two fiscal years covered by this report, only seven establishments have been visited twice by the bureau's lone factory inspector, and, of course, the largest number of establishments were not visted at all.

Prosecutions.

During the two fiscal years ending June 30, 1922, the bureau started eighty prosecutions against labor law violations. Of these eighty prosecutions, 51 convictions were secured. In other words, 63.7 per cent of those prosecuted were convicted (Table 14).

Private Employment Agencies.

1. In the year 1920-1921, 192 employment agencies, for which information was secured, collected, in round numbers a total of $1,024,632 in fees, an average of $5,337 per agency. In 1921-1922, the total collected was, in round numbers, $1,026,177 by 184 agencies, an average of $5,577 per agency (Table 17).

2. Of the total fees collected in 1921-1922, $656,669.35 or 64 per cent was collected from male applicants for employment, while $369,507.59 or 36 per cent, was collected from female applicants (Table 18).

3. Forty-three commercial employment agencies collected during the year 1921-1922, $295,268.71 from successful applicants for employment. Of this sum the female applicants contributed $167,679.81 or 57 per cent of the total; while the male applicants contributed the remainder of $127,588.90 or 43 per cent of the total (Table 18).

4. The average amount of money collected in fees by each of the 43 commercial agencies in 1922 was $6,866.71 (Table 17).

5. The average amount of money collected in fees by teachers' agencies was higher in 1921-1922 than for any other class of agency. Teachers

agencies constituted 5.4 per cent of all agencies for which information was tabulated for 1921-1922, but these agencies collected 11.5 per cent of the total amount of fees collected (Table 17).

6. Commercial agencies were 23.4 per cent of all agencies for which information was tabulated for the year 1921-1922, but these agencies collected 28.8 per cent of the total amount of fees collected by all agencies. In other words, the commercial agencies in 1922 may be said to have collected 5.4 per cent of the total fees more than is their proportionate quota (Table 17).

7. Hotel agencies were 6.0 per cent of all agencies for which information was tabulated for 1921-1922, but these agencies collected 11.6 per cent of the total fees collected by all the agencies (Table 17).

8. Next to teachers' agencies, hotel agencies averaged the highest annual collections in 1921-1922. The average amount of fees collected per hotel agency in 1921-1922 was $10,857.71 (Table 17).

9. About 67 per cent of all commercial agencies charge fees ranging between 25 to 50 per cent of the applicant's first month's salary, the percentages charged varying with the rapidity with which the fees are paid (Table 21).

10. Teachers' agencies generally charge 5 per cent of the applicant's first year's salary. Some charge 7 per cent of the first year's salary.

11. Hotel and domestic and oriental agencies generally charge 10 per cent of the applicant's first month's salary. When board and room is not included in these salaries, these agencies sometimes charge only 8 or 9 per cent of the applicant's first month's salary.

12. Most private employment agencies, commercial agencies included, have been reporting casual jobs together with temporary and permanent jobs. Thus, if five supposedly permanent positions were sold during the day at $30 each, aggregating $150 in fees and another five supposedly temporary positions were sold the same day at $4 each, aggregating $20 in fees, the commercial employment agency reported to the bureau the total of 10 positions sold for $170, making an average of only $17 per position.

13. Some of the agencies have been reporting one job two or more times. Thus, if a fee of $30 has been paid in three equal installments of $10 each, three jobs have been reported at $10 each, thereby reducing the average fee per job.

14. Owing to the manner in which employment agencies have been hitherto reporting their business to the bureau, it is impossible to quote accurate average fees per positions and all average fees quoted must be carefully defined.

15. The average fees quoted in this report for all classes of agencies are based upon both *temporary* and *permanent* positions and are consequently considerably lower than would be averages for permanent positions only. Conversely, these average fees are higher than would be the averages for *temporary* positions only.

16. In 1914, there were 355 licenses issued to private employment offices. With the introduction of the public employment offices in 1915, the number of private offices kept steadily declining until it reached the number of 184 in 1919. But since 1920, the number of licenses issued to private employment offices has been on the increase and in 1922, 240 licenses have been issued to private employment offices (Table 15).

17. The average fees per job charged by general labor employment agencies in 1922 was $2.31 for male applicants and $3.45 for female applicants (Table 18).

18. During the months of relative slack, as in January, February, March, April, November and December, the fees charged by private employment agencies are higher than in summer months when jobs are more plentiful. This means that the harder it is to get the jobs, the more does the job cost (Table 19).

19. The fees charged by oriental labor agencies exceed those charged by general labor agencies.

20. In 1920-1921, nine theatrical agencies for which information was tabulated, collected $127,367.85 in fees. In 1921-1922, ten theatrical agencies for which information was tabulated collected $96,802.88 in fees. During the two years these agencies collected $224,170.73.

Free Public Employment Offices.

1. During the biennial fiscal period covered by this report, the free public employment bureaus have furnished 345,410 jobs to 146,054 wage earners applying for work, or an average of 2.36 jobs per individual.

2. Of the total number of the 345,410 jobs furnished, 61,039 or 17.7 per cent were jobs furnished to women workers.

3. The several permanent offices of the free public employment system ranked as follows in order of the greatest number of jobs they furnished applicants during the year 1921-1922:

First—Los Angeles.
Second—San Francisco.
Third—Oakland.
Fourth—Fresno.
Fifth—San Jose.
Sixth—Sacramento.
Seventh—Stockton.

4. Conservatively estimated, the free public employment system has saved to the workers of the state, $439,880 during the two fiscal years ending June 30, 1922, an average of $219,940 per year.

California Industries.

1. The State of California is rapidly gaining a foremost place among the great industrial states of the Union. In 1869, California ranked sixteenth among the states as regards the gross value of its manufactured products. In 1909, California advanced to the eleventh place, and, in 1919, to the eighth place.

2. The total value of California's manufactured products in 1919, according to the United States census, was $1,981,204,701, an amount which was exceeded only by the states of New York, Pennsylvania, Illinois, Ohio, Massachusetts, New Jersey and Michigan, in order named.

3. During the last twenty years, the population of California increased from 1,485,053 in 1910 to 3,426,861 in 1920. This represents an increase of 131 per cent. During approximately the same period the wage earning population increased 216 per cent (Table 24).

4. The proportion of female persons to the total number of persons engaged in manufactures has steadily increased from 12.5 in 1909 to 14.2 per cent in 1914, and to 16.1 per cent in 1919 (Table 25).

5. More than one-half (54.3 per cent) of all manufacturing establishments employed between 1 to 5 wage earners. However, more than one-fourth (25.7 per cent) of all wage earners were employed in establishments employing over 1,000 employees (Table 26).

6. The following industries, in order named, rank highest according to the number of wage earners employed.

First—The canning and preserving of fruits and vegetables.

Second—Lumber and timber products.

Third—Cars and general construction and repairs by steam railroad companies.

Fourth—Foundry and machine shop products.

Fifth—Lumber, planing-mill products, not including planing mills connected with sawmills.

Sixth—Automobile repairing, etc.

Earnings of California Wage Earners.

That the earnings of California wage earners in 1921 were greater than in 1918 is evidenced by the following facts:

1. In 1918 the percentage of wage earners whose weekly earnings were less than $16 was 20.1. In 1921 the percentage of wage earners whose weekly earnings were less than $16 was 11.7 (Table 31).

2. In 1918, 29.3 per cent of the wage earners earned $30 per week or more, while in 1921, 34 per cent of the wage earners earned $30 per week or more (Table 31).

3. It is significant to note that among females 18 years of age and over there has been an especially marked increase in weekly earnings, viz: In 1918, 77.1 per cent of females 18 years of age and over earned less than $16, while in 1921, only 28.2 per cent of the females 18 years of age and over earned less than $16 per week.

4. Again, in 1918, only 22.9 per cent of females 18 years of age and over earned more than $16 or more per week, while in 1921, 71.8 per cent of the females 18 years of age and over earned $16 or more per week (Table 32).

5. Another significant fact shown by the wage statistics contained in this report is that the weekly earnings of male workers 18 years of age and over have, up to a certain point, remained practically the same in 1921 as in 1918. Thus, in 1918 as well as in 1921 the same percentages of male workers 18 years of age and over earned less than $16 and less than $18 per week. Female workers of the same age group and in the same earnings groups, it was shown above, earned considerably more in 1921 than in 1918 (Table 32).

6. These and similar facts submitted in this report, point to the effectiveness of the minimum wage law for women and argue for its continuance.

RECOMMENDATIONS.

The following recommendations relating to changes in existing labor laws are offered with the hope and expectation that they will receive serious consideration at the hands of the legislature. Years—nay decades—of experience with the administration and enforcement of the labor laws of the State of California prompt the recommendations herewith submitted. The enactment of better labor laws will put California even farther ahead in the ranks of the progressive and humane states fo the Union.

Payment of Wages.

In order that our laws pertaining to payment of wages might be more effectively administered and enforced, these laws should be amended as follows:

1. Sheriffs should be required to notify the Labor Commissioner when attaching a place where employees have been working. The law now provides that claims for wages should have priority rights in cases of attachments, but no one is compelled to serve notice on the workers when an attachment is made.

2. The Small Claims Court Law, as it was passed at the 1921 legislature, provides that only cases involving not more than $50 may be tried before justices of the peace. An amendment to this law is needed to permit wage claims of $150 or less to be presented to the small claims courts. The law should be further amended as to permit the Labor Commissioner and his deputies to appear in behalf of the plaintiffs and to present evidence. Such amendments to the law would considerably facilitate the bureau's efforts to collect wages from delinquent employers.

3. Another amendment to the Wage Law (Stats. 1919, Ch. 202) which would redound to the interests of workers deprived of their legitimate earnings would be to permit the Labor Commissioner to file civil suits in behalf of claims for wages, without the payment of the customary filing fees.

4. Under the existing Wage Collection Law (Stats. 1919, Ch. 228), the bureau has been taking assignments of wage claims from workers filing complaints with the bureau against nonpayment of wages. This report shows that the bureau has now on hand in its cash trust receipts fund wage claims to the amount of $7,024.47, which it is unable to distribute to the rightful wage claimants. This condition arises as a result of the inability on the part of the bureau to locate the claimants whose wages had been collected. In most cases, the accumulation of this sum of undistributed wage claims is due to the failure on the part of wage claimants to notify the bureau of the change of their addresses. After a reasonable time had elapsed from the date of the collection of the undistributed wage claims collected by the bureau, the amounts involved should be turned over to the state treasury. Appropriate legislation should be passed to provide for the transfer into the state treasury of the $7,02447. of undistributed wage claims, as well as of other such moneys. This law should, of course, also provide that the undistributed wage claims turned over to the state treasury should be subject to the call of the bureau in behalf of the wage claimants involved.

5. The establishment of a branch office of the bureau in the city of Oakland would, as explained below, also facilitate the administration and enforcement of the wage laws as well as of other laws.

Private Employment Agencies.

Although our present law governing employment agencies affords considerable protection against unscrupulous employment agencies, a great deal more can be accomplished to protect jobless workers. As the law now reads it prohibits, among other things, misrepresentations by employment agents. The law should be so amended as to require employment agencies truthfully to inform applicants for employment, when they are referred to positions, as to existing conditions of employment, such as living and sanitary conditions. Too many men are sent to work to labor camps outside of this state and to other places of employment which are not fit to work in from the standpoint of living conditions and general sanitation.

The employment agencies act should also be amended to curtail the present exorbitant fees charged by most employment agencies. The fees charged by private commercial agencies are especially high and are a heavy burden upon a large class of office workers seeking employment. A number of other states, as shown in this report, have already recognized the need of regulating the fees of employment agencies through legislative action.

It is further recommended that the employment agencies act should be so amended as to make it obligatory upon all voluntary associations and organizations furnishing employment opportunities to register with the Bureau of Labor Statistics. Such voluntary organizations should also be required to furnish reports of their business to the bureau upon the request of the Commissioner of the Bureau of Labor Statistics.

Misrepresentations of Conditions of Employment.

Not only should employment agencies be obliged to give truthful and complete information concerning places of employment, but employers, or their agents, should also be required to furnish to prospective employes complete information concerning sanitary and living conditions under which they will be required to work. In order to accomplish this end, the act "to prevent misrepresentations of conditions of employment" (Stats. 1915, p. 52) should be so amended as to make it obligatory upon employers, or their agents, to furnish truthful information concerning conditions of employment. As this act now reads, it merely enjoins employers from misrepresenting conditions of employment but it does not require that they state actual existing conditions of employment.

The Free State Public Employment Offices.

That the state free public employment system has been rendering invaluable services to the people of the state will be seen from the account of its performances contained in this report. These services, however, could be further improved and extended if it were financially possible for the bureau to establish offices in the cities of Long Beach, San Diego, and El Centro. Although the commissioner is authorized under the law

to establish employment offices wherever he deems it necessary, inadequate appropriations have made it impossible for him to establish employment offices in the cities mentioned. The industrial and agricultural interests of the employers and of the workers in these communities could be served best by affording them the benefits of permanent public employment offices.

It is also felt by the bureau that the usefulness of the free public employment system would be further enlarged if its administration could receive the active and sustained cooperation of public spirited citizens. In order to achieve this end, it is recommended that the law provide for the creation of an advisory council to cooperate with the Commissioner of the Bureau of Labor Statistics in the administration of the free public employment system. This advisory council should consist of representatives of employers, organized labor, and of representatives of the public at large. The creation of such a council would no doubt redound to the best interests of all concerned in the administration of the free public employment system.

The Child Labor Law.

The following section of the Child Labor Law (Stats. 1919, p. 415) is ambiguous and the wording of it should be so changed as to make its intent clearer:

SEC. 5. * * * Nor shall anything in this act be construed to prohibit any minor between the ages of fifteen and eighteen years, who is by any statute or statutes of the State of California, now or hereafter in force, permitted to be employed as an actor, or actress, or performer in a theater, or other place of amusement, previous to the hour of ten o'clock p. m., in the presentation of a performance, play or drama, continuing from an earlier hour till after the hour of ten o'clock p. m., from performing his or her part in presentation as such employee between the hours of ten and twelve o'clock p. m.; provided, the written consent of the Commissioner of the Bureau of Labor Statistics is first obtained * * *.

It appears from this section that certain minors may be hired previous to the hour of ten o'clock p. m. to perform between the hours of ten and twelve o'clock p. m., if the performance had been commenced before ten o'clock p. m. While this appears to be the intent of the law, this intent is not quite clear owing to the somewhat involved terminology employed.

The Child Labor Law, as it now stands, delegates to the Commissioner of Labor the duties of issuing permits to minors to perform in theatres. The law authorizes "the employment of any minor, whether resident or nonresident, in the presentation of a drama, play, performance, concert or entertainment, with the written consent of the Commissioner of the Bureau of Labor Statistics." And the law further states that "no such consent shall be given unless the officer giving it is satisfied that the environment in which the drama, play, performance, concert or entertainment is to be produced is a proper environment for the minor, and that the conditions of such employment are not detrimental to the health of such minor, and the minor's education will not be neglected or hampered by its participation in such drama, play, performance, concert or entertainment, and the commissioner may require the person charged with the issuance of age and schooling certificates to make the necessary investigation into such conditions." This provision of the Child Labor Law has not operated to the satisfaction of the bureau. It appears that the school authorities rather than the commissioner should be empowered

to issue permits to minors whose parents wish them to perform in theatres. The bureau does not itself have the facilities of investigating the minor's educational and physical fitness to perform in amusement places. Neither is it practicable that the bureau should refer every application for a permit to the school authorities. Since the school authorities are better situated as to judge the status of minor's education or the status of his health, the school authorities should issue these permits. The law should therefore be so amended as to transfer to the school authorities the duties and responsibilities of issuing permits to minors to perform in places of amusement. In fact, this is the only class of permits which is at the present time not administered by the school authorities.

The Eight Hour Law.

The law limiting the hours of women to eight in one day (Stats. 1919, p. 394) does not prohibit the employment of women at their homes for any number of hours, because homes are not considered establishments under the law. An amendment is therefore needed to the law to include all places of employment within the meaning of an establishment. This would prevent the exploitation of women at their homes after they had already worked eight hours in regular factory establishments.

Alaska Salmon Canneries.

The method of recruiting men to work in Alaska salmon canneries, as described in the fifteenth biennial report of the bureau, does not appear to have undergone any appreciable changes since 1912. It is therefore worth while at this time to reproduce the bureau's description of the Chinese labor contracting system as published in its fifteenth biennial report. With some slight improvements the following description still appears to represent actual conditions.

These men (the Alaska cannery hands) are hired in San Francisco during the months of March and April and are shipped north to work in the salmon canneries, located on the coast of Alaska. They are returned during the months of August and September and are paid off in San Francisco for the full season's work. At the time these men are paid off the real trouble begins. Innumerable disputes arise on account of the deductions that are made for various items—principally for gambling debts, liquor and food. In order to fully realize the situation, it will be necessary to explain the methods resorted to in the hiring of men to work in these canneries. As a rule, the company owning or operating the cannery enters into a contract with a Chinese contractor, whereby the Chinese contractor agrees to furnish all the help necessary to clean, pack, cook, label and box all the salmon delivered to him at a certain cannery. The company agrees to pay the Chinese contractor a certain amount for each case of salmon packed and guarantees a minimum number of cases. If no salmon is packed—by reason of the failure to deliver the fish at the cannery, which may arise when the salmon are not running—the Chinese contractor receives his contract price. The Chinese contractor guarantees to deliver a certain number of men—necessary to operate the cannery—and is penalized in the sum of $250 for each man he is short on the day of the sailing of the company's ships. As soon as the Chinese contractor signs up with the company, he sublets his contract to several other subcontractors, consisting chiefly of Japanese, Filipinos, Porto Ricans and Mexicans. These subcontractors go among their own people and hire them for the season at a fixed sum, usually from $160 to $180. This sum is, as a rule, the full amount that the Chinse contractor has allowed the subcontractor, but the subcontractor figures to make his money from the privileges of running the "slop chest"—which is the term applied to the store—and from the gambling. In addition the subcontractor draws his wages, and it is the general practice for a subcontractor to work along with his men at the cannery. The Chinese contractor advances $40 for each man to the subcontractor. The subcontractor

turns this amount over to his men, but not directly. Usually he permits them to go to some store which he selects—where they can purchase clothes—and he often pays their room and board up to the time of sailing, for it must be understood that the hiring of men goes on for months before the ship sails. When the men are on board the ship, whatever is left of the $40 advance money, after the above deductions have been made, is paid to them. A rather interesting deduction is the one of $2.50 to $5 per man for the services of detectives and watchmen, who are employed by the subcontractor to see that the men do not get away before the ship sails. Here we have the unique position of a man being obliged to pay for the privilege of being watched so that he can not run away. The Chinese contractor furnishes the food on the voyage to and from and during the time the men are at the cannery. This food consists of the regular Chinese fare, namely, rice, kelp, tea and sometimes beans, except that at the cannery, fish is often given to the men.

It is urged that some action be taken by the legislature to remedy the abuses to which the thousands of Alaska cannery hands are annually subjected. There appears to be no just and valid reason for the existence and the continuance of this antiquated Chinese contracting system.

Schemes to Defraud Labor.

The attention of this bureau is frequently called to various schemes for defrauding labor. There are still among us parasites who would rather live by the misfortunes of others than perform useful work themselves. The large groups of persons coming to California from other states seem to furnish the culture upon which these parasites seek to grow fat, much to the detriment of the fair name of our state.

One of the methods of defrauding labor which appears to have become a favorite is to organize a so-called cooperative enterprise. An advertisement is inserted in the newspapers which purports to offer a well paying and steady job to some chosen few who would immediately take advantage of the opportunity to invest money as partners in a "cooperative" enterprise, usually some cafeteria. Ordinarily, the advertisers accomplish their nefarious aims by interesting a group of individuals to make substantial investments in what appears to them to be in return for a share in a promising business and for a steady well paying job. The contract drawn up between the unaware investor and the advertisers says nothing about the well paying job, which remains a verbal agreement. After the victim has worked a few weeks on his "steady" job, he is refused his weekly wages and is forced out by another victim who has become a member in the cooperative. The maltreated and deceived individual soon finds that he has not only lost his steady job and his wages but that he has also lost his savings invested in the cooperative.

One of such frauds which was of considerable magnitude came to the attention of the Los Angeles office of the bureau. After considerable trouble and litigation, the bureau finally succeeded in getting for the defrauded persons eighty cents on every dollar of their money invested. This was accomplished, because Mr. Leighton, of the Leighton cafeterias, came to the rescue and bought the property of the so-called cooperative which was compelled to liquidate its business.

In New York state there is a law which regulates the conduct of cooperatives along genuinely cooperative lines. A similar law is needed in California. It would be of immense value to the promotion of honestly conducted cooperative enterprises and would serve as a check against the fraudulent abuses of the term "cooperative."

Another case of fraud which has recently come to the attention of the bureau relates to the operation of a "moving picture school." The desire to become "movie stars" which is a recognized weakness among many girls have been taken advantage of by this fraudulent concern. This school advertised for girls to teach them the art of acting in the movies, promising to furnish them jobs in photo-producing establishments. The girls replying to the advertisement were first made to pay a tuition fee of fifteen dollars. They were then given a few perfunctory lessons in posing for moving picture cameras and were sent home to wait for the next opening with a photo-producing establishment. These opportunities never came and the girls were thus cheated out of their money.

The abuses practiced by schools do not stop with moving picture schools. The following is another instance of fraud perpetrated by a so-called school. Here, again, the newspaper advertising columns were used to attract the victims. The following is the advertisement referred to:

> WANTED—Ladies for needlework and tinting at home, make $10 to $20 weekly. Apply 123 W. 4th St., bet. 10 and 2.

The ladies applying are induced to pay a tuition fee for which they are promised to be taught a trade which would enable them to find work in any of the garment factories in the city. After having paid a tuition fee of ten dollars and another five dollars for materials worth much less, the learners are amiably referred to all of the garment shops in the city. They soon learn that their needle art is of no use to these factories. These types of schools not only succeed in getting money under false pretenses but they also succeed in getting work done freely by women learners.

It is the belief of this bureau that the malpractices and misrepresentations of the so-called art schools could be considerably reduced by requiring that trade and art schools secure licenses from the State Board of Education. It should devolve upon the school authorities to sift the bona fide schools from the fraudulent undertakings and to eliminate the latter.

Mechanic's Liens.

Another matter relating to the security of the earnings of labor deserves serious consideration. There exists urgent need for the extension of our lien laws to include additional subjects. Our present mechanics' lien laws are practically of no value to farm labor. The following are several of the numerous instances of abuses of farm workers which frequently come to the attention of the bureau.

In one case the landowner had his land leveled and scraped by a contractor who employed the complainant. When the work was completed, the landowner gave the contractor a check for the amount due out of which he was supposed to pay the complainant. The contractor put the check through the bank and gave other checks of his own on the strength of this check. For some unexplained reason, the landowner canceled payment on the original check with the result that the contractor's check came back marked, "No funds." The complainant, together with the other person, who accepted the contractor's checks

swore to the warrants against him. But, in the meantime, the contractor had fled from town for parts unknown rather than face felony charges. The complainant was left unpaid for his labor, while the landowner was unjustly enriched to the extent of the labor done in leveling his land, which work he obtained practically for nothing. When the matter was taken up by the bureau with the landowner, he flatly refused to pay the complainant who had a clear moral right but no legal right that he could enforce in the courts.

In another case, a man in San Francisco employed an irresponsible hay baler on his ranch at Manteca. The contractor drew money in advance and spent it lavishly and then left his laborers unpaid. The landowner refused to do anything to help the laborers who were left in distress.

Still another case. A landowner at Fresno paid a Mexican contractor about $1,600. The contractor soon disappeared, leaving about twenty of his Mexican laborers stranded and with large families to support. A felony warrant was procured against the contractor and the landowner was sued but the case was thrown out of court on demurrer. The county of Fresno was subsequently obliged to support the families of these men for a long period, as their earnings for the summer were gone.

Similar cases, almost without end might be cited which show the existing need of extending the mechanic's lien laws to protect farm labor. A lien should be allowed for such improvements as the plowing of the land, the filling of a vacant lot or the construction of a sidewalk on the street in the front of a lot, etc. The Minnesota legislature, apropos, has in 1921, amended its mechanics' lien laws by making the clearing and first breaking of land subject property to a lien.

Other Laws.

Among the other labor laws which should be amended are the elevator seat law, the drug clerk act, the election law and the act providing for one day's rest in seven.

The law (Stats. 1921, p. 106) provides that "all elevators used for the carriage of passengers shall be provided with a suitable seat for the operator in charge of same." This law, however, does not provide that the seat should be so situated as to enable the operator to be seated while operating the elevator.

A recent court decision (*In re Twig*, 204 Pacific, p. 1082) practically vitiates the intent of the law (Stats. 1921, p. 1323) regulating the hours of employees engaged in selling, at retail, drugs and medicines, and compounding physicians' prescriptions. According to the decision referred to, drug clerks may be employed any number of hours, provided they are not employed more than nine hours in any one day in the actual compounding of prescriptions. Such interpretation of the law is inimical to the interests of public health. The interests of the public require that the hours of labor of drug clerks compounding prescriptions should be limited, in order to insure accurate and painstaking attention on the part of drug clerks when preparing medicines.

Section 1212 of the Political Code provides that employees entitled to vote may absent themselves from their places of employment for two hours on general election days and that no deductions from wages and

salaries may be made for such absences. This law, however, has no teeth in it in that it provides for no penalties upon employers who deprive their employees of their opportunities to exercise their rights of citizenship. The bureau's attention has been called to cases where employers have discharged employees for absenting themselves from work for two hours on general election days. It is urgently recommended that this section of the Political Code be so amended as to prescribe a penalty for offending employers.

The act providing for one day's rest in seven (Stats. 1893, p. 54) states that "every person employed in any occupation of labor shall be entitled to one day's rest therefrom in seven." This act is often obviated by requiring employees to work the seventh day "voluntarily." This condition should be remedied by amending the law so as to enjoin employers from encouraging and permitting their employees to work more than six days in any one week.

The Enforcement of Labor Laws.

With the Commissioner of the Bureau of Labor Statistics is vested the "authority and power to enforce any and all labor laws of the State of California, the enforcement of which is not specifically vested in any other officer, board or commission" (Stats. 1915, p. 814). The laws which come most frequently to the attention of the commissioner and his deputies, that is, the laws which most frequently require the exercise of the bureau's power of enforcement are, in order of their importance, the following:

1. The laws relating to payment of wages.
2. The laws relating to the regulation of employment agencies.
3. The eight hour law for women.
4. The child labor law.
5. The laws relating to sanitation and ventilation in workshops and factories.
6. The weekly day of rest law.

In addition to the laws just enumerated, other miscellaneous labor laws, as will be seen by the following, often require the exercise of the bureau's enforcement power.

Complaints Against Labor Law Violations.

All complaints against alleged labor law violations received at the several district offices of the bureau, either through interested persons or through the efforts of the bureau's agents and deputies, are investigated, numbered, disposition noted and filed.

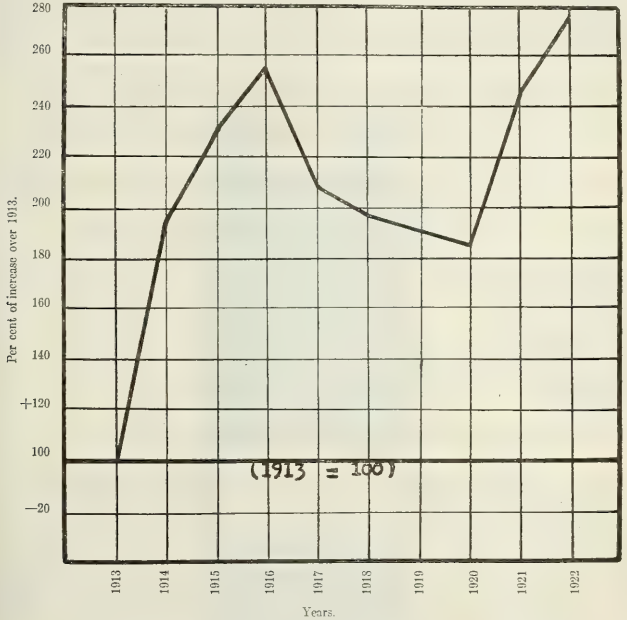
Table 1, following, shows the number of complaints against alleged violations of laws filed with and investigated by the Bureau of Labor Statistics during the ten fiscal years ended June 30, 1922:

TABLE 1—Total Number of Complaints Against Alleged Violations of Labor Laws Filed with the Bureau and Investigated, from 1913 to 1922, by Single Years.

Fiscal year ended June 30	Number of complaints	Increase or decrease (—) over preceding year		
		Number	Per cent	Relative (1913=100)
1913	4,957			100
1914	9,621	4,664	94 1	194
1915	11,448	1,827	19 0	231
1916	12,366	918	8 0	249
1917	10,385	—1,981	—16 0	209
1918	9,791	—594	—5 7	197
1919	9,511	—280	—2 9	192
1920	9,198	—313	—3 3	186
1921	12,047	2,849	31 0	243
1922	13,823	1,776	14 7	279

It will be observed that the number of complaints against alleged violations of labor laws has been increasing year by year from 1914 to 1916, inclusive. Thus, in 1916, the number of complaints against labor law violations was about two and one-half times as great as was the number in 1913. No doubt the fact that 1914 and 1915 were years of industrial depression had considerable to do with the increase in the number of complaints against law violations. Both the occurrence and the reporting of labor law violations are more likely to happen in a year of industrial depression than in a year of industrial prosperity. It appears reasonable to suppose that during periods of unemployment, falling prices and business failures there are likely to be more frequent law violations, such as nonpayment of wages, misrepresentation by employment agencies, the eight hour law for women, etc. On the other hand, in periods of industrial prosperity, such as we have witnessed during the years of 1918, 1919 and part of 1920, violations of labor laws and complaints relating to them occurred less frequently. As shown in Table 1, the number of complaints against violations of labor laws has gradually declined during the four relatively prosperous years of 1917 to 1920, inclusive. In 1921, the number of complaints has again jumped almost to the 1916 figure. In 1922 the number of complaints filed with, and investigated by the bureau was, by about 15 per cent, greater than in 1921. In the accompanying diagram (Diagram 1), are graphically presented the figures shown in the preceding table.

DIAGRAM 1—Relative Increase of Complaints Against Alleged Violations of Labor Laws Filed with the Bureau and Investigated from 1913 to 1922, Each Year Compared With 1913.



In this diagram, the year 1913 is taken as the basis of comparison and all succeeding years are shown in relation thereto. It will be noticed that although the curve fluctuates considerably, it does not fall below the 1913 base line and reaches a maximum percentage increase of 179 over the base year of 1913.

Distribution of Complaints Against Labor Law Violations.

In the preceding section were shown the total number of complaints filed against all alleged violations of labor laws for a period of ten years. The table and diagram following (Table 2 and Diagram 2), show the nature of complaints investigated by the bureau:

TABLE 2—Total Number and Per Cent Distribution of Complaints Against Alleged Violations of Labor Laws Filed in All Offices of the Bureau During the Fiscal Years 1921 and 1922.

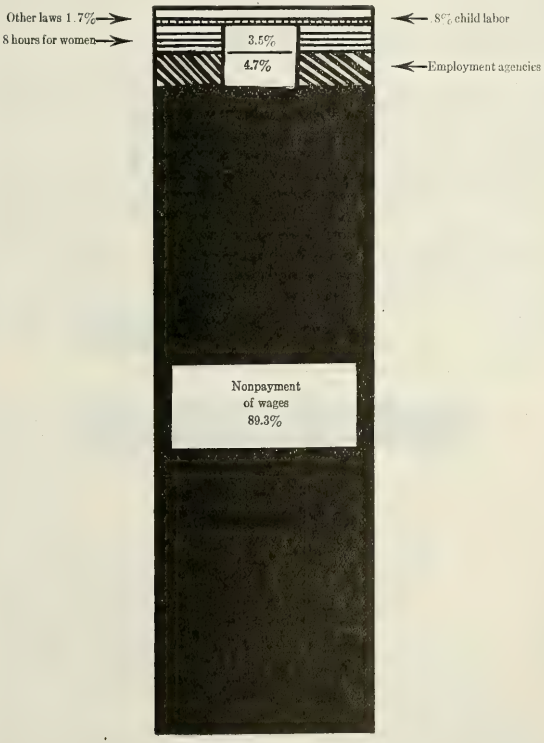
Nature of complaint	1920-1921 to 1921-1922		1920-1921		1921-1922	
	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution
Total	25,870	100 0	12,047	100 0	13,823	100 0
Nonpayment of wages	22,718	87 8	10,369	86 1	12 349	89 3
Employment agencies—license and misrepresentations by	1,434	5 5	788	6 5	646	4 7
Eight hour law for women	870	3 4	390	3 2	480	3 5
Child labor	283	1 1	166	1 4	117	0 8
Refund of transportation	193	0 7	126	1 0	67	0 5
Sanitation and ventilation	75	0 3	59	0 5	16	0 1
Semi-monthly pay day	40	0 2	26	0 2	14	0 1
Eight hour law on public work and underground work	23	0 1	2	(*)	21	0 2
Weekly day of rest	22	0 1	10	0 1	12	0 1
Miscellaneous	212	0 8	111	0 9	101	0 7

*Less than one-tenth of one per cent.

It will be seen that during the biennial fiscal period of 1920-1921 and 1921-1922, there were filed in all district offices of the bureau the sum of 25,870 various complaints against real and assumed law violations. An examination of Table 2 shows that nearly nine-tenths, (87.8 per cent) of all complaints were against nonpayment of wages. Altogether, during the two fiscal years ended June 30, 1922, there were filed with the bureau 22,718 wage claims. Of this number, 10,369 were filed during the fiscal year 1920-1921, while 12,349 wage claims were filed during the fiscal year 1921-1922.

Next to complaints against nonpayment of wages were those relating to private employment agencies. Of the 25,870 complaints filed with the bureau during the two fiscal years discussed, 1434, or 5.5 per cent of all complaints were those pertaining to misrepresentation by, and licensing of, private employment agencies. The eight hour law for women, the child labor law, refund of transportation, sanitation and ventilation laws, etc., in order mentioned, were most frequently abused.

DIAGRAM 2—Percentage Distribution of Complaints Against Alleged Violations of Labor Laws Filed With the Bureau During the Fiscal Year of 1921-1922.



Payment of Wages.

During the biennial period ending June 30, 1922, the number of complaints against nonpayment of wages received at the bureau was 22,718 as compared with 15,107 of similar complaints received during the preceding biennial period ended June 30, 1920. This represents an increase of 7611 cases, or 50 per cent, during the period covered by the present report. The reasons for this increase in the number of wage claims filed with the bureau is to be found largely in the fact that the two fiscal years ending June 30, 1922, were periods of marked industrial depression with attendant business failures and inability to meet wage bills.

The enlarged business of the bureau, as represented by the increased number of wage claims filed, has meant increased exertion on the part of the agents and unusually deep inroads into the bureau's funds. The bureau has in effect, had neither an adequate staff nor adequate funds to follow up each complaint to its final conclusion.

The amount of work involved in the collection of wage claims can only be fully appreciated by those who are in daily contact with the work performed. It seldom happens that the defendant pays the wage claim in full immediately upon the demand of the bureau. In nearly all cases complaints must be handled by our agents a large number of times. In the majority of cases the defendant is cited into the office of the bureau to show cause why he should not be compelled to pay the claimant's wages and often the defendant is later cited to appear before the district attorney.

The table next presented (Table 3) shows the activities of the bureau in connection with its work of collecting wage claims:

TABLE 3.—Number, Per Cent, and Amount of Wage Claims Collected by the Bureau During the Ten Fiscal Years, 1913-1922, by Single Years.

Fiscal year ended June 30	Number of wage claims			Amount of wages collected		
	Filed with the Bureau	Collected through the Bureau	Per cent collected of total filed	Total	Increase or (—) decrease over preceding year	
					Amount	Per cent
1913	3,573	2,213	62 0	$36,450 69		
1914	7,330	4,904	66 9	110,911 93	$74,461 24	204 3
1915	9,320	5,349	56 3	155,804 20	42,892 27	38 7
1916	10,167	5,672	55 8	179,132 22	25,328 02	16 5
1917	8,774	4,550	51 8	150,661 69	—28,470 53	—15 9
1918	8,058	4,118	51 1	120,841 20	—29,820 49	—19 8
1919	7,504	5,356	71 4	202,965 61	82,124 41	68 0
1920	7,603	5,362	70 5	206,389 72	3,424 11	1 7
1921	10,369	4,895	47 2	221,350 82	14,961 10	7 3
1922	12,349	5,643	45 7	228,813 49	7,462 67	3 4

It will be seen that the number of wage claims received by the bureau during the fiscal year 1922 was more than three times the number received in 1913, while the amount of money collected by the bureau in 1922 was over six times the amount collected in 1913. In fact, for every dollar in wage claims collected by the bureau in 1913, abour six dollars and twenty-five cents was collected in 1922.

Further examination of the figures shown in Table 3 indicates that in the year 1918, a year of almost unprecedented industrial prosperity, the

number of wage claims filed with the bureau was 8058, which was 4291 or about 53 per cent less than in 1922. This fact corroborates the observation above made to the effect that the number of labor law violations varies with industrial conditions.

It will be seen that the amount of money collected by the bureau from delinquent employers during the fiscal years 1921 and 1922 was greater than the two preceding years. However, the increase in the amount of money collected in wage claims was not in proportion to the increase in the number of claims. Thus, the number of claims has, during the last biennial fiscal period, increased 50 per cent compared with the preceding biennial fiscal period, while the amount of money collected in wage claims has increased only 10 per cent.

The difficulty involved in collecting wage claims grows out of the fact that in most cases the defendant is devoid of funds due to some unfortunate and unexpected turn in his business. There are, of course, a large number of cases in which the workers are wilfully deprived of their earnings through some fraudulent schemes of unscrupulous persons.

Diagrams 3 and 4 following show, graphically, several of the outstanding facts shown in Table 3.

DIAGRAM 3—Number of Wage Claims Filed With the Bureau and Amount of Wages Collected During the Biennial Fiscal Period 1919-1920 Compared With the Biennial Fiscal Period 1921-22.

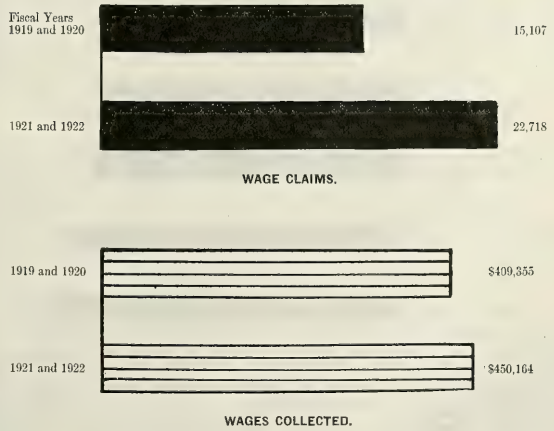
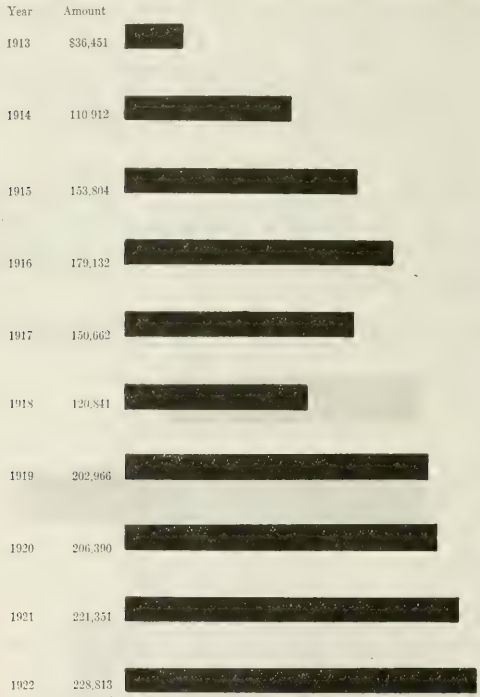


Diagram 3 shows the increase in the number of wage claims and amount of money collected during the fiscal period covered by this report compared with the preceding biennial fiscal period.

Diagram 4 clearly shows the variations in the sums of money collected each year.

DIAGRAM 4—Amount of Wage Claims Collected by the Bureau Each Fiscal Year from 1913 to 1922, Inclusive.



It will be observed that during the ten years ended June 30, 1922, the bureau collected, in round numbers, the sum of $1,611,322, or on the average of over $161,000 annually.

It is not possible to tell definitely how much money the bureau saves the workers of the state in legal fees. An estimate of these savings, however, might not be amiss here. Were it not for the existing laws pertaining to payment of wages, vesting with the Commissioner of the Bureau of Labor Statistics the power to enforce payment, most of the workers having wage claims would be compelled to resort to legal aid. In a considerable number of cases it would not pay the worker to pay lawyers' fees, since the amounts involved are too small to justify legal proceedings. But where the amounts are large enough to justify such

proceedings, the legal fees would range approximately from one-third to one-half of the wages collected. On this basis, it might be roughly estimated that the bureau has been saving the workers in legal fees on the average of from $50,000 to $80,000 annually. On the same basis, it might be further estimated that the bureau saved the wage claimants, in legal fees, from $75,000 to $100,000 during each of the fiscal years 1921 and 1922.

But the benefit derived by the employers and workers of the state from the laws pertaining to payment of wages is not to be measured only in terms of money saved them in legal fees. Our laws pertaining to the payment of wages also save the wage disputants time. The endless loss of time which would be entailed by the claimants and employers if they had to resort to legal proceedings is practically eliminated through the enforcement of the wage laws by the bureau. The bureau attempts to take immediate action on all complaints filed. The absence of technical rules of procedure at hearings before the commissioner or his deputies has been an incalculable aid in expediting matters and in bringing about relatively rapid settlements of claims. Then, too, not infrequently the several branch offices of the bureau receive written complaints against nonpayment of wages. These complaints are attended to by sending the claimant certain blanks upon which he is required to fill out his claim in detail, thus frequently obviating the necessity of the claimants' loss of time through personal appearance at the bureau's offices.

The wage collection activities of the bureau are not confined to its offices alone. Quite the contrary. In order to adjust claims of persons residing outside of the cities where the bureau maintains branch offices, its agents are daily called upon to go outside of these cities.

Causes Leading to the Presentation of Wage Claims.

In an article in the Monthly Labor Review of the United States Bureau of Labor Statistics of March, 1921*, the principal causes leading to the presentation of wage claims are aptly summarized as follows:

1. Misunderstanding of rates of pay and employment conditions.
2. Laborers allowing their accounts to run on and not insisting upon periodic payments.
3. Men leaving without giving notice or not working out the full time for which they are engaged.
4. Giving bad checks to employes.
5. Employers venturing on business projects with insufficient capital and contractors taking contracts at such a low figure that they are unable to pay their workers.
6. Objections of employer to paying wages except on regular pay days. Sometimes the intention is to defraud the laborer of his earnings, as the employer knows workers are often unable to wait in the neighborhood for their money and must move on to take other jobs.
7. Inefficiency in management, and
8. Inadequate wage payment legislation.

With the possible exception of the last mentioned cause, the causes leading to the representation of wage claims just quoted apply to California as well as to the other states reviewed in the article mentioned.

*Mary T. Waggaman; Collection of Wage Claims by State Labor Offices. Published in the U. S. Bureau of Labor Statistics, Monthly Labor Review, March, 1921, pp. 72-81.

Court Decisions Relating to our Wage Law.

At least two important court decisions, formerly not mentioned in the reports of the bureau, upholding the constitutionality of our wage law should be mentioned here. In 1915, our wage law was amended to provide that if the discharged employee is not paid immediately upon his discharge, the wages are to continue for 30 days as a penalty. Section 5 of our wage law reads as follows:

In the event that an employer shall wilfully fail to pay, without abatement or reduction, any wages or compensation of any employee who is discharged or who resigns or quits, as in section one of this act provided, then as a penalty for such nonpayment the wages or compensation of such employee shall continue from the due date thereof at the same rate until paid, or until an action therefor shall be commenced; *provided*, that in no case shall such wages continue for more than thirty days; and *provided*, further, that no such employe who secretes or absents himself to avoid payment to him, or who refuses to receive the payment when fully tendered to him, including any penalty then accrued under the provisions of this section, shall be entitled to any benefit under this act for such time as he avoids payment.

The constitutionality of this law was the issue in Moore vs. Indian Spring Channel Gold Mining Co., decided by the California District Court of Appeal in May, 1918, upholding the state law.

Moore and his assignors were employed as miners by the defendants. The employment was by one Mushrush who agreed to pay plaintiff $3.50 per day for an 8-hour day. Plaintiff worked for defendants several months until the end of August, when the mine became flooded and plaintiff was discharged. Mushrush, however, refused to pay plaintiff and his assignors (other miners) their wages for the month of August. Plaintiff brought action under a law of California (Ch. 663, acts of 1911 as amended in 1915, Bul. 186, p. 87) which provides that when discharged an employee's wages become at once due and payable, and further provides that, in case of nonpayment, the wages are to continue for 30 days as a penalty. The only issue in this case is the constitutionality of this law under the constitutions of the United States and California. In holding this law constitutional, after reviewing various authorities and decisions, the court announced the following conclusion:

"It is not to be expected that the laborer upon whose service these industries depend will give his service without assurance of receiving the reward promised for such service, and any law whose object is to give to the laborer some further assurance that he will be promptly paid for his labor, in addition to his employer's promise, would seem to be reasonable, especially as the object is to induce, if not to compel, the employer to keep faith with his employee, and imposes a penalty only when he commits a wrong which not only injures the employee but is an injury to the public in its tendency to deprive the public of an incidental benefit which comes from the employee's labor. The law imposes no unreasonable burden upon the employer, for, operating as it does in the future, and disturbing no vested right, he must, and it is but fair he should, make provision to pay his employee before hiring him, failing in which he should pay the penalty. Many enterprises require the services of large numbers of men—the numbers shifting from day to day—some being discharged and others taken on the job. It is common knowledge that a refusal to pay discharged men under such circumstances would tend to create breaches of the peace and disturb the public tranquillity. The intention of the penalty imposed by the act in question is to make it to the interest of the employer to keep faith with his employees and thus avoid injury to them and possible injury to the public at large.

We can discover no ground for holding the act to be violative of any provisions of our constitution, or that it violated the fourteenth amendment of the National Constitution."*

*U. S. Bureau of Labor Statistics, Bulletin No. 258, Decisions of Courts and Opinions Affecting Labor 1918, pp. 147-148.

The other decision worth noting is that of Manford vs. Memil Singh, District Court of Appeal, Third District of California.

In this case our law requiring the payment of wages on the termination of employment, and fixing a penalty for noncompliance, was held to be valid as against individual employers.

L. V. Manford proceeded against Memil Singh, his employer, to recover wages and penalty as provided in chapter 663, acts of 1911, amended by chapter 143, acts of 1915 (repealed and superseded by chapter 202, acts of 1919). Judgment had been in Manford's favor in the court below and Singh appealed, claiming that the statute was unconstitutional.

The question of constitutionality had been decided in favor of the law in *Moore* vs. *Indian Spring Channel Gold Mining Co.*, 174 Pac. 378 (see Bul. No. 258, p. 147). However, the defendant claimed a distinction between the power of the legislature to enact such a law to govern corporations and its power to control the acts of individuals. He conceded that the act is valid "if it can be reasonably held that the prompt payment of employee's wages is a matter that affects the public generally."

In upholding the law as accomplishing this end, the court said, in part:

"Its design is to protect the employee and to promote the welfare of the community. Without defeating that purpose, it should be construed so as to hamper as little as possible the valuable right and privilege of making contracts. But it is to be observed that the most formidable objection to the statute derives its principal force from the supposed hardships of a hypothetical case wherein the employer is without fault or the employee is guilty of culpable conduct. The statute is not subject to such reproach. It contemplates that the penalty shall be enforced against an employer who is at fault. It must be shown that he owes the debt and refuses to pay it. He is not denied any legal defense to the validity of the claim. Indeed, the fullest right to contract as to payment is but slightly restricted, and an employer can easily provide in advance for the contingencies that may arise under the statute. If he refuses to pay what is due as therein provided, it is not unjust that he should be subjected to a penalty."*

*U. S. Bureau of Labor Statistics, Bulletin No. 290, Decisions of Courts and Opinions Affecting Labor, 1919-1920, p. 294.

Occupations of Wage Claimants.

The table following (Table 4) shows the occupations of the wage claimants.

TABLE 4.—Number and per cent of wage claims filed by male and female workers during the biennial period ending June 30, 1922, by industries and principal occupations

Industries and principal occupations	Number	Per cent distribution
All industries	22,718	100 0
Agriculture, forestry and animal husbandry	3,548	15 6
Extraction of minerals	370	1 6
Manufacturing and mechanical industries	11,634	51 2
Transportation	357	1 6
Trade	1,688	7 4
Public service ((N. E. C.)	186	8
Professional service	1,604	7 1
Domestic and personal service	2,109	9 3
Clerical occupation	1,222	5 4
Agriculture, forestry and animal husbandry	3,548	100 0
Farm hands	2,747	77 4
Fruit pickers	298	8 4
Woodchoppers	181	5 1
All others	322	9 1
Extraction of minerals	370	100 0
Miners	357	96 5
All others	13	3 5
Manufacturing and mechanical industries	11,634	100 0
Cannery hands (food industries)	148	1 3
Carpenters	1,161	10 0
Cooks (food industries, fruit and vegetable canning)	719	6 2
Engineers	229	2 0
Foremen and managers	377	3 2
Laborers	4,519	38 8
Machinists	415	3 5
Painters	614	5 3
Factory hands	174	1 5
Artisans	275	2 4
All others	3,003	25 8
Transportation	357	100 0
Chauffeurs	195	54 6
All others	162	45 4
Trade	1,688	100 0
Drivers	642	38 0
Salesmen	540	32 0
Teamsters	256	15 2
All others	250	14 8
Public service	186	100 0
Professional service	1,604	100 0
Actors	417	26 0
Musicians	214	13 3
Nurses	740	46 2
All others	233	14 5
Domestic and personal service	2,109	100 0
Dishwashers	188	8 9
Waiters and waitresses	514	24 4
Housekeepers and attendants	822	39 0
All others	585	27 7
Clerical occupation	1,222	100 0
Bookkeepers	181	14 8
Clerks	456	37 3
Stenographers	324	26 5
All others	261	21 4

It will be seen from this table that over 51 per cent of all wage claimants have been engaged in manufacturing and mechanical industries; 15.6 per cent were engaged in agricultural pursuits and 9.3 per cent of the claimants were rendering domestic and personal services. Persons engaged in trade, such as drivers, salesmen, and teamsters, etc. persons rendering professional services such as actors, musicians, nurses, and clerical workers, in order named, had filed the largest proportion of complaints against nonpayment of wages.

Of the wage claimants engaged in manufacturing and mechanical industries, the largest proportion, namely, 38.8 per cent, were laborers. Carpenters constituted the next highest proportion in this industrial group. Cooks, in food industries, painters and machinists were next highest in this industrial group.

It is interesting to note that of the persons rendering professional services, who filed complaints against nonpayment of wages, the largest proportion, 46.2 per cent, were nurses. Apparently many families when sickness visits them, engage the services of nurses regardless of their ability to pay them. Actors are next highest in the professional group who are frequently denied compensation for their services.

The number and percentages of wage claims filed by female workers are shown in Table 5.

TABLE 5—Number and per cent of wage claims filed by female workers during the biennial period ending June 30, 1922, by industries and principal occupations.

Industries and principal occupations	Number	Per cent distribution
All industries	4,105	100 0
Manufacturing and mechanical industries	423	10 3
Candy makers	4	.9
Dressmakers	142	33 6
Factory hands	153	36 2
Milliners	24	5 7
Tailoresses	52	12 3
Film cutters	9	2 1
Decorators	1	.2
Cigarmakers	2	.5
Bookbinders	1	.2
All others	35	8 3
Transportation	17	.4
Operator, phone	15	88 2
All others	2	11 8
Trade	152	3 7
Saleslades	137	90 1
Window cleaners	1	.7
All others	14	9 2
Professional service	1,159	28 2
Actresses, photoplayers	197	17 0
Entertainers	38	3 3
Musicians	59	5 1
Nurses	719	62 0
Photographers	3	.2
Teachers	39	3 4
All others	104	9 0
Domestic and personal service	1,660	40 4
Attendants	13	.8
Cooks	252	15 2
Domestics	570	34 3
Hairdressers	31	1 9
Housekeepers	81	4 9
Kitchen help	17	1 0
Laundresses	45	2 7
Maids	158	9 5
Waitresses	333	20 1
All others	160	9 6
Clerical occupations	694	16 9
Bookkeepers	53	7 6
Cashiers	38	5 5
Clerks	169	24 3
Solicitors	50	7 2
Stenographers	315	45 4
All others	69	10 0

It will be seen that during the biennial period covered by this report, 4105 female workers filed complaints against nonpayment of wages. Altogether, as shown in the preceding table, 22,718 wage complaints were filed. This means that 18 per cent of the total wage claimants were women workers. Since the proportion of women workers in California industries is 16 per cent, it appears that women are somewhat more frequently denied their wages than are male workers.

Among the female wage complainants, the largest proportion are those who are engaged in rendering domestic and personal services. More than four-tenths, 40.4 per cent, of the women wage claimants were engaged in rendering these services. The largest number of complainants in the clerical group were stenographers, who constituted 45.4 per cent of the total in that group.

Wage Claims Unpaid by the Bureau.

It sometimes happens that the bureau is unable to pay to the complainants the wages which the bureau has collected in their behalf from defaulting employers. This happens as a result of the inability of the bureau to locate the complainant who had failed to notify the bureau of the change of his address. Cases of failures to pay to the complainants unpaid wages collected by the bureau arise most frequently in connection with claims the collection of which had been prolonged because of the employer's financial insolvency.

At the present time the bureau has on hand, in its cash trust receipt fund, $7,024.47, which the bureau is unable to pay to the rightful wage complainants. This money should not indefinitely remain in the bureau's cash trust receipt fund. Instead, after a reasonable time has elapsed from the date of the collection of the unpaid wage claim, the money involved should be turned over to the state treasury subject to the demand of the bureau in behalf of the complainant. It is hereby recommended that suitable legislation be enacted to make the reversion of such funds to the state treasury possible.

Wages of Alaska Cannery Hands.

In addition to collecting wages from defaulting employers, the bureau has been regularly supervising the paying off of the Alaska fishing boat crews. This work was started by the bureau in 1913 in compliance with the provisions of an act passed by the legislature of that year. This act was recommended by the bureau and provides in part, as follows:

SEC. 2. Upon application of either the employer or the employe, the wages earned in seasonal labor, shall be paid in the presence of the commissioner of the bureau of labor statistics or an examiner appointed by him.

SEC. 3. The commissioner shall hear and decide all disputes arising from wages earned in seasonal labor and he shall allow or reject any deductions made from such wages; *provided, however,* that he shall reject all deductions made for gambling debts incurred by the employe during such employment and for liquor sold to the employe during such employment.

This law was passed as a result of deplorable labor conditions which had existed in the canneries at that time. These conditions, described in detail in our fifteenth biennial report, have by no means been entirely remedied. The Chinese contract system of recruiting labor for the Alaska salmon canneries which is still in vogue is inhuman and is revolting to every American's ideal of justice and fair play. Appropriate legislation is needed to remedy this antiquated method of labor exploitation and humiliation.

As a result of the bureau's supervision over the paying off of the fishing crews, the earnings of the Alaska cannery hands have been considerably augmented.

Table 6, following, shows the net average earnings due each Alaska cannery hand upon his return to San Francisco after the season.

TABLE 6—Average Net Earnings of Alaska Cannery Hands Each Season, from 1913 to 1921, Inclusive.

Year	Number of ships	Number of men	Total net balance due	Net average amount due each man
1913		1,382	$237,447 00	$110 00
1914		1,528	259,134 00	120 00
1915	21	1,566	191,018 00	121 34
1916	22	1,574	201,494 00	128 01
1917	24	1,859	241,494 00	130 08
1918	23	2,069	322,445 00	155 84
1919	23	1,996	374,867 00	187 81
1920	23	1,971	444,494 00	225 52
1921	17	1,569	309,793 00	198 58

From these net average earnings, it should be remembered, have not been deducted the indebtedness of the Alaska workers to storekeepers in San Francisco.

It will be observed that the net average amount due each man has been increasing each year from 1913 to 1920. For the season of 1920, the average amount received by Alaska cannery hands was more than double the amount received in 1913. In 1921, however, the net average earnings had declined to $198.58, a decrease of $26.94 compared with 1920.

This increase in earnings will be especially appreciated in view of the fact that in 1912 the net average paid these men on their return to San Francisco was often as low as $35. Such low average net earnings were made possible because of the fact that cannery hands would be allowed advance money for gambling purposes.

The next table (Table 7) shows in detail the number of men paid off and their earnings for the seasons of 1920 and 1921.

TABLE 7—Number and Earnings of Men Paid Off on Alaska Fishing Boat Crews in 1920 and in 1921.

1920.

Bureau's ship number	Number of men	Advance before sailing	Balance due on return	Total net earnings	Average net earnings per man
I	48	$3,282 01	$7,615 99	$10,898 00	$227 04
II	50	4,493 91	6,508 84	11,002 75	220 06
III	71	4,071 50	11,413 50	15,485 00	218 10
IV	75	5,577 20	13,029 70	18,606 90	248 09
V	34	3,614 71	3,882 79	7,497 50	220 51
VI	67	3,662 10	11,612 90	15,275 00	227 98
VII	90	8,395 75	12,659 80	21,055 55	233 95
VIII	81	4,457 95	12,977 05	17,435 00	215 25
IX	51	3,436 75	9,625 95	13,062 70	256 13
X	47	7,161 05	3,660 00	10,821 05	230 24
XI	147	8,174 90	23,905 10	32,080 00	218 23
XII	27	2,361 15	4,172 30	6,533 45	241 98
XIII	82	4,895 35	13,734 65	18,630 00	227 20
XIV	109	7,002 25	17,182 75	24,185 00	221 88
XV	152	8,504 51	25,010 49	33,515 00	220 49
XVI	61	3,912 70	9,934 30	13,847 00	227 00
XVII	144	9,867 55	22,156 55	32,024 10	222 39
XVIII	48	4,535 80	8,164 20	12,700 00	264 58
XIX	94	4,704 53	16,180 47	20,885 00	222 18
XX	150	8,506 25	24,763 75	33,270 00	221 80
XXI	138	8,903 60	21,101 40	30,005 00	217 43
XXII	52	3 952 10	7,957 90	11,910 00	229 04
XXIII	153	7,743 30	26,026 70	33,770 00	220 72
Total, 23 ships	1,971	$131,216 92	$313,277 08	$444,494 00	$225 52

1921.

I	71	$3,697 07	$9,722 93	$13,420 00	$189 01
II	80	5,839 15	10,650 85	16,490 00	206 12
III	118	7,134 21	10,962 79	18,097 00	153 36
IV	64	3,460 20	10,456 95	13,917 15	217 45
VII	152	8,665 45	21,408 55	30,074 00	197 85
X	52	3,967 75	7,004 00	10,971 75	211 00
XI	118	6,791 65	17,548 35	24,340 00	206 27
XII	21	1,401 45	1,219 05	2,620 50	124 79
XIII	86	4,850 70	12,699 30	17,550 00	204 07
XIV	112	6,568 02	15,966 98	22,535 00	201 21
XV	119	6,653 70	17,516 30	24,170 00	203 11
XVI	58	3,977 45	8,092 55	12,070 00	208 11
XIX	99	6,922 80	12,759 20	19,682 00	198 80
XX	114	6,058 90	16,567 10	22,626 00	198 47
XXI	112	7,640 85	15,379 15	23,020 00	205 53
XXII	70	4,163 65	10,811 35	14,975 00	213 93
XXIII	114	5,370 20	17,864 80	23,235 00	203 82
Total, 17 ships	1,560	$93,163 20	$216,630 20	$309,793 40	$198 58

An examination of this table shows that the net average earnings of men for the season vary considerably. Thus, in 1921, the average net earnings of the men on ship III were $153.36, while the cannery hands on ship XXII averaged as high as $213.93. These differences in the average net earnings of the men are ascribable to differences in working conditions existing on the several Alaska salmon ships.

Misrepresentation by Employment Agencies.

The act regulating private employment agencies (approved June 3, 1913, Stats. 1913) provides, among other things, against misrepresentations by employment agencies. Sections 12 and 13, respectively, provide as follows:

SEC. 12. No such licensed person shall accept a fee from any applicant for employment, or send out any applicant for employment without having obtained, either orally, or in writing, a bona fide order therefor, and in no case shall such licensed person accept, directly or indirectly, a registration fee of any kind. In case the applicant paying a fee fails to obtain employment such licensed agency shall repay the amount of said fee to such applicant upon demand being made therefor; *provided*, that in cases where the applicant paying such fee is sent beyond the limits of the city in which the employment agency is located, such licensed agency shall repay, in addition to the said fee any actual expenses incurred in going to and returning from any place where such applicant has been sent; *provided, however*, where the applicant is employed and the employment lasts less than seven days by reason of the discharge of the applicant, the employment agency shall return to said applicant the fee paid by such applicant to the employment agency, or such portion of said fee as in the judgment of the commissioner of labor may be adequate. (Amended, Stats. 1915, p. 930.)

SEC. 13. No licensed person conducting an employment agency shall publish or cause to be published any false or fraudulent or misleading information, representation, notice of advertisement; all advertisements of such employment agency by means of cards, circulars, or signs and in newspapers and other publications and all letterheads, receipts, and blanks shall be printed and contain the licensed name and address of such employment agent and the word agency, and no licensed person shall give any false information, or make any false promise or false representation concerning an engagement or employment to any applicant who shall register or apply for an engagement or employment for help.

The number of complaints against violations of these sections filed with the bureau, together with the disposition of these complaints, is shown in Table 8.

TABLE 8—Number and Disposition of Claims Filed Against Employment Agencies from 1913 to 1922, Inclusive.

Fiscal year ending June 30th	Complaints filed	New positions furnished	Dismissed or pending	Fees and expenses ordered returned	
				Number	Amount
1913	479	47	68	364	$1,384 45
1914	923	77	214	632	2,328 30
1915	1,035	86	271	678	2,370 15
1916	846	56	212	578	1,508 59
1917	491	56	122	313	1,048 96
1918	513	144	98	271	1,262 11
1919	532	38	126	368	1,312 70
1920	635	34	156	445	2,034 18
1921	754	30	188	536	2,878 16
1922	598	10	222	366	2,218 55

It will be observed that the number of complaints have risen each year from 1913 to 1915. In the latter year, the largest number of complaints was filed against misrepresentations by employment agencies. Since 1915, as will be seen in the subsequent section on private employment agencies, the number of private employment agencies has decreased as a result of the inauguration of the free public employment bureaus. This decline in the number of private agencies has resulted in the relative decline in the number of complaints against these agencies.

During the biennial fiscal period covered by this report, the bureau has investigated 1352 misrepresentation cases. Of these, 902, or 66.7 per cent, were disposed of by ordering the affected employment agencies to return to the applicants their fees and expenses. The sum of money returned to the applicants under these orders amounted to $5,096.71 during the two years covered.

It should be said that in a considerable number of cases these misrepresentations are not wilful, but are caused by the manner in which employers order help from private employment agencies. Employers often order help from several agencies at the same time. Each agency receiving the order seeks to fill it as soon as possible in order to satisfy its client and to collect the fees involved. As a rule, if the jobs to be filled are out of town, the agency telephones to the employer to find out whether the jobs are still vacant. It sometimes happens, however, that the manager of the employment agency is either unable to get in touch with the prospective employer or else fails to get in touch with him and he takes a chance on sending men on the job. If other men had reached the job before and were hired, the employment agent is, under the law, compelled by the bureau to return the fees and expenses of the men he sent out.

The Eight Hour Law.

The eight hour law for women passed the legislature in 1911, but not until 1913 was its enforcement placed in this bureau. The number of complaints against violations of this law filed with the bureau in 1922 was 480 compared with 390 complaints filed in the fiscal year 1921. The next table (Table 9) shows the number of complaints filed in the several cities where the bureau maintains branch offices.

TABLE 9—Number of Complaints Against Violations of the Eight Hour Law for Women Filed with the Bureau and Investigated during the Fiscal Years 1920-1921 and 1921-1922, by Industries.

Industries	Total for state				San Francisco		Los Angeles		Sacramento		Fresno		San Diego	
	1920-21 to 1921-22		1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22
	Number	Per cent distributed												
All industries	870	100 0	390	480	175	220	148	161	31	52	31	24	5	23
Automobile dealers	5	6	2	3		2	2	1	--					
Bakeries	21	2 4	7	14	2	6	5	4		2				2
Candy and confectionery	39	4 5	19	20	12	14	6	2	1	2		2		
Cleaning and dyeing	9	1 0	3	6	3	5								1
Drygoods and clothing stores	44	5 1	16	28	10	11	4	12	1	--	1	4		
Groceries and markets	7	8	5	2	2	1	2	1	1					
Hairdressing parlors	6	7	3	3		1		1	---		3			1
Hospitals and sanitaria	57	6 6	24	33	14	13	8	14		2	2	2		2
Hotels, apartments and boarding houses	169	19 4	76	93	34	42	25	26	8	18	5	2	4	5
Laundries	61	7 0	18	43	12	26	4	8	2	3		4		2
Manufacturing, general	39	4 5	19	20	13	14	3	6	2				1	
Millinery	3	3		3		3								
Photograph galleries	4	5	1	3			1					1		3
Printing and publishing	7	8	3	4		2	1	2	2					
Public service corporations	16	1 9	7	9	6	8				1	1			
Restaurants	189	21 7	87	102	29	26	39	46	11	19	8	6		5
Retail stores, general	50	5 7	19	31	2	12	16	16	1	1				2
Tailoring and dressmaking	22	2 5	10	12	6	4	4	8						
Theatres	6	7	4	2	2	1	2			1				
Miscellaneous	116	13 3	67	49	28	29	26	14	2	3	11	3		

It will be observed that most violations were reported and investigated in San Francisco. The next largest number of complaints was reported in Los Angeles. It cannot be safely assumed that the number of complaints investigated by the bureau is indicative of the actual number of violations which had taken place. The absence of adequate factory inspections, owing to insufficient appropriations, may be the cause of law violations not discovered by the bureau.

An examination of the preceding table shows that the largest number of violations of the eight hour law had taken place in restaurants. Thus, during the biennial fiscal period ending June 30, 1922, 870 complaints against violations of the eight hour law were investigated by the bureau. Of these, 21.7 per cent were against restaurant keepers. Hotels, apartments and boarding houses were next highest in the rank of industries against which complaints were filed. About 20 per cent of all eight hour law violations were committed by hotels, apartment houses and boarding houses. Stores, candy and confectionery shops were also responsible for a large number of eight hour law violations.

Child Labor.

During the two fiscal years covered by this report, 283 child labor law violations were investigated by the bureau. The number of complaints against violators of the child labor law are rapidly diminishing. The administration of the law is largely in the hands of the school authorities, while the enforcement of it is lodged with the Board of Education and with the Bureau of Labor Statistics. The Industrial Welfare Commission has also been cooperating with the Board of Education and with this bureau in the enforcement of this law.

Under the educational rights of children act (Stats. 1921, p. 1674), the authority to issue permits to children under 16 is lodged with the superintendent of schools and with persons authorized by him. There are four distinct classes of permits which may be issued by the school authorities. These are:

CLASS A.

1. A minor under the age of 16 years and over the age of 15 years who has completed the equivalent of the seventh grade of a public school may receive a permit to work.

2. A minor under the age of 16 years and over the age of 14 years who holds a diploma of graduation from the prescribed elementary school course may receive a permit to work.

CLASS B.

A minor over the age of 14 years but under the age of 16 years may receive a permit to work outside of school hours for a period of time which when added to the time such minor is required by law to attend school shall not exceed eight hours in one day.

CLASS C.

Any minor over the age of fourteen years may be assigned to a vocational course in a place of employment, such employment to be in lieu of the regular school course, which such minor is pursuing.

CLASS D.

Any minor over the age of 12 years and under the age of 16 years may hold a vacation permit permitting such minors to be employed on the regular weekly school holidays and during the regular vacation of the public school and during the period of a specified occasional public schoool vacation.

During the school year of 1921-1922, 2395 working permits were issued to children under 16 years of age. Of this number 1423, or 59.4 per cent, were issued to children between 14 and 15 years of age. The remaining permits were issued to children between 15 and 16 years of age. In 1920-1921, 1203 permits were issued or 1192 less than in the year following.

In addition to these four classes of permits issued by the Superintendent of Public Instruction, the Bureau of Labor Statistics is authorized under the child labor law (Stats. 1919, p. 415) to issue permits to children to perform in places of amusement. The provision of the law dealing with the issuance of these permits is quoted above on page 22. It has already been pointed out above that the bureau does not consider itself competent to issue theatrical permits for the reason that it does not possess the needed knowledge and facilities to judge the education and physical qualifications of the children under its jurisdiction. The issuance of all working permits, whether in the shop, factory or on the stage should be delegated to the school authorities. The theatrical permit is the only permit not now issued by the school authorities.

According to the United States census of 1920, there has been a general decline in the employment of children during the last decade. Thus in 1910, there were in the United States, 1,990,225 children 10 to 15 years of age gainfully employed. In 1920, the number of gainfully employed children of the same age group had declined to 1,060,838, a decrease of 929,367, or 46.7 per cent. This decrease took place in spite of the increased number of children of the same age group in 1920 as compared with 1910.

California has also shared in the general decline in the number of gainfully employed children, though not to the same extent as has the country as a whole. In 1910 there were in California 11,251 gainfully employed children. In 1920 this number declined to 9057, a decrease of 2194, or 19.5 per cent. Again in 1910, the percentage of children between 10 to 15 years of age who were gainfully employed in California was 5.4 of the total number of children of the same age group. In 1920, the percentage of children in California who were gainfully employed decreased to 3.0.

The following table (Table 10) shows the number and proportion of children gainfully employed in California cities having, in 1920, 25,000 inhabitants or more.

TABLE 10—Number and Proportion of Children of Each Sex, 10 to 15 Years of Age, Engaged in Gainful Occupations in California, in 1920, by Cities.

(Computed from U. S. 14th Census Data.)

Cities	Both sexes 10 to 15 years of age			Males, 10 to 15 years of age			Females, 10 to 15 years of age		
	Total	Engaged in gainful occupations		Total	Engaged in gainful occupations		Total	Engaged in gainful occupations	
		Number	Per cent		Number	Per cent		Number	Per cent
The state	304,320	9,057	3.0	153,301	7,229	4.7	151,019	1,828	1.2
Alameda	2,744	113	4.1	1,377	96	7.0	1,367	17	1.2
Berkeley	5,178	142	2.7	2,542	120	4.7	2,636	22	0.8
Fresno	4,192	144	3.4	2,076	116	5.6	2,117	28	1.3
Los Angeles	44,185	1,380	3.1	21,654	1,041	4.8	22,531	339	1.5
Long Beach	4,424	125	2.8	2,183	108	4.9	2,241	17	0.8
Oakland	18,344	565	3.1	9,124	447	4.9	9,220	118	1.3
Pasadena	3,580	120	3.3	1,820	105	5.8	1,760	15	0.9
Sacramento	5,548	230	4.1	2,687	183	6.7	2,861	50	1.7
San Diego	5,710	233	4.1	2,792	197	7.1	2,918	36	1.2
San Francisco	37,184	1,273	3.4	18,429	914	5.0	18,755	359	1.9
San Jose	3,976	91	2.3	1,961	72	3.7	2,015	19	0.9
Stockton	3,238	123	3.8	1,615	97	6.0	1,623	26	1.6
Other places	166,016	4,518	2.7	85,041	3,736	4.4	80,975	782	1.0

This table shows that the proportions of gainfully employed children in the cities of Alameda, Sacramento, and San Diego were more than one-third greater than was the proportion in the state as a whole. In none of the cities shown in the table does the percentage of gainfully employed children exceed 4.1.

It will be observed that the percentage of gainfully employed boys between 10 and 15 years of age was 4.7 compared with the percentage of 1.2 for gainfully employed girls. San Diego shows the highest proportion of gainfully employed boys, namely, 7.1 per cent. Sacramento has 6.7 per cent of its boys gainfully employed, while Stockton shows 6.0 per cent of its boys gainfully employed.

The cities of San Francisco, Stockton, Sacramento and Los Angeles, in order named, rank highest in the percentages of gainfully employed girls between the ages of 10 and 15 years.

Table 11, next following, shows the number and percentage distribution of gainfully employed children according to principal divisions of occupations.

TABLE 11.—Number and Percentage Distribution of Children 10 to 15 Years of Age Gainfully Employed in Each General Division of Occupations, in California, 1920.

(Computed from U. S. 14th Census Data.)

Division of occupations	Both sexes		Males		Females	
	Total	Per cent distribution	Total	Per cent distribution	Total	Per cent distribution
All occupations	9,057	100.0	7,229	100.0	1,828	100.0
Agriculture, forestry, and animal husbandry	1,832	20.2	1,614	22.3	218	11.9
Extraction of minerals	18	0.2	17	0.2	1	
Manufacturing and mechanical industries	1,725	19.0	1,312	18.2	413	22.6
Transportation	425	4.7	358	5.0	67	3.7
Trade	2,310	25.5	2,047	28.3	263	14.4
Public service	39	0.4	39	.5		
Professional service	187	2.1	112	1.5	75	4.1
Domestic and personal service	894	9.9	424	5.9	470	25.7
Clerical occupations	1,627	18.0	1,306	18.1	321	17.6

An examination of this table shows that more than one-fourth of all gainfully employed children were found in trade occupations. This group of occupations includes newspaper selling and delivering in which young boys are employed in large numbers. The agricultural group is next highest in the proportion of gainfully employed children. The fact that the 1920 census taken as of January first rather than as of April fifteenth in 1910, accounts in large measure for the relatively smaller proportion of children employed in agricultural pursuits. It will be observed that of the 9057 gainfully employed children 1627, or 18 per cent, were employed in clerical occupations.

In studying these figures, it should be remembered that the term "gainfully employed" has no reference to the time employed. Thus, children employed after school hours are considered gainfully emp oyed for the statistical purposes of the census.

Other Labor Law Violations.

The following table (Table 12) shows the number of compla nts against alleged labor law violations filed in each of the cities in which the bureau maintains branch offices.

TABLE 12—Total Number of Complaints Against Alleged Violations of Labor Laws Filed with the Bureau and Investigated during the Fiscal Years 1921 and 1922, by Nature of Complaint and by Offices.

Nature of complaint	Total for state		San Francisco		Los Angeles		Sacramento		Fresno		San Diego	
	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22
Total	12,047	13,823	3,869	4,540	2,869	4,384	3,234	2,808	1,772	1,653	303	438
Nonpayment of wages	10,369	12,349	3,205	3,808	2,582	4,093	2,570	2,349	1,725	1,602	287	407
Misrepresentations by employment agencies	754	598	115	133	28	73	602	387			9	5
Eight hour law for women	390	480	175	220	148	161	31	52	31	24	5	23
Child labor	166	117	95	81	46	19	19	15	4	2	2	
Refund of transportation	126	67	113	66	13	1						
Sanitation and ventilation	59	16	34	6	21	8	3		1	2		
Employment agencies—license	34	48	19	34	14	13			1			1
Semi-monthly payday	26	14	16	11	3	2	7	1				
Weekly day of rest	10	12	10	8						4		
Scaffolding, flooring, etc	10	2	2		6		1	1	1			1
Advertising for help—strike conditions	9	11	9	11						3		
Seats for females	4	10	4	6		1						
Discharging men for joining union	3		3									
Blowers		2		2								
Eight hour law—public work	1	8	1	2		2						
Eight hour law—underground work	1	13	1	5		1		2		4		
Medical cabinet law	1	1	1	1						4		1
Pay check law	1	2	1	2								
Ten hour law for drug clerks	1	2	1			2						
Miscellaneous	82	71	64	54	8	8	1	1	9	8		

In all the offices of the bureau, it will be seen, the largest number of complaints was against nonpayment of wages. The Sacramento office leads all the other offices in the number of complaints received against private employment agencies. This is due to the fact that Sacramento has an unusually large number of private employment agencies, considering the size of the city. There are 18 employment agencies licensed in Sacramento of which 15 are general labor employment agencies.

The smallest number of complaints was filed in the San Diego office. The number of complaints filed in the Los Angeles office was in 1921-1922 about equal the number filed during the same period in the San Francisco office.

An Oakland Office.

The fact that the bureau has had no regular branch office in Oakland has given rise to considerable criticism on the part of interested citizens in Oakland. According to the 1920 federal census, Oakland had a population of 216,261 when the census was taken. In other words, Oakland is the third largest city in the state. The size of the city would seem to warrant the establishment of a branch office in that city. If that were done, it would save considerable time and trouble to Oakland employers and workers who are at the present time compelled to travel across the bay to the San Francisco office in connection with claims against nonpayment of wages. The following is a statement of the number of complaints against violation of labor laws which originate in Oakland and its vicinity. It is presented in the form of a memorandum submitted to the commissioner by the bureau's statistician.

(Letterhead of the Bureau of Labor Statistics.)

San Francisco, October 27, 1922.

MEMORANDUM.

From: Louis Bloch, Statistician.

To: Walter G. Mathewson, Commissioner.

Subject: *Complaints against violations of all labor laws originating in Oakland and its vicinity.*

In compliance with your request, I am herewith submitting to you a statement showing the number and proportions of complaints against violations of labor laws originating in Oakland, and in its vicinity. The following percentages and averages are based upon a record of nine months, from January 1, 1922, to October 1, 1922. The figures submitted are considered conservative and fairly representative.

Average number of complaints against alleged violations of labor laws filed at the San Francisco office per month	461
Average number of Oakland complaints per month	51
Average number of complaints from Oakland and its vicinity, including Berkeley, Alameda, Fruitvale, etc.	63
Per cent Oakland complaints are of the total filed at this office	11
Per cent Oakland and its vicinity complaints of total filed at this office	14

CITATIONS.

Average number of Oakland defendants cited in each month	30
Average number of Oakland and its vicinity defendants cited in each month	36
Per cent of Oakland defendants cited per month	58
Per cent of Oakland and its vicinity defendants cited per month	58

It will be seen that 14 per cent of all complaints against alleged violations of labor laws filed at the San Francisco office originate in Oakland. Approximately 36 defendants, employers and business men, are cited into the San Francisco office monthly

to answer charges against labor law violations, especially charges against nonpayment of wages. This does not include the number of complainants who are compelled to come across the bay to the bureau's office. And the number of complainants at least equals the number of defendants and most likely exceeds that number.

This inconvenience to which Oakland residents have been put, has been found unavoidable in spite of the fact that one of the bureau's agents has been assigned to hear Oakland complaints at Oakland twice a week. What Oakland needs and what Oakland residents have been demanding, is a permanent regular branch office of the bureau. The establishment of such an office would not only be of value to Oakland residents but would also result in the expediting of complaints originating in San Francisco. Appropriate legislation, including necessary appropriations, is needed to effect the suggested branch office in Oakland.

Inspections.

During the two fiscal years ending June 30, 1922, the bureau has made 2267 inspections of factories and mercantile establishments. Of this number only 206 inspections were made outside of San Francisco.

Only one of the bureau's agents has been regularly assigned to the making of inspections. At times, when the rush of other work has made it necessary, even this one agent has been detailed to do other work, thus leaving factory inspection to take care of itself. There is no doubt that our factory and mercantile establishment inspections have been inadequate. During the fiscal years covered by this report, only seven establishments have been visited twice, and the larger number of establishments were not visited at all. In 1899, there were in this state, according to the United States census of manufactures, a total of 4997 manufacturing establishments. This number has, in 1919, increased to 11,942, an increase of 139.0 per cent. Similarly, during the same period the number of wage earners engaged in manufactures, as will be seen in a subsequent section, has increased 215.6 per cent. But in spite of this increase in the industrial development of the state, there has been no attempt made at more frequent factory and mercantile establishment inspections. The urgent calls for quick action attendant upon the constantly growing number of wage complaints filed with the bureau have made necessary the concentration of the bureau's activities upon the collection of wage claims to the detriment of the enforcement of other labor laws. Only more adequate appropriations for the bureau would make possible adequate factory inspections, as well as more adequate and expeditious enforcement of our labor laws in general.

Prosecutions.

During the fiscal period ending June 30, 1922, the bureau has undertaken eighty prosecutions against law violations. Of these, the largest number were against nonpayment of wages. The next largest number of prosecutions were against violations of the eight hour law for women and the child labor law.

The following table (Table 13) shows the number of prosecutions for each of the fiscal years 1921 and 1922 and shows the disposition of these prosecutions.

TABLE 13—Number and Disposition of Prosecutions Against Law Violations Started by the Bureau during the Fiscal Years 1921 and 1922.

Laws violated	Prosecutions					
	Total		Disposition			
			Convicted		Dismissed	
	1921	1922	1921	1922	1921	1922
Total	31	49	23	28	8	21
Child labor law	9		9			
Eight hour law for women	6	11	6	8		3
Misrepresentation by employment agencies	4		1		3	
Employment agencies—license	1		1			
Nonpayment of wages	10	36	5	19	5	17
Scaffolding law	1		1			
Miscellaneous		2		1		1

It will be seen that in 1921 the number convicted was proportionately larger than in 1922. Thus, in 1921 the bureau secured 23 convictions as a result of 31 prosecutions, while in 1922, the bureau secured 28 convictions as a result of 49 prosecutions.

Table 14 shows the number of prosecutions brought and convictions secured by the bureau each biennial fiscal period from 1911 to 1922.

TABLE 14 Number of Prosecutions Brought and Convictions Secured by the Bureau, 1911-1912 to 1921-1922.

Fiscal year ended June 30	Prosecutions brought	Convictions secured	Per cent convictions of total actions
Total	937	545	58.2
1911 and 1912	173	80	46.2
1913 and 1914	248	136	54.8
1915 and 1916	179	102	56.9
1917 and 1918	138	82	59.4
1919 and 1920	119	94	79.0
1921 and 1922	80	51	63.7

It will be observed that the number of prosecutions undertaken by the bureau has been declining since the biennial period ending June 30, 1914. The percentages of convictions secured, on the other hand, have increased since 1914. During the biennial fiscal period ending June 30, 1912, 46.2 per cent of all persons prosecuted were convicted, while during the biennial fiscal period covered by this report, 63.7 per cent of all persons prosecuted were convicted.

In view of the increased number of complaints against law violations, the decline in the number of prosecutions seems to indicate a slackening up of vigorous law enforcement. However, this is not the case, for in the largest number of cases the bureau has confined itself to warnings against the repetition of the same offense. Prosecutions have been undertaken only when such warnings were not heeded. In cases of nonpayment of wages, it is often entirely useless to resort to the courts for the reason that the defendant is known to be unable to meet his financial obligations.

PRIVATE EMPLOYMENT AGENCIES.

Regulation of Employment Agencies.

The first attempt to regulate private employment agencies in this state was made in 1903. In 1909 the law was modified by providing for the licensing of private employment agencies and for the uniform keeping of records by private employment agencies as prescribed by the Commissioner of the Bureau of Labor Statistics. The law now also provides against misrepresentations by employment agencies by way of giving false information or making false representations concerning prospective places of employment. The law further provides that when the employment lasts less than seven days by reason of the discharge of the applicant, the employment agency must return to the applicant his fee or such part of the fee as in the judgment of the Commissioner of Labor may be adequate.

There has been considerable agitation in this state against alleged malpractices on the the part of private employment agencies. This agitation has been leveled particularly against the fees charged by commercial agencies which are in most cases exorbitant.

One of the evils charged against private employment agencies which the bureau sought to remedy, has been the practice of taking assignments of unearned wages by employment agencies from the applicants for employment. Nearly all of the commercial employment agencies, and a large number of other agencies, have been demanding, as a part of the contract with the applicant for employment, that the applicant assign part of his, or her, wages to the employment agency to cover the fees charged by the agency. The following is a sample of an order on the employer which applicants have been obliged to sign when registering with a commercial employment agency before receiving a position:

To_____ San Francisco,_____192__

For value received I hereby assign, and you are hereby directed to pay to the _____employment agency or order, the sum of_____ dollars, the same to be deducted from moneys which may be due me as salary or otherwise, or that may subsequently be due me.

I hereby appoint said_____employment agency my true and lawful attorney, irrevocable, with full power to receive and receipt for the same as well as to do any and all other things in the premises to be done by myself.

Signature_____

Several of the agencies demand that the applicant sign a promissory note when registering instead of an assignment of wages. Such promissory note, in most contracts, reads as follows:

_____ San Francisco, Cal.,_____

Thirty days after date, without grace, I promise to pay to the order of_____ _____dollars, for value received, payable in U. S. Gold Coin at San Francisco, Cal., and in case suit is instituted to collect this note or any portion thereof, I promise to pay such additional sum as the Court may adjudge reasonable as attorney's fees in the said suit.

Due (date)_____ _____

The following excerpt from a complaint against an employment agency lodged with the Los Angeles office of the bureau typifies the evils growing

out of the practice of signing promissory notes and assignments of wages in advance of fully accepting the position.

EXCERPT FROM A LOS ANGELES COMPLAINT.

Sent out from the ..... Commercial employment agency the first part of May, 1921, to the ..... company in regard to a position as bookkeeper.

After interviewing the ..... company, returned to the ..... commercial employment agency, telling them that two girls had left the position, after trying it a few days and that I would consider it if I could have the privilege of trying the position out. Mr. A. of the ..... commercial employment agency, informing me that this would be perfectly all right. After a 2 days trial, I decided that I did not care to have the position as the office was dark, damp and cold, being required to work under artificial light most of the day.

At noon of the second day I called on the ..... commercial employment agency, telling them that I would not consider the position that I would let the ..... company know that day, giving the ..... commercial employment agency time to place some one else on the job.

At the close of the month the ..... commercial employment agency rendered me a statement for $36.91. I went to their Mr. A., telling them of their verbal agreement, and offered to pay them $2.50, one-sixth of the fee earned. Mr. A refused the money offered him and asked me if I remembered having signed this (a promissory note which everyone signs before they leave the office of the ..... commercial employment agency, or even know where they will be sent). Mr. A. also asked me what I would offer to settle and I told him that I would pay the $2.50. He refused the money and I went on my way.

At the close of the next month I received a statement from Mr. B. collector for the ..... commercial employment agency, in the amount of $36.91. I went to Mr. B, telling him that I thought that the statement was in error and that I would pay him the $2.50, the amount due the ..... commercial employment agency. He refused the money. At the end of the month he served summons on me.

In order to remedy the evils arising out of assignments of wages, the Commissioner of the Bureau requested the Attorney General for an opinion as to the legality of this practice on the part of the employment agencies. The bureau received the following reply from the Attorney General:

STATE OF CALIFORINA.
OFFICE OF ATTORNEY GENERAL.

San Francisco, June 10, 1922.

HON. WALTER G. MATHEWSON,
Commissioner, Bureau of Labor Statistics,
948 Market Street, San Francisco, California.

Dear Sir:

I have your communication in which you refer to an application and agreement, which I understand is used by some employment agencies in this state when persons apply for positions. Under the terms of this agreement the applicant agrees upon accepting a position, furnished through the efforts of the said employment agency, to pay a certain per cent of the first whole month's salary within certain periods of time, the amount thereof depending upon the time within which the said percentage payment is made.

There is also a further provision with reference to what percentage will be paid in the event of the person being discharged or leaving for other reasons than of his own accord. There is then included this agreement:

> "This agreement shall constitute an order on my employers for any commission that may be due said ....., and said employer is hereby requested to pay such amount to said ....., and charge the same against my salary."

You ask whether this agreement comes within the provisions of section 955 of the Civil Code of this state.

I am writing to advise that in my opinion the agreement that the same shall constitute an order on employers and be chargeable against the applicant's salary does come within the provisions of section 955 of the Civil Code. It would appear to be an assignment or order for wages or salary prior to the same having been earned, and as such it is not valid under that portion of said section 955, which reads as follows:

> "No assignment of, or order for, wages or salary shall be valid unless at the time of the making thereof, such wages or salary have been earned, except for the necessities of life and then only to the person or persons furnishing such necessities of life directly and then only for the amount needed to furnish such necessities."

At the bottom of this application and agreement appears a promissory note, under the terms of which the applicant promises to pay to the order of the employment agency, thirty days after date, for value received, a sum of money. I understand that this sum is in some instances fixed in amount, and in some cases left blank. For instance, if the amount of wages or salary is uncertain at the time the position is obtained, the amount of the note is filled in later. Or, if it is uncertain at what time the applicant intends to pay the note, it is so filled in later. As between the employment agency and the maker of the note, this would appear to be of no particular importance, so long as the payee does not exceed its authority in filling in the amount of the note.

It would also appear that the note is not an assignment of unearned wages. The employer would not be authorized to recognize it as such an order on him.

It is possible, however, that the courts might consider seriously the question whether the note is so marked by the entire transaction as to make it subject to attack on account of illegal consideration. The argument might be advanced that the position would never have been obtained for the employee unless the invalid assignment of future earnings was executed, and that this element effects the consideration of securing a position for the applicant, which otherwise would be sufficient consideration for the note.

Very truly yours,

U. S. Webb, Attorney General,
By (signed) Frank English, Deputy.

In accordance with this ruling of the Attorney General, the bureau instructed the employment agencies that no assignment or order for unearned wages of the applicant can be given upon the employer. The following letter was sent out to the commercial employment agencies by Walter G. Mathewson, Commissioner of the Bureau:

(Letterhead of the Bureau of Labor Statistics.)

San Francisco, July 12, 1922.

Gentlemen:

It has been called to our attention in several instances that the form of application and agreement as approved by this department is not being used by many of the agencies. While it was generally understood that the old printed forms could be used pending the time that the new forms were printed, there was a distinct understanding that the sections which were objectionable should be stricken out and the changes adopted by this department inserted, which I learned has not been done. We therefore officially advise you that it will be necessary to file at once with this office your corrected form of application and receipt, in accordance with the regulations of this department.

In doing this you will take into consideration the recent ruling of the Attorney General—that no assignment or order for unearned wages of the applicant can be given upon the employer; also the intent of the following clauses must appear in your contract.

Fee on temporary positions shall be 10 per cent of amount earned.

Ninety (90) days or less to be considered temporary employment.

In the event of the applicant resigning or losing the position for any reason, the fee is to be 10 per cent of amount earned, provided however that if applicant is discharged

within seven days, no amount may be deducted and any money paid by applicant should be refunded.

It has been further called to the attention of this department that some agencies have refused the return of fee to applicants who have not accepted positions. This is contrary to the law as interpreted by this department.

Your immediate compliance with the above will be greatly appreciated.

Respectfully yours,

(Signed) Walter G. Mathewson,
Commissioner.

As a result of this letter, action was instituted by the Pacific Audit and System Company, a commercial employment agency, against the commissioner of the bureau. The object of the suit was to test the right of the commissioner to regulate the contractual relation between the applicant for employment and the employment agency.

The plaintiff, secured a temporary injunction restraining the commissioner from the following acts, which the agency alleged the commissioner had committed and was threatening to enforce upon all employment agencies:

1. Defining the term, "temporary employment" to include all employment lasting ninety days or less.

2. Requiring that the fees charged for temporary employment should not exceed ten per cent of the amount earned.

3. Requiring that all employment agencies cease taking orders or assignments of unearned wages or salaries of applicants for positions.

The case was tried in the Superior Court for Los Angeles County on October 2, 1922, Judge Chas. S. Burnell, presiding. The decision was rendered in favor of the bureau, thus dissolving the temporary injunction.

The facts upon which the court dismissed the case and rendered judgment against the plaintiff did not settle the principal issue involved, namely, whether the commissioner is authorized by the law to regulate the contractual relations between the employment agencies and their prospective clients. The injunction was dissolved because the plaintiff had failed to show that the commissioner had caused damage to the business of the plaintiff by issuing the instructions contained in the letter of the commissioner of July 12, 1922, above quoted.

The court held further that the commissioner did not exceed his authority when he issued a circular to all employment agencies, including the plaintiff, the Pacific Audit and System Company, requesting compliance with the ruling of the Attorney General that taking of orders or assignments of unearned wages or salaries was unlawful.

Subsequent to this decision, the commissioner, acting upon the advice of his attorney in this case, Mr. Henry Heidelberg of San Francisco, issued the following circular letter to all commercial agencies:

(Letterhead of the State Bureau of Labor Statistics.)

San Francisco, October 23, 1922.

Gentlemen:

Supplementing our communication of July 12, 1922: The words "definite" and "indefinite" as used in section 11 of the Employment Agency Act are hereby construed to mean "temporary" or "permanent," respectively.

Temporary employment is hereby defined as all work lasting for a period of ninety days or less.

All other work lasting for a greater period of time than ninety days is to be considered permanent employment.

The fees charged for temporary positions shall be the fees now charged by you for indefinite employment, and the fees charged for permanent employment are to be those now charged by you for definite employment. Provided, however, that if the applicant is discharged or loses his position within seven days of the time of commencement of employment, no amount is to be collected as a fee and any moneys paid by applicant therefor are to be refunded.

The Superior Court of Los Angeles County, Judge Burnell presiding, has ruled that assignments of wages contained in applicants' contracts for employment are illegal. Therefore, believing that it is the desire of all employment agencies to conduct their offices in a legal manner, I would suggest the elimination from such contracts of all assignments of wages.

Failure to comply with the above will be deemed cause for revocation of your state license.

Trusting to receive your immediate cooperation, I remain,

Very respectfully,

(Signed) WALTER G. MATHEWSON,
Commissioner.

Section 12 of the Employment Agency Act provides, in part,

* * * where the applicant is employed and the employment lasts less than seven days by reason of the discharge of the applicant, the employment agency shall return to said applicant, the fee paid by such applicant to the employment agency, or such portion of said fee as in the judgment of the commissioner of labor may be adequate.

It is this section of the law under which the commissioner has ruled in the above circular letter that "if the applicant is discharged or loses his position within seven days of the time of commencement of employment, no amount is to be collected as a fee and any moneys paid by applicant therefor are to be refunded."

Briefly summarized, the commissioner has made the following regulations binding upon private employment agencies:

First—That no assignment or order for the unearned wages or salary of the applicant can be given upon the employer to the employment agency to guarantee its fee or commission.

Second—That positions lasting ninety days or less must be considered temporary or indefinite employment and that only positions lasting over ninety days may be considered permanent or definite employment.

Third—That charges for temporary employment, as just defined, shall in no case be more than the prevailing charges for temporary employment and should in no case exceed the charges for permanent employment, and

Fourth—That if an applicant is discharged within seven days of the time of commencement of employment, no amount is to be collected as a fee and any moneys paid by applicant therefor must be refunded to the applicant.

The first, second and fourth rulings are considered by the bureau binding upon all agencies; while the third ruling was promulgated to cover only commercial employment agencies or other agencies doing similar business.

As the employment agency law now reads, the bureau will probably be unable to enforce its rulings pertaining to temporary and permanent positions and the charges to be made therefor, for the reason that these rulings involve the regulation of fees and of the contractual relations between the employment agency and their applicants for employment. In the interests of fair dealing with applicants for employment, the Employment Agency Act should be so amended as to make these rulings of the bureau legally enforcible.

Regulation of Employment Agencies by Other States.

Although the Employment Agency Act of California affords considerable protection to applicants for employment, there is nothing in the law to curb excessive fees for jobs which most agencies are known to exact from applicants for employmen . Under the laws of California regulating the conduct of employment agencies, an applicant for employment may secure relief if fraud is shown to have been perpetrated upon him by the employment agency. The applicant for employment may also secure redress in case a prospective job has been misrepresented to him. But in the absence of misrepresentation and fraud on the part of the employment agency, the applicant for employment may be taxed to the limit of his or her capacity to pay for offered opportunities to work. This fact constitutes a genuine evil in connection with the operation of most commercial agencies, an evil which should be remedied by appropriate legislation.

A number of other states extend better protection to applicants for employment than does California in that these states limit the fees which certain agencies may charge. "The laws of fourteen states contain provisions intended to limit the total fees which may be charged applicants who secure positions through private employment agencies. Seven of those states—Connecticut, Indiana, Maine, Michigan, Nebraska, Oregon, and Utah—fix the maximum fees in their statutes, the majority of them at 10 per cent of the first month's salary. New Jersey, Ohio, Pennsylvania, South Dakota and Wisconsin provide that the state department which administers the private employment agency law shall approve or fix the fees which may be charged, while Massachussetts and Rhode Island leave the regulation of fees to the city councils."*

The fees charged by general labor employment agencies as explained below, are, in large measure, determined by the competitive conditions under which these classes of agencies operate. However, the fees of commercial and of other agencies seem to be determined by custom and general practice and are apparently not influenced by competitive conditions. The existence of the free public employment agencies offers constant and effective resistance to possible unreasonable fees on the part of general labor agencies. But the presence of the public free employment bureaus affords no protection against unreasonable fees charged by most commercial agencies. In view of these and similar considerations, there appears to be justification for legislative regulation of the fees charged by private commercial agencies.

*U. S. Bureau of Labor Statistics: Monthly Labor Review, October, 1922, p. 3.

Number and Kind of Employment Agencies.

For statistical purposes, the private employment agencies are divided into the following eight classes:

1. Commercial.
2. Domestic.
3. General.
4. Hotel.
5. Nurses.
6. Oriental.
7. Teachers.
8. Theatrical.

The problems affecting these classes of agencies and their methods of doing business are dissimilar. The methods of doing business as practiced by teachers' agencies are, for instance, quite different from the methods of doing business as practiced by general employment agencies. Similarly, theatrical agencies do business on a somewhat different basis than do commercial or teachers' agencies. All classes of employment agencies, though differing in their methods of doing business, owe their existence to recurring joblessness of workers whether skilled or unskilled. semiprofessional or professional. This fact has often given rise to fraudulent practices on the part of some employment agencies. These frauds consist in collusions between employment agents and foremen of factories or superintendents of large companies whereby workers are deliberately discharged in order to create job seekers for employment agencies. Although such malpractices have to all appearances been reduced during the last few years, there is no doubt that they still exist. Only painstaking and prolonged investigation, however, could bring such practices to the surface.

The statistics which follow relate to the number and kind of agencies and the fees which these agencies charge. The average fees shown in the following tables, it should be remembered are for all kinds of jobs, regardless of their duration. One-day or one-week jobs are thrown in with the jobs and positions of so-called "permanent" duration.

Table 15 following shows the number of licenses issued by the bureau to private employment agencies from 1910 to 1922.

TABLE 15—Number of Licenses Issued by the Bureau to Private Employment Agencies Each Fiscal Year from 1910 to 1922, Both Inclusive.

Year ending March 31	Number of licenses issued	Increase or (—) decrease	
		Number	Per cent
1910	321		
1911	302	—19	—5.9
1912	307	5	1.7
1913	310	3	1.0
1914	355	45	14.5
1915	264	—91	—25.6
1916	221	—43	—16.3
1917	195	—26	—11.8
1918	200	5	2.6
1919	184	—16	—8.0
1920	204	20	10.9
1921	238	34	16.7
1922	240	2	.8

It will be seen that the largest number of licenses, namely, 355, were issued during the fiscal year 1914. In the year following, the bureau issued 91 licenses less. The reason for this decline is attributable to the passage of the law providing for free public employment bureau in 1915. The number of private employment agencies in the state was gradually decreasing until 1920. In 1919 there were 184 private employment agencies in the state compared with 355 in 1914—a decrease of over 48 per cent. In 1918, a year of exceptional industrial activity, the number of agencies licensed by the bureau was 200. From 1920 to 1922, the number of agencies has again been on the increase. During the fiscal year 1922 the bureau licensed 240 employment agencies. This number, it should be observed, is still considerably less than the number of agencies licensed in 1914. The tendency on the part of the private employment agencies to increase shown during the last three years, may be ascribed to our increasing industrial population as well as to the fact that the number of public employment bureaus has not increased during the last two years.

Table 16 shows the number and kind of agencies licensed by the bureau from April 1, 1922, to November 1, 1922.

TABLE 16—Number of Employment Agencies Licensed by the Bureau from April 1, 1922 to November 1, 1922, by Classes of Agencies.

Class of agency	Total in state	Per cent of totals	Number in		
			San Francisco	Los Angeles	All other towns
Total	233	100 0	58	74	102
Commercial	56	24 0	16	23	17
Domestic	16	6 9	2	5	9
General	77	33 0	12	11	54
Hotel	19	8 2	8	5	6
Nurses	3	1 3			3
Oriental	24	10 3	12	5	7
Teachers	14	6 0	*1	8	6
Theatrical	24	10 3	7	17	

*The Pacific Teachers' Agency which is part of the Kemp Agency and has no separate license.

It will be seen that altogether 233 agencies were licensed. Of these 77, or 33 per cent, are general agencies, while 56, or 24 per cent of the total, are commercial agencies. Oriental, theatrical, hotel, domestic, teachers, and nurses' agencies, in order named, ranked highest in their ratio to the total agencies licensed during the current year.

Average Total Fees Collected by Employment Agencies.

Table 17, next presented, shows the total fees collected by all agencies for which information was tabulated, the average fees collected per agency, and the percentages of the total fees collected by each of the several classes of agencies.

TABLE 17—Average Total Fees Collected by Private Employment Agencies for which Information was Secured by Classes of Agencies, 1920-1921 and 1921-1922.

Class of agency	1920-1921				
	Agencies reporting		Fees collected		Average per agency
	Total	Per cent of total	Total	Per cent of total	
All agencies	192	100.0	$1,024,632 20	100.0	$5,336 62
Commercial	40	20.8	$343,719 43	33.5	$8,592 99
Domestic	11	5.7	20,069 16	2.0	1,824 47
General	99	51.6	469,067 40	45.8	4,738 05
Hotel	5	2.6	34,429 50	3.3	6,885 90
Nurses	5	2.6	13,418 29	1.3	2,683 66
Oriental	22	11.5	39,600 86	3.9	1,800 04
Teachers	10	5.2	104,327 56	10.2	10,432 76

Class of agency	1921-1922				
	Agencies reporting		Fees collected		Average per agency
	Total	Per cent of total	Total	Per cent of total	
All agencies	184	100.0	$1,026,176 94	100.0	$5,577 04
Commercial	43	23.4	$295,268 71	28.8	$6,866 71
Domestic	18	9.8	41,046 39	4.0	2,280 36
General	75	40.7	405,201 76	39.5	5,402 69
Hotel	11	6.0	119,434 76	11.6	10,857 71
Nurses	6	3.3	11,118 95	1.1	1,853 16
Oriental	21	11.4	35,433 38	3.5	1,687 30
Teachers	10	5.4	118,672 99	11.5	11,867 30

The total amount of money collected in fees by all agencies was greater in 1921-1922 than in the preceding year, although in the latter year, information was tabulated for less agencies. The total average fees per agency were in 1921-1922, $5,577.04, compared with an average of $5,33€.62 of the preceding year.

The largest proportion of the total fees collected in 1921-1922, namely, 39.5 per cent went to the general employment agencies. This class of agencies, however, constituted 40.7 per cent of all agencies tabulated. Commercial agencies collected in the same year $295,268.71, or 28.8 per cent of the total, although they constituted only 23.4 per cent of the total agencies tabulated. The teachers' agencies constituting 5.4 per cent of the total agencies considered collected 11.5 per cent of the total fees collected.

Table 18 shows the total number of positions furnished, the total fees collected and the average net fee per position, by sexes and by classes of agencies.

TABLE 18—Number of Positions Furnished by Private Employment Agencies, Total Fees Collected and Average Net Fee per Permanent and Temporary Positions by Classes of Agencies, 1921 and 1922.

Class of agency	Number of agencies reporting		Males and females					
			Total positions furnished		Total net fees collected		Average net fee per position	
	1920–1921	1921–1922	1920–1921	1921–1922	1920–1921	1921–1922	1920–1921	1921–1922
All agencies	192	184	281,270	263,656	$1,024,632 20	$1,026,176 94		
Commercial	40	43	26,603	30,760	$343,719 43	$295,268 71	$12 92	$9 60
Domestic	11	18	4,571	11,029	20,069 16	41,046 39	4 39	3 72
General	99	75	224,709	172,234	469,067 40	405,201 76	2 09	2 35
Hotel	5	11	8,990	32,529	34,429 50	119,434 76	3 83	3 67
Nurses	5	6	2,454	1,926	13,418 29	11,118 95	6 24	5 77
Oriental	22	21	12,653	12,763	39,600 86	35,433 38	3 13	2 78
Teachers	10	10	1,593	2,415	104,327 56	118,672 99	65 49	49 14
			Males					
All agencies	192	184	240,297	210,163	$679,617 16	$656,669 35		
Commercial	40	43	10,182	12,519	$151,682 75	$127,588 90	$14 90	$10 19
Domestic	11	18	154	2,487	670 40	7,066 34	4 35	2 84
General	99	75	211,633	165,081	433,384 98	$80,536 33	2 05	2 31
Hotel	5	11	5,247	16,756	21,078 77	70,946 06	4 01	4 23
Nurses	5	6	37	55	227 20	180 38	6 14	3 28
Oriental	22	21	12,615	12,649	39,474 51	35,170 33	3 13	2 78
Teachers	10	10	429	616	33,158 55	35,181 01	77 29	57 11
			Females					
All agencies	192	184	40,973	53,493	$345,015 04	$369,507 59		
Commercial	40	43	16,421	18,241	$192,036 68	$167,679 81	$11 69	$9 19
Domestic	11	18	4,417	8,542	19,398 76	33,980 05	4 39	3 98
General	99	75	13,076	7,153	35,682 42	24,665 43	2 73	3 45
Hotel	5	11	3,743	15,773	13,410 73	48,488 70	3 58	3 07
Nurses	5	6	2,114	1,871	13,191 09	10,938 57	6 24	5 85
Oriental	22	21	38	114	126 35	263 05	3 32	2 31
Teachers	10	10	1,164	1,799	71,169 01	83,491 98	61 14	46 41

The average net fees per position for all agencies have not been included in this table because they are considered of no significance. By net fees are meant the fees remaining with the agencies after certain fees have been returned to applicants as a result of their failure to secure positions. In 1920-1921, $172,802.41 was refunded to unsuccessful applicants, while in 1921-1922, $154,082.29 was refunded to unsuccessful applicants.

The total number of positions furnished include all positions and jobs regardless of their duration and the average fees quoted are based upon temporary and permanent jobs. The average fees would be different if they could be separated into average fees for permanent and temporary jobs. For reasons discussed below, this could not be done in compiling this report. Average fees for permanent positions would be considerably higher than the average fees shown in the tables presented; while, conversely, the average fees for temporary and casual jobs would be lower than the averages shown for such jobs.

It will be observed that the highest fees were charged by teachers' agencies; next highest by commercial agencies, nurses, domestic, hotel, oriental, and general, in order named, charged the highest average fees.

It will be observed further that the average fees for jobs furnished to women workers by general, domestic and nurses' agencies were higher than the average fees for jobs furnished to male workers by these agencies.

Fees Charged by Selected Representative Agencies.

The several tables next presented show the average fees charged by certain selected representative employment agencies. The data shown in these tables are based upon the reports of agencies which were found to be more complete in that they contained information covering operations for the entire year. An attempt has been made in the following tables to discover whether any difference existed in the charges made for jobs sold to workers in the busy and slack seasons of the year. For this purpose it was found necessary to include only established agencies which had reported business for each month of the year.

A word of caution is needed in connection with the use of the term "average fee." In the composition of this average enter jobs and positions of various durations. Short jobs lasting one week or less, as well as so-called "permanent" jobs are included in the average. The forms upon which the bureau requires the agencies to send in monthly reports make no provision for the separate reporting of temporary jobs.*

Most private employment agencies, therefore, commercial agencies, included, have been reporting casual jobs together with temporary and permanent jobs. Thus, if five supposedly permanent positions were sold during the day at $30 each, aggregating $150 in fees and another five supposedly temporary positions were sold the same day at $4 each, aggregating $20 in fees, the commercial employment agency reported to the bureau the total of ten positions sold for $170, making an average of only $17 per position.

Some of the agencies have been reporting one job two or more times. Thus, if a fee of $30 has been paid in three equal installments of $10 each, three jobs have been reported at $10 each, thereby reducing the average fee per job. In view of this manner of reporting, it is impossible to quote accurate average fees. The fees shown in the preceding, as well as in the following tables, are merely approximations and are in most instances lower than are the average fees prevailing.

Tables 19 and 20 show the average fees per job by months.

*This defect is now being remedied by the bureau.

TABLE 19—Number of Jobs Furnished to Male and Female Applicants by Selected Representative General, Domestic and Hotel Labor Agencies in the State and Average Cost Per Job to Applicants During Fiscal Years 1921 and 1922, by Sex and by Months.

1920-1921.

Months	Data for 59 agencies			Data for 29 agencies		
	Male applicants			Female applicants		
	Number of jobs furnished	Percentage distribution	Average fee per job	Number of jobs furnished	Percentage distribution	Average fee per job
Total	229,248	100 0	$2 16	21,519	100 0	$3 22
January	9,411	4 1	$2 72	2,248	10 4	$3 26
February	9,673	4 2	2 62	1,871	8 7	3 22
March	14,549	6 3	2 56	2,081	9 7	3 33
April	22,112	9 7	1 98	1,628	7 6	3 02
May	23,354	10 2	2 01	1,509	7 0	3 34
June	24,328	10 6	2 04	1,617	7 5	3 17
July	24,650	10 8	2 03	1,665	7 7	3 06
August	23,891	10 4	2 03	1,594	7 4	3 02
September	24,593	10 7	1 99	1,758	8 2	3 10
October	24,362	10 6	2 08	1,836	8 5	3 27
November	18,053	7 9	2 30	1,848	8 6	3 53
December	10,272	4 5	2 54	1,864	8 7	3 22

1921-1922.

	Data for 63 agencies			Data for 28 agencies		
Total	149,463	100 0	$2 31	26,303	100 0	$3 25
January	8,393	5 6	$2 36	2,095	8 0	$3 35
February	7,628	5 1	2 35	1,940	7 4	3 23
March	13,221	8 8	2 22	2,259	8 6	3 26
April	15,605	10 4	2 28	2,059	7 8	3 35
May	15,536	10 4	2 30	2,100	8 0	3 36
June	15,767	10 6	2 35	2,465	9 4	3 25
July	14,054	9 4	2 37	2,294	8 7	2 95
August	12,957	8 7	2 34	2,470	9 4	3 11
September	13,610	9 1	2 30	2,369	9 0	3 14
October	14,619	9 8	2 20	2,321	8 8	3 36
November	10,570	7 1	2 37	2,114	8 0	3 45
December	7,508	5 0	2 39	1,817	6 9	3 17

TABLE 20—Number of Jobs Furnished to Male Applicants by Selected Representative Oriental General, Domestic and Hotel Labor Agencies in the State and Average Cost per Job to Applicants during Fiscal Years 1921 and 1922, by Months.

Months	1920-1921			1921-1922		
	Data for 19 agencies			Data for 15 agencies		
	Number of jobs furnished	Percentage distribution	Average fee per job	Number of jobs furnished	Percentage distribution	Average fee per job
Total	12,990	100 0	$3 25	10,282	100 0	$2 99
January	889	6 8	$2 94	728	7 1	$3 18
February	982	7 5	2 88	669	6 5	3 12
March	1,095	8 4	3 07	870	8 5	2 94
April	1,142	8 8	3 32	980	9 5	2 96
May	1,210	9 3	3 23	785	7 6	3 29
June	1,230	9 5	3 34	920	9 0	3 00
July	1,082	8 4	3 74	855	8 6	3 15
August	1,153	8 9	3 73	943	9 2	3 10
September	1,086	8 4	3 58	946	9 2	2 87
October	1,112	8 6	3 21	916	8 9	2 69
November	1,001	7 7	2 93	847	8 2	2 89
December	1,007	7 7	2 86	793	7 7	2 76

It is interesting to note (Table 19) that during the seven months of April, May, June, July, August, September, and October of 1921, the average fees were less than was the average for the whole year. During these seven months 73 per cent of all jobs were sold and only 68 per cent of the total fees were collected. The total fees charged for the 229,248 jobs amounted to $494,171. Of this amount, $338,295.19, or 68 per cent, was collected during the seven busy months during which 73 per cent of all jobs were sold. In 1922 the jobs were more evenly distributed throughout the year; so that the average fees charged during the busier months are not uniformly lower than in the relatively slack months. On the whole, however, it will be observed that during the months of January, February, November and December, when jobs were relatively fewer, the fees were higher than the average fee for the year. The conclusion to be derived from these figures appears to be that jobs sell at higher prices when they are fewer in number and vice versa. The average fees charged by general labor employment agencies seem to be determined by the demand for and the supply of jobs. The business of the private general labor employment agencies is competitive in that no regular rates for jobs exist. A job in the slack season draws a higher fee than the same job in the busy season when there are less jobless workers.

Table 21 shows the average fees per job charged by the general and oriental agencies in principal cities and in all cities.

TABLE 21—Average Fee per Temporary and Permanent Job Charged by Selected Representative General, Domestic and Oriental Employment Agencies in California during 1921 and 1922, by Cities.

General Agencies—Male Applicants.

Cities	1920-1921			1921-1922.		
	Number of jobs	Number of representative agencies	Average fee	Number of jobs	Number of representative agencies	Average fee
All cities	229,248	59	$2 16	149,463	63	$2 31
San Francisco	67,570	10	$2 24	35,765	11	$2 81
Los Angeles	62,078	15	2 37	52,555	12	2 34
Sacramento	55,259	12	2 04	24,965	7	2 24
Stockton	18,665	6	2 01	13,590	5	2 01
San Diego	7,336	3	1 29	5,821	3	1 14
*Oakland	911	4	4 01	692	3	3 82
All other towns	17,429	9	1 86	16,075	12	1 83
General and Domestic Agencies—Female Applicants.						
All cities	21,519	29	$3 22	26,303	28	$3 25
San Francisco	4,530	6	$3 81	7,917	8	$3 79
Los Angeles	11,254	9	3 40	13,169	8	3 28
All other towns	5,735	14	2 39	5,217	12	2 34
Oriental Agencies—Male Applicants.						
All cities	12,990	19	$3 25	10,282	15	$2 99
San Francisco	3,802	9	$6 74	2,687	7	$6 57
Los Angeles	6,290	4	2 05	5,689	3	1 68
All other towns	2,898	6	1 28	1,906	5	1 85

*The Oakland agencies included in this table are Hotel and Domestic Agencies.

It will be observed that the average fee charged female applicants in 1921 was $3.22 as compared with $2.16 charged male applicants. This difference is accounted for by the fact that the jobs sold female applicants are usually classified as permanent jobs, and the fees for these jobs range from five to ten per cent of the first month's wages and are in the greatest number of cases ten per cent. The average for general agencies was $2.31 for the fiscal year 1922 as compared with $2.16 for the fiscal year 1921.

The highest average fee shown is that for the oriental agencies. The San Francisco oriental agencies charge an average of $6.74 for temporary and permanent jobs. Practically all San Francisco oriental agencies charge ten per cent of the first month's wages. The Los Angeles oriental offices, it will be observed, charge an average of $2.05. The reason for the lower average Los Angeles fee is that Los Angeles oriental offices handle a large number of agricultural laborers who are sent out on temporary work. Oakland agencies, which are domestic and hotel agencies, show an average fee per job of $4.01. These Oakland agencies charge at the rate of ten per cent of the first month's salary. If permanent jobs only were considered, the average fee would be about $8 or $10.

Fees Charged by Selected Representative Commercial Agencies.

About one-fourth of all the agencies licensed by the bureau are designated as commercial. There are fifty-six of these agencies in the state, which is 24 per cent of the total licensed by the commissioner from April 1 to November 1, 1922 (Table 16).

As shown in the preceding table (Table 16) Los Angeles ranks highest in the number of commercial agencies. Of the fifty-six commercial agencies operating in the state, 23 operate in Los Angeles and 16 operate in San Francisco. These agencies specialize in furnishing stenographers, bookkeepers, typists, clerks and other office help. The fees charged by these agencies vary from 17.5 per cent to 50 per cent of the office workers' first month's salary. Nearly all contracts of these agencies provide for lower percentage fees when fees are paid in advance of taking the job within one or two weeks after the applicant has begun working. The following is a sample of a typical contract which an applicant for employment is required to sign when applying for a position at commercial employment agencies.

THE JOHN DOE AGENCY
John Doe, Manager

Member
National Employment Board

San Francisco,

Residence ..... Name .....
Date ..... Phone No. ..... Religion .....
Position wanted? .....
Minimum salary to start? ..... Education? .....
Experience? (Years) ..... Age? ..... Nationality? ..... Married? .....
What foreign languages, if any, can you speak? ..... Would you go to the country? .....
Are you a bookkeeper? ..... Full charge or assistant? ..... Good at Figures? ..... Cashier? .....
Stenographer? ..... Typist? ..... What typewriter can you operate? .....
Biller? ..... Speed Shorthand? ..... Speed typing? ..... Touch System? .....
Dictaphone? ..... Multigraph? ..... Telephone Exchange? ..... Comptometer? .....
Machine Biller? ..... Fisher Biller? ..... Adding Machine? .....
Underwood, Elliott Fisher, Remington or Burroughs Bookkeeping Machine? .....
Policy writer? ..... Bordereau? ..... Hollerith? .....
Last Employer? ..... Salary? .....
Reason for leaving? .....
Additional information .....
Do you understand our terms of commission? ..... Will you pay cash for a position? .....

(NOTE—On the other side of this sheet, in space indicated give record of past employment.

CONTRACT

(Read this carefully before you sign it.)

Upon accepting a position through information furnished me either directly or indirectly by the John Doe Agency, hereinafter called the AGENCY, I agree to pay the said AGENCY at its offices in San Francisco, California, a sum amounting to

27 per cent of the first month's salary on the day of accepting the position, or

30 per cent of the first month's salary within fifteen days of accepting the position, or

35 per cent of the first month's salary within thirty days of accepting the position, one-half of which shall be paid within fifteen days and the balance within the thirty days.

Should I leave the position of my own accord, I agree to pay the full commission as above.

Should I involuntarily lose a position after seven days and before the end of the first month, I agree to pay 10 per cent of the amount actually received by me and I further agree to inform the AGENCY and pay any commission within 24 hours after losing the position and failing to do so I agree to pay the full commission as above.

If board and room form a portion of the remuneration, commission on the same shall be computed at the rate of $30.00 per month.

Should I fail to pay my commission within the time specified above, in order to compensate the AGENCY for delays and cost of collection I agree that my commission shall be increased 25 per cent.

I agree to regard all information given me by the AGENCY as confidential and for my own exclusive use, and I agree further to become personally responsbile for any loss to the AGENCY should I violate this clause of the contract.

I have read the above contract and accept it as a binding and legal agreement.

Dated at San Francisco, Cal., this_____day of_____192...

Residence_____ Signed_____

It is not unusual for office workers securing positions through commercial agencies to have to pay from $25 to $50 for their opportunities. For temporary positions, commercial agencies generally charge ten per cent of the amount earned.

The bureau has secured copies of contracts of thirty-three commercial agencies. The percentages of the first month's salary charged by these agencies are shown in the following table:

TABLE 21a—Number of Commercial Agencies Charging Specified Percentages of Applicants' First Month's salaries as Fees for Supplying "Permanent" Positions.

Percentages of first month's salaries charged as fees for "permanent" positions	Number of agencies
Total	3
Not less than 10 per cent nore more than 10 per cent	2
Not less than 15 per cent nor more than 20 per cent	1
Not less than 15 per cent nor more than 25 per cent	1
Not less than 17.5 per cent nor more than 25 per cent	1
Not less than 20 per cent nor more than 25 per cent	3
Not less than 20 per cent nor more than 30 per cent	1
Not less than 25 per cent nor more than 25 per cent	5
Not less than 25 per cent nor more than 30 per cent	4
Not less than 25 per cent nor more than 33 per cent	4
Not less than 25 per cent nor more than 50 per cent	3
Not less than 27 per cent nor more than 30 per cent	1
Not less than 27 per cent nor more than 35 per cent	1
Not less than 30 per cent nor more than 35 per cent	4
Not less than 33.3 per cent nor more than 50 per cent	2

It will be seen that the fees charged by 28 of the 33 agencies tabulated range from 20 to 50 per cent of the first month's salary.

In Tables 22 and 23 the average fees for permanent and temporary positions have been grouped in order to show their frequencies. Only those of the commercial agencies have been included in these tables whose reports were considered sufficiently accurate for the purpose.

TABLE 22—Number and Per Cent of Positions Secured by Male Applicants From Certain Commercial Agencies at Specified Average Fees During Fiscal Years 1921 and 1922, by Specified Cities.

Average fees per permanent and temporary positions	Number of positions secured at specified average fees								
	Total for State			San Francisco		Los Angeles		Other places	
	1921 and 1922	1921	1922	1921	1922	1921	1922	1921	1922
Total	13,326	7,081	6,245	3,004	2,668	3,766	3,121	311	456
Under $3.00	13	6	7		6			6	1
$3.00 to $6.00	147	90	57	53			32	37	25
$6.00 to $9.00	1,150	627	523	365	141	227	209	35	173
$9.00 to $12.00	2,970	1,885	1,085	152	283	1,683	784	50	18
$12.00 to $15.00	2,332	704	1,628	258	538	421	1,050	25	40
$15.00 to $18.00	1,358	597	761	377	617	202	124	18	20
$18.00 to $21.00	12,59	439	820	319	766	120	14		40
$21.00 to $24.00	810	606	204	558	87	42	67	6	50
$24.00 to $27.00	424	265	159	160	72	68	50	37	37
$27.00 to $30.00	787	472	315	373	60	89	229	10	26
$30.00 to $33.00	611	250	361	154	47	30	298	66	16
$33.00 to $37.00	617	382	235	153	40	215	185	14	10
$37.00 to $40.00	302	229	73	48	11	181	62		
$40.00 and over	546	529	17	34		488	17	7	
	Percentages of positions secured at specified average fees								
Total	100 0	100 0	100 0	100 0	100 0	100 0	100 0	100 0	100 0
Under $3.00	1	1	1		2			1 9	2
$3.00 to $6.00	1 1	1 3	9	1 8			1 0	11 9	5 5
$6.00 to $9.00	8 6	8 9	8 4	12 1	5 3	6 0	6 7	11 3	38 0
$9.00 to $12.00	22 3	26 6	17 4	5 1	10 6	44 7	25 1	16 1	3 9
$12.00 to $15.00	17 5	9 9	26 1	8 6	20 2	11 2	33 6	8 0	8 8
$15.00 to $18.00	10 2	8 4	12 2	12 6	23 1	5 4	4 0	5 8	4 4
$18.00 to $21.00	9 4	6 2	13 1	10 6	28 7	3 2	5		8 8
$21.00 to $24.00	6 1	8 6	3 2	18 6	3 3	1 1	2 1	1 9	11 0
$24.00 to $27.00	3 2	3 7	2 5	5 3	2 7	1 8	1 6	11 9	8 1
$27.00 to $30.00	5 9	6 7	5.0	12 4	2 2	2 4	7 3	3 2	5 7
$30.00 to $33.00	4 6	3 5	5 8	5 1	1 8	8	9 6	21 2	3 5
$33.00 to $37.00	4 6	5 4	3 8	5 1	1 5	5 7	5 9	4 5	2 2
$37.00 to $40.00	2 3	3 2	1 2	1 6	4	4 8	2 0		
$40.00 and over	4 1	7 5	.3	1 1		12 9	6	2 3	

TABLE 23—Number and Per Cent of Positions Secured by Female Applicants From Certain Commercial Agencies at Specified Average Fees During Fiscal Years 1921 and 1922, by Specified Cities.

Average fees per permanent and temporary positions	Number of positions secured at specified average fees								
	Total for state			San Francisco		Los Angeles		Other places	
	1921 and 1922	1921	1922	1921	1922	1921	1922	1921	1922
Total	27,732	13,844	13,888	6,682	5 642	6,373	7,293	789	953
Under $3.00									
$3.00 to $6.00	2,914	1,450	1,464	936	54	316	1,234	198	176
$6.00 to $9.00	5,667	2,969	2,698	411	993	2,309	1,376	249	329
$9.00 to $12.00	9,634	3,770	5,864	2,078	3,199	1,587	2,500	105	165
$12.00 to $15.00	3,714	2,260	1,454	1,642	1,006	553	349	65	99
$15.00 to $18.00	2,235	1,502	733	1,173	223	302	435	27	75
$18.00 to $21.00	1,917	918	999	275	118	498	772	145	109
$21.00 to $24.00	1,354	857	497	137	38	720	459	.....	.....
$24.00 to $27.00	196	69	127	22	11	47	116	.....	.....
$27.00 to $30.00	101	49	52	8	.....	41	52	.....	.....
$30.00 and over									
	Percentages of positions secured at specified average fees								
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Under $3.00									
$3.00 to $6.00	10.5	10.5	10.5	14.0	1.0	5.0	16.9	25.1	18.5
$6.00 to $9.00	20.4	21.4	19.4	6.2	17.6	36.2	18.9	31.6	34.5
$9.00 to $12.00	34.7	27.2	42.2	31.1	56.7	24.9	34.3	13.3	17.3
$12.00 to $15.00	13.4	16.3	10.5	24.6	17.8	8.7	4.8	8.2	10.4
$15.00 to $18.00	8.1	10.9	5.3	17.6	3.9	4.7	5.9	3.4	7.9
$18.00 to $21.00	6.9	6.6	7.2	4.1	2.1	7.8	10.6	18.4	11.4
$21.00 to $24.00	4.9	6.2	3.6	2.0	.7	11.3	6.3	.....	.....
$24.00 to $27.00	.7	.5	.9	.3	.2	.7	1.6	.....	.....
$27.00 to $30.00	.4	.4	.4	.1	.....	.7	.7	.....	.....
$30.00 and over									

It will be observed that in 1922, 68.8 per cent of the male applicants paid fees ranging from $9 to $21 per job. The modal average fee, that is the fee occurring most frequently during 1922 were between $12 and $15 for male applicants. The modal average fee for female applicants was in the same period between $9 and $12 for both temporary and permanent positions.

List of Employment Agencies to Whom Licenses Have Been Issued Up To November 1 1922, For the Year Ending March 31, 1923.

SAN FRANCISCO.

License No.		
	COMMERCIAL.	
235.	Active Personal Service Agency	995 Market street
2.	Bookkeepers' and Stenographers' Exchange Agency	315 Montgomery street
8.	Bureau of Occupations Agency	68 Post street (Fayeraft Building)
96.	Business Men's Clearing House Agency	523 Market street
5.	Business Service Bureau Agency	204 Hearst Building
7.	Clerical Placement Bureau Agency	593 Market street
1.	Commercial Expert Company Agency	809 Pacific Building
48.	Commercial Placement Bureau	830 Market street
123.	Community Placement Bureau	908 Phelan Building
106.	The Hawthorne Company Agency	601 Market street
129.	Kemp Agency	681 Market street
6.	Mercantile Service Agency	68 Post street
21.	Pacific Audit and System Company Incorporated, Agency	57 Post street (604 Mec. Inst. Building)
98.	San Francisco Clerical Agency	785 Market street
231.	Olivia Stengel, Vocational Director Agency	74 New Montgomery street (543 Call Building)
105.	Western Service Bureau Agency	760 Market street
	GENERAL.	
19.	American Sunset Employment Agency	768 Howard street
210.	Cosmopolitan Employment Agency	757 Howard street
50.	Duperu and Company Agency	752 Howard street
99.	Elite Employment Agency	935 Market street
141.	International Employment Agency	726 Howard street
133.	Italian Employment Agency	1011 Kearny street
140.	Metropolitan Employment Agency	23 Embarcadero
20.	Mitchell and Company Agency	805 Howard street
10.	Murray and Ready Agency	784 Howard street
56.	National Employment Agency	743 Howard street
108.	Reliable Employment Agency	775 Howard street
49.	Treacy's Employment Agency	720 Howard street
	THEATRICAL.	
17.	Ackerman and Harris Agency	344 Phelan Building
4.	Blake and Amber Amusement Agency	973 Market street
109.	Coast Amusement Agency	607 Pantages Building
225.	De Reeat Corporation	1061 Market street
109.	Bert Levey Circuit Agency	Alcazar Building
182.	Meiklejohn and Dunn Agency	501 Pantages Building
203.	Screen Service Bureau Agency	25 Stockton street
	TEACHERS.	
129.	Kemp Agency	681 Market street
	DOMESTIC.	
107.	Andre's Employment Agency	1801 Buchanan street
155.	Dillon Employment Agency	1851 Sutter street
	HOTEL.	
130.	California Hotels Employment Agency	1112 Market street
127.	Mrs. M. E. Day Agency	628 Ellis street
3.	Federated Employment Agency	964a Market street
9.	Gibbs Employment Agency	330-2 Pacific Building
33.	Hotel Reporter Employment Agency	966 Market street
14.	Knight's Employment Agency	16 Geary street
18.	Norton's Employment Agency	1701 Geary street
151.	Plunkett Employment Agency	1896 Sutter street
	ORIENTAL.	
131.	Grant Employment Agency	821 Sacramento street
15.	Hori and Company Agency	1711 Post street
177.	Japan American Employment Agency	1623 Buchanan street
181.	Japanese Employment and Housecleaning Agency	2122 Fillmore street
104.	Kinney Employment Agency	785 Clay street
55.	Knoph Employment Agency	777 Clay street
217.	John Quan Lee Agency	737 Grant avenue
157.	New Grant Employment Agency	960 Grant avenue
16.	Ong Foon Agency	1 Brenham street
138.	Oriental Employment Agency	1647 Post street
47.	Philipino Employment Agency	623 Pacific street
103.	Tamura and Company Agency	1646 Post street

List of Employment Agencies to Whom Licenses Have Been Issued up to November 1, 1922, for the Year Ending March 31, 1923—Continued.

LOS ANGELES.

License No.		
	COMMERCIAL.	
230.	Adjustment and Replacement Service Agency	321 West Third street
184.	Automotive Agencies	1316 S. Grand street
31.	B. and I. Office Service Company Agency	508 Pacific Mutual Building
159.	B. and T. Efficiency Bureau Agency	228 West Fourth street
35.	F. S. Beavis Agency	1117 Chapman Building
71.	Bonded Service Agency	130 South Broadway
191.	Bost and Jones Agency	977 East Twelfth street
218.	Business Men's Clearing House Agency	510 South Spring street
23.	California Commercial Service Agency	512 West Sixth street
156.	Collins Commercial Service Agency	600 Broadway, Central Building
220.	Consolidated Agencies, Incorporated	740 South Broadway
29.	Educational Expert Company Agency	219 West Seventh street
28.	Employers Service Bureau Agency	415 Merritt Building
226.	Hollywood Bureau of Employment	6623½ Hollywood boulevard
222.	Hollywood Employment Agency	6356 Hollywood boulevard
30.	Los Angeles Commercial Service Agency	238 Van Nuys Building
126.	New Era Placement Bureau Agency	315 South Broadway
154.	Office Efficiency Bureau Agency	315 South Broadway
68.	Organization Builders Agency	108 West Sixth street
22.	Pacific Audit and System Company Incorporated, Agency	802 Story Building
60.	Pacific Coast Record Agency	510 Title Insurance Building
171.	Pacific Commercial Service Agency	933 Title Insurance Building
26.	Pacific Service and Pacific Teachers' Agency	228 West Fourth street
	GENERAL.	
173.	Big Four Employment Agency	205 East Second street
34.	C. and C. Employment Agency	119 East Second street
150.	Coleman Employment Agency	211 East Second street
63.	Hummel Brothers Agency	116 East Second street
62.	Hummel Brothers Agency	538 Douglas Building
132.	International Labor Agency	403 North Main street
111.	Los Angeles Labor Agency	117 North Main street
11.	Murray and Ready Agency	110½ Second street
58.	Plaza Employment Agency	432 North Main street
66.	Red Crossing Employment Agency	134 East Second street
70.	Rodriguez, R., Agency	426 North Main street
	THEATRICAL.	
65.	Actors' Equity Association Agency	6412 Hollywood boulevard
100.	Artist's Booking Exchange Agency	6015 Hollywood boulevard
167.	Ted Braun Agency	520 South Broadway
200.	Classic Film Actors Agency	310 Grosse Building
208.	Mabel Condon Exchange Agency	Hollywood Security Building
69.	Hollywood Studios, Incorporated, Agency	6642 Santa Monica Building
152.	Inglis Motion Picture and Theatrical Eng. Bureau Agency	6324 Hollywood boulevard
233.	Bert Levey Circuit Agency	Jr. Orpheum Building, Eighth floor
139.	Lichtig and Rothwell Agency, Incorporated	6372 Hollywood boulevard
128.	Meiklejohn and Dunn Agency	801 Majestic Theatre Building
158.	Parks Vaudeville and Booking Agency	406 South Main street
169.	Picture Players Exchange Agency	210 Mason Opera House Building
219.	Producers Film and Photoplay Exchange Agency	643 South Olive street
168.	Robertson and Webb Agency	816 Pacific Mutual Building
205.	Screen Talent Representatives	312 West Second street
125.	Service Bureau Agency	1036 South Hill street
32.	Walter E. Trask Theatrical Exchange Agency	337½ South Main street
	TEACHERS.	
201.	American Teachers' Agency	605 Detwiler Building
142.	Boynton Teachers' Agency	520 West Seventh street
195.	Clark Teachers' Agency	420 California Building
124.	Coddington Teachers' Agency	533 Citizens National Bank Building
36.	Fisk Teachers' Agency	510 Spring street
26.	Pacific Service and Pacific Teachers' Agency	228 West Fourth street
118.	Rocky Mountain Teachers' Agency	508 Pacific Mutual Building
194.	Teachers' Cooperative Agency	734 Loew's State Building
	DOMESTIC.	
212.	Dillon Reliable Employment Agency	105 Court street
25.	Hawley Employment Agency	254 South Broadway
61.	Henderson Employment Agency	212 West Third street
211.	Hollywood-Wilshire Employment Bureau	1011 Northwestern avenue
24.	Mrs. Patten's Employment Agency	253 South Broadway
	HOTEL.	
61.	Henderson Employment Agency	212 West Third street
27.	Hess Employment Agency	126 West Third street
115.	Swedish American Employment Agency	101½ South Broadway
95.	Tourist and Hotel Reporter Employment Agency	145 South Spring street
117.	Tuckers' Hotel and Restaurant Employment Agency	211½ West Second street
	ORIENTAL.	
59.	A. B. C. Japanese Employment Agency	223 Boyd street
110.	Eagle Japanese Employment Agency	624 West Sixth street
146.	Filipino-American Employment Agency	342 North Main street
176.	Oriental Employment Agency	107 Marchessault street
57.	Pacific Japanese A. A. A. Employment Agency	624½ West Sixth street

List of Employment Agencies to Whom Licenses Have Been Issued up to November 1, 1922, for the Year Ending March 31, 1923—Continued.

OAKLAND.

License No.		
	COMMERCIAL.	
37.	Block Agency	205 First Savings Bank Building, Sixteenth and San Pablo avenue
73.	East Bay Clerical Bureau Agency	912 Federal Building
	DOMESTIC.	
122.	Arts and Crafts Agency	1512 Broadway
74.	Nelson's Employment Agency	470 Thirteenth street
72.	Oakland Employment Agency	1510 Franklin street
	HOTEL.	
75.	Peoples Employment Agency	419 Fifteenth street
	ORIENTAL.	
149.	Chenz Yuen Employment Agency	541 Webster street
178.	Japanese-Chinese Employment Agency	805 Franklin street

BERKELEY.

	COMMERCIAL.	
120	Bureau of Occupations, University of California	113 California Hall, University of California
	TEACHERS.	
97.	Esterly Teachers' Agency	2161 Shattuck avenue
116.	Fisk Teachers' Agency	2161 Shattuck avenue
165.	J. M. Han Teachers' Agency	2161 Shattuck avenue
51.	McNeill Teachers' Agency	Center and Oxford streets
52.	Western Teachers' Exchange Agency	Berkeley Bank Building

FRESNO.

	COMMERCIAL.	
207.	Business Men's Headquarters Exchange Agency	417 Rowell Building
	GENERAL.	
81.	Brown's Employment Agency	2234 Tulare street
112.	Independent Employment Agency	2460 Tulare street
44.	Wright Employment Agency	1038½ H street

PASADENA.

	COMMERCIAL.	
54.	Pasadena Service Bureau Agency	344 Chamber of Commerce Building
	DOMESTIC.	
89.	Boston Employment Agency	141 North Euclid avenue
227.	National Employment Agency	811 South Fair Oaks avenue
119.	Mrs. C. J. Weylandt's Employment Agency	124 North Broadway
	ORIENTAL.	
70.	Mikado Employment Agency	107 South Fair Oaks avenue
162.	Yamoto Employment Agency	158 Colorado street

SACRAMENTO.

	COMMERCIAL.	
196.	California Service Company Agency	1026 Second street
214.	Club Employment Agency	1024 Third street
197.	Sacramento Placement Bureau	1024 Forum Building
	GENERAL.	
161.	American Labor Agency	205 J street
42.	Big Four Labor Agency (retired from business October 7, 1922)	129 J street
113.	Big Three Sacramento Employment Agency	1026 Second street
40.	Breslau and Company Red Cross Employment Agency	203 I street
76.	Capital Employment Agency	904½ Second street
134.	Cosmopolitan Labor Agency	918 Second street
188.	49 Employment Agency	129 K street
42.	Murray and Ready Agency	1004 Second street
43.	National Employment Agency	926 Second street
57.	Original California Employment Agency	1001 Second street
78.	Pacific Coast Labor Agency	1014a Second street
190.	Standard Employment Agency	1104 Second street
215.	West Coast Employment Agency	123 K street
198.	Western Labor Bureau	1281½ J street
41.	Wide Awake Employment Agency	910 Second street

List of Employment Agencies to Whom Licenses Have Been Issued up to November 1, 1922, for the Year Ending March 31, 1923—Continued.

SAN DIEGO.

License No.		
	COMMERCIAL.	
102.	Employment Counselors Agency	1127 First National Bank Building
101.	Employment Specialists Agency	477 Spreckels Building
160.	Enterprise Employment Agency	129 J street
143.	Expert Service Bureau Agency	550 Spreckels Building
	GENERAL.	
83.	Federal Employment Agency	955 First street
223.	Henry Frati Employment Agency	441 Fifth street
175.	Model Employment Agency	929 Third street
147.	Western Employment Agency	814 Fourth street
	TEACHERS.	
148.	Golden West Teachers' Agency	1025 Fourth street, 413 Owl Building
	HOTEL.	
153.	Reliable Employment Bureau Agency	1130 Seventh street
213.	San Diego Employment Agency	2445 Fifth street
206.	Star Employment Agency	26 Sefton Building

STOCKTON.

	GENERAL.	
114.	Big Three Stockton Employment Agency	46½ South Center street
172.	Independent Employment Agency	28 East Market street
38.	Kings Employment Agency	114 South San Joaquin street
82.	Moffett and Barcena Agency	11 West Main street
13.	Murray and Ready Agency	Main and Center streets
189.	Pacific Employment Company Agency	44 East Market street
229	Rizal Employment Agency	240 South El Dorado street
39.	Standard Employment Agency	14 West Main street
53.	Steele Employment Agency	111 South San Joaquin street
155.	Williams Employment Agency	6 West Market street

ANAHEIM.

	GENERAL.	
234.	Anaheim Employment Agency	102 South Clementine street

BAKERSFIELD.

	GENERAL.	
137.	California Employment Agency	1817 Chester avenue
	NURSES.	
94.	Bakersfield Nurses Registry Agency	1728 Truxton avenue

BURLINGAME.

	DOMESTIC.	
84.	Burlingame Employment Agency	710 Peninsula avenue

EUREKA.

	GENERAL.	
85.	Kerr Employment Agency	307 Second street
86.	Metropole Employment Agency	215 D street

FORT BRAGG.

	GENERAL.	
144.	Fort Bragg Employment Agency	306 Franklin street

LONG BEACH.

	COMMERCIAL.	
202.	Commercial Service Bureau Agency	457 West Ocean avenue
193.	Pacific Employment Agency	38 Pine avenue
	NURSES.	
192.	Nurses Central Registry Association, the Graduate Nurses Association	152 Elm avenue
	ORIENTAL.	
145.	Togo Employment Agency	216 Elm street

List of Employment Agencies to Whom Licenses Have Been Issued up to November 1, 1922, for the Year Ending March 31, 1923—Continued.

MERCED.

GENERAL.

License No.		
93.	Warfield Employment Agency	517 Canal street
46.	Wright Employment Agency	517 Canal street

MODESTO.

GENERAL.

174.	Independent Employment Agency	805 Eighth street

MONROVIA.

NURSES.

204.	Monrovia Placement Bureau	319 South Heliotrope street

POMONA.

COMMERCIAL.

186	Pomona Valley Employment Agency	442 Investment Building, Third and Townsend streets

RED BLUFF.

GENERAL.

121.	C. A. Brown Agency	416 Walnut street

REDDING.

COMMERCIAL.

89.	Redding Employment Agency	432 Yuba street

GENERAL.

88.	Standard Employment Agency	510 California street

RIVERSIDE.

GENERAL.

87.	Toler Employment Agency	Eighth and Market streets

SAN BERNARDINO.

GENERAL.

45.	Boesenberg and Son Employment Agency	396 Third street
170.	Fortier's Employment Agency	326 F street
180.	Preciado Employment Agency	414 Court street
183.	Tafolla, A. M., Agency	315 D street

SANTA ANA.

GENERAL.

64.	Hummel Brothers Agency (closed May 12, 1922)	404 East Fourth street
163.	Palace Employment Agency	320 East Fourth street

HOTEL.

228.	Jackson-Goddard Employment Agency	201 Spurgeon Building

OCEAN PARK.

ORIENTAL.

92.	Japanese Employment Agency	2653 Main street

OROVILLE.

GENERAL.

221.	Oroville Employment Agency	523 Montgomery street

List of Employment Agencies to Whom Licenses Have Been Issued up to November 1, 1922, for the Year Ending March 31, 1923—Concluded.

SANTA BARBARA.

License No.		
	DOMESTIC.	
90.	Austin Employment Agency	722 Anacapa street
	GENERAL.	
224.	Caesar R. Taylor Emp. Agency	515 Garden street
	HOTEL.	
216.	Johnston's Employment Agency	734 State street
	ORIENTAL.	
66.	Japanese Employment Agency	125 East Canon Perdido street

SANTA MARIA.

	DOMESTIC.	
64.	Santa Maria Employment Agency	601 West Main street

VACAVILLE.

	GENERAL.	
187.	George F. Ream Agency	Vacaville

VENICE.

	COMMERCIAL.	
209.	Washington Boulevard Employment Agency	814 Washington boulevard

VENTURA.

	GENERAL.	
185.	Tolman Brothers Agency	4 Arcade Building

VISALIA.

	GENERAL.	
91.	Howell Employment Agency	101 North Garden street

THE PUBLIC FREE EMPLOYMENT BUREAUS.

The Need for More Offices.

The act authorizing the creation of free public employment bureaus became a law on August 18, 1915. In February, 1916, were opened the San Francisco, Sacramento, Los Angeles and Oakland free public employment offices. Since then offices were established in Fresno, San Jose, Stockton, Marysville and Chico.

The Marysville and Chico offices were made permanent at the close of the fiscal year in 1917-1918, but owing to lack of sufficient business, the offices were discontinued on July 31, 1921. However, both of these offices were opened again as seasonal offices in 1922. The Marysville office was opened again on May 13, 1922, and was closed on October 11, 1922; while the Chico office was reopened on August 28, 1922, and was closed on October 26th of the same year. Other seasonal offices were operated in Modesto and in Lodi. The Bakersfield office was opened as a permanent office on June 29, 1922.

The work of the free public employment offices has been of genuine usefulness and importance to both the workers and the employers of the state. Especially has the work of our free public employment bureaus been of value to the thousands of jobless workers who were afforded opportunities to work without paying for these opportunities. It is becoming an increasingly accepted principle that no one should be called upon to buy the means of honestly earning his livelihood. The State of California, like many other forward looking states, recognized this principle in 1915 when it passed the Free Public Employment Bureaus Act. The extension of this principle by the opening up of more free employment offices is now most urgently needed.

The act establishing free employment agencies, authorizes the Commissioner to establish additional free employment bureaus "whenever he deems it necessary," but limited appropriations have made the establishment of such additional offices impossible. Were it not for the limited appropriations the Commissioner would have established free employment offices in the cities of San Diego, Long Beach and El Centro where such offices are urgently needed.

It is only fair and just that the opportunities extended by the state to wage earners in several cities of the state should be afforded also to citizens of other cities where large groups of employers and of workers could benefit thereby.

The effect of the establishment of the free public employment offices upon private employment agencies has been shown above in Table 15. The free public employment offices have not only reduced the number of private employment agencies but have also acted as a powerful check against their increase in the state. The work of the free public bureaus has also influenced the fees charged by the general private employment offices. In the presence of free employment offices, private employment agencies must of necessity charge more reasonable fees.

The preceding observations concerning the effect of the free employment offices upon the private employment agencies do not apply to the private

commercial employment agencies. The state free public employment system has thus far afforded no check upon the fees charged by these agencies or upon their number. The exception to this statement is the Los Angeles office. From the data submitted below it will be seen that the commercial branch of the free employment office of Los Angeles was responsible for a large number of clerical and professional placements. In 1920-1921, the Los Angeles offices placed 3745 regular clerical and professional workers, in addition to several hundred of shipping clerks, stock clerks, etc. In 1921-1922, this office placed 3573 such workers. It is obvious that the presence of such an office in the city must act as some deterrent upon the establishment of more private commercial offices. The clerical placement work of the Oakland office might also be considered of considerable magnitude to have influenced the slow growth of private commercial employment offices in that city.

It was shown above, in the section on private employment agencies, that commercial agencies collected during 1921-1922, 28.8 per cent of the total fees collected by all the classes of agencies (theatrical excluded). Unless the exorbitant fees charged by most of the private commercial employment agencies are eliminated by proper legislation, the public employment system should be sufficiently strengthened financially to enable it to compete effectively with the private agencies of this class.

Summary of Statistics of the Free Public Employment Offices.

Detailed statistics showing the work of the free public employment system will be found in Part III of this report. The following is a summary of the principal facts:

1. During the biennial fiscal period covered by this report, the free public employment bureaus have furnished 345,410 jobs to 146,054 wage earners applying for work, or an average of 2.36 jobs per individual.

2. Of the total number of the 345,410 jobs furnished, 61,039, or 17.7 per cent were jobs furnished women workers.

3. Of the total number of jobs furnished during the biennial period 1920-1921 and 1921-1922, 245,238 or 71 per cent were placements within the several cities in which the office have operated, while 100,172 or 29 per cent were placements outside of these cities.

4. The duration of the jobs offered were as follows:

Number of days and years	Per cent of total jobs
One day or less	
1920-1921	25.7
1921-1922	28.0
2 to 7 days.	
1920-1921	16.2
1921-1922	22.1
8 days or over.	
1920-1921	58.1
1921-1922	49.1
Total	
1920-1921	100.0
1921-1922	100.0

Taking both years together the number of jobs which were of eight days duration or over was 187,180 or 54.2 per cent of the total number of jobs furnished this period.

5. The several permanent offices of the free public employment system ranked in 1921-1922 in the order of the greatest number of jobs they furnished applicants as follows:

1. Los Angeles.
2. San Francisco.
3. Oakland.
4. Fresno.
5. San Jose.
6. Sacramento.
7. Stockton.

In the year 1920-1921 the order was the same with the exception that during that year Sacramento had furnished more jobs than did San Jose.

6. During the biennial period covered by this report employers ordered a total of 418,067 persons. The number of persons wanted by employers was 72,657 in excess of the number of jobs furnished to applicants. The number of persons ordered by employers is often in excess of what he actually needs. The excess number of employes is ordered to insure the securing of the actual number wanted.

7. The following are the numbers and percentages of placements by industries and principal occupations:

Industry and principal occupation	1920-1921		1921-1922	
	Number	Per cent of total	Number	Per cent of total
Total	180,331	100 0	165,079	100 0
Hotels, restaurants, apartments, cafeterias, camps, clubs, hospitals and institutions	26,662	14 8	21,095	12 8
Building construction	25,324	14 0	37,603	22 8
Private homes	23,871	13 2	25,125	15 2
Agriculture	20,328	11 3	19,109	11 6
Wholesale and retail trade	15,616	8 7	15,675	9 5
Transportation and public utilities	15,137	8 3	10,265	6 2
Metals and machinery	11,456	6 4	7,863	4 8
Lumber and timber products	10,023	5 6	5,562	3 4
Factories (N. E. S.)	7,587	4 2	5,007	3 0
Mining, quarrying, oil, smelting and dredging	5 962	3 3	2,047	1 2
Clerical and professional	4,759	2 6	4,449	2 7
Foods, beverages and tobacco	4,459	2 5	3,791	2 3
Street and highway	2,664	1 5	1,775	1 0
Office buildings	920	.5	802	.5
Recreation and amusement	540	.3	707	.4
Miscellaneous	5,023	2 8	4,234	2 6

In 1921-1922, it will be observed, the highest proportion of placements, namely 22.8 per cent, were in the building and construction industry. Next highest number of placements, in order named, were (1) in private home, (2) in hotels, restaurants, apartments, etc., and (3) in agricultural pursuits.

8. Conservatively estimated, the free public employment system has saved to the workers of the state $439,880 during the fiscal year of 1920-1921 and 1921-1922, or an average of $219,940 per year.

This estimate has been arrived at as follows: During the two fiscal years of 1920-1921 and 1921-1922, the free public employment offices have given out 187,180 jobs, or 54 per cent of the total jobs, lasting eight days or over. The average fee per job charged by general private employment agencies was $2.35 in 1921-1922. Assuming that this average fee would have been collected by private employment agencies for each of the 187,180 jobs, the total collected in fees would have aggregated the sum of $439,873. Since a large number of these jobs were domestic, hotel and clerical for which the fees would have been considerably higher than the average fee charged by general employment agencies, the estimate presented may be considered fair and conservative.

9. For the two fiscal years ended June 30, 1922, the legislature had appropriated $190,000 for the support of the free public employment bureaus. The savings to the wage earners by the free public employment bureaus during this period exceeded this appropriation by $249,873. In other words, the savings to the wage earners of the state was about two and one-third times the amount appropriated for the support of the free public employment system.

Employment Surveys of Manufacturing Industries.

In order that recent information might be available on employment conditions in the state, the bureau has been making periodical surveys of employment conditions in large manufacturing establishments. These employment surveys have been conducted by the state director of employment, under the direction of the Commissioner. The data obtained as a result of this survey have been mimeographed and issued as bulletins of the Bureau of Labor Statistics. The first of these employment bulletins was issued on October 15, 1921, and since that date, five more bulletins have been issued. Copies of these bulletins are sent to the United States Bureau of Labor Statistics for publication in the Monthly Labor Review of that Bureau, as well as to all establishments reporting. These periodical surveys of employment conditions in the state have been of genuine value and have served as reliable indications of conditions of employment and unemployment in the state. The latest Employment Bulletin of the bureau, showing the results of the sixth employment survey of the state, is reproduced below in full.

Employment Bulletin No. 6.

EMPLOYMENT SURVEY OF MANUFACTURING INDUSTRIES AS OF AUGUST 31, 1922.

CONDUCTED BY THE BUREAU OF LABOR STATISTICS OF THE STATE OF CALIFORNIA IN COOPERATION WITH THE U. S. DEPARTMENT OF LABOR EMPLOYMENT SERVICE.

San Francisco, California,
948 Market St., September 20, 1922

During the latter part of August, 1922, more than 800 questionnaires were sent out to the large manufacturing establishments in the different industries throughout the state, and up to the time of compiling this bulletin, about 65 per cent of them were returned. In making up these figures, however, we have used only the reports of firms who also reported for August of last year and June of this year. On account of the shopmen's strike, no reports were received from the transcontinental railroads, the figures shown here being for city and suburban railways.

The State: The 500 establishments reported 105,976 employes at work the month ending August, 1922, as against 94,222 for June, 1922, and 94,361 for August, 1921, showing for August, this year, an increase of 11,754 over June of this year and an increase of 11,615 over August a year ago. To make this gain during the past year, a loss of over 8000 had to be overcome in the shipbuilding industry. The net gain, however, amounts to 12.5 per cent over June of this year and 12.3 per cent over August a year ago. In the yearly comparison, the canning and packing industry shows the largest gain in employees, amounting to 6793, or 50 per cent. Timber products comes next with 4877, of which the logging industry contributed a gain of 3896 or 34.7 per cent for the 19 establishments reporting. The largest percentage of increase was shown by the automobile industry with 123.7 per cent, followed by the agricultural implements with 81.1 per cent.

San Francisco: The 122 firms reporting show a numerical gain in employees for the year of 1919 or 11.8 per cent for all industries. The metal industry was the largest contributor, showing a gain of 792 or 23 per cent more than for August last year.

Los Angeles: The 107 firms reporting show a numerical gain of 2119 in the number of employees for the past year, showing a percentage increase amounting to 14.3. The automobile industry contributed 527 of this total increase, or 177 per cent gain.

Oakland: The 47 establishments reporting showed a numerical loss of 1180 for the year. Oakland, however, suffered a loss of 4048 in the shipbuilding industry during that time and the other industries showed a numerical gain of 2868. The canning industry contributed the largest part of this, followed by the automobile industry. Practically all industries, however, report an increase.

Balance of State: The 224 establishments reporting show a numerical gain of 8757 for the year, of which the canning industry furnished an increase of 5107, followed by the logging industry with a gain of 3896, and oil refining 1091. Nearly all industries show a gain with the exception of the shipbuilding, which shows a loss of over 4000. Despite this loss, however, the net gain in employees was 17.1 per cent for the year, which is higher than the three large cities.

Comparative Tables Showing Number Employed by Various Manufacturing Establishments in Industry Throughout California at Specified Times With Percentages of Increase or Decrease in Each Industry.

Industry or locality	Number of establishments representing	Number at work month ending			Per cent change August, 1922, from	
		August 1922	June 1922	August 1921	June 1922	August 1921
THE STATE (TABLE NO. 1).						
Canning, drying and preserving	78	20,386	11,656	13,593	+74.9	+50.0
Bakery products	17	1,469	1,482	1,394	— .9	+ 5.4
Confectionery	17	891	910	1,102	— 2.1	—19.1
Flour and grist mills	8	1,038	973	1,149	+ 6.7	— 9.7
Sugar	8	3,381	3,117	3,647	+ 8.5	— 7.3
Slaughtering and packing	13	3,345	3,210	3,020	+ 4.2	+10.2
Other kindred food products	3	177	181	175	— 2.2	+ 1.1
Wearing apparel	23	4,100	4,156	4,287	— 1.3	— 4.4
Tents, awnings, jute products	5	474	499	521	— 5.0	— 9.0
Agricultural implements, including tractors	6	1,099	1,190	607	— 7.6	+81.1
Gas engines, pumps, boilers	11	1,271	1,198	1,065	+ 6.1	+19.3
Structural and ornamental steel	4	1,542	1,303	1,108	+18.3	+39.2
Iron and steel forgings	4	14.58	1,375	1,191	+ 6.0	+22.4
Shipbuilding, including naval repairs	9	6,091	7,108	14,113	—14.3	—56.8
Foundry and machine shops, N. E. S.	36	2,661	2,519	1,839	+ 5.6	+44.7
Tin cans	5	2,322	2,021	1,831	+14.9	+26.8
Other sheet metal products	13	890	875	526	+ 1.7	+69.2
Copper and other metal products	6	430	425	272	+ 1.2	+58.1
Sawmills and logging camps	22	15,114	13,369	11,218	+13.0	+34.7
Planing mills, box factories, etc.	23	3,942	3,833	3,382	+ 2.8	+16.5
Other lumber products	14	1,450	1,356	1,029	+ 6.1	+40.9
Tanning and wool scouring	11	1,082	1,068	955	+ 1.3	+13.3
Finished leather products	4	334	332	305	+ .6	+ 9.5
Paper bags, boxes, etc.	9	720	722	676	— .3	+ 6.5
Printing and publishing	11	1,463	1,448	1,366	+ 1.0	+ 7.1
Other paper products	8	1,306	1,219	989	+ 7.1	+32.1
Liquor, beverages and ice	9	694	699	732	— .7	— 5.2
Mineral oil refining	5	4,879	4,524	3,788	+ 7.8	+28.8
Other chemical products	30	3,397	3,074	2,864	+10.5	+18.6
Cement	7	2,364	2,376	2,063	— .5	+14.6
Glass, including bottles	4	758	853	814	—13.5	— 9.3
Brick, stone and clay products	15	2,386	2,234	1,818	+ 6.8	+31.2
Tobacco products	6	992	961	1,111	+ 3.2	—10.7
Wagons and autos, including bodies	8	2,658	2,626	1,188	+ 1.2	+123.7
†Railroad repair shops	7	2,902	2,091	1,855	.....	+12.8
Laundries	28	3,206	3,211	2,846	— .2	+12.6
Miscellaneous industries	13	4,134	4,018	3,922	+ 2.9	+ 5.4
Totals	500	105,976	94,222	94,361	+12.5	+12.3
Localities (Table No. 2)—						
San Francisco	122	18,209	17,672	16,290	+ 3.0	+11.8
Los Angeles	107	16,882	16,349	14,763	+ 3.3	+14.3
†Oakland	47	10,947	8,935	12,127	+22.5	—10.8
Balance of state	224	59,938	51,266	51,181	+16.9	+17.1
Totals	500	105,976	94,222	94,361	+12.5	+12.3

*No returns from transcontinental railroads on account of strike. Figures given are for city and suburban railways.
†Includes Emeryville, Alameda and Berkeley.
Where canning, oil, railroad, etc., companies have plants located at different points, separate reports are received from each plant and listed accordingly.

The bureau is continually receiving inquiries concerning employment conditions in California. In order to be able to answer all inquiries as completely as possible, the bureau is planning to gather and publish monthly reports concerning employment conditions in the state. This, it is expected, will be done in cooperation with the Federal Bureau of Labor Statistics.

THE GROWTH OF INDUSTRIES IN CALIFORNIA.

The State of California is rapidly gaining a foremost place among the great industrial states of the Union. Not only has the population of the state been increasing by leaps and bounds, but the industrial activities of the state have also been multiplying at an ever growing rate. California today ranks eighth highest in population, compared with other states. In 1910, our state ranked twelfth as regards its population. Again, in 1869 California ranked sixteenth among the states as regards the gross value of its manufacturing products, but in 1909 California has advanced to the eleventh place, and in 1919 to the eighth place. The total value of California's manufactured products in 1919, according to the United States census, was $1,981,204,701, an amount which was exceeded only by the states of New York, Pennsylvania, Illinois, Ohio, Massachusetts, New Jersey, Michigan, in order named.

In 1900 the population of the State of California was 1 485,053. In 1920 the population increased to 3,426,861, an increase of about 131 per cent. But the wage earning population has increased to a greater extent than has the total population. Thus in 1899, as shown in the follow ng table (Table 24) there were in our state 77,224 wage earners engaged in manufactures.

TABLE 24—Increase in the Number of Establishments, Wage Earners and Other Persons Engaged in California Manufactures, from 1899 to 1919, by Years.

(Computed from U. S. 14th Census Data).

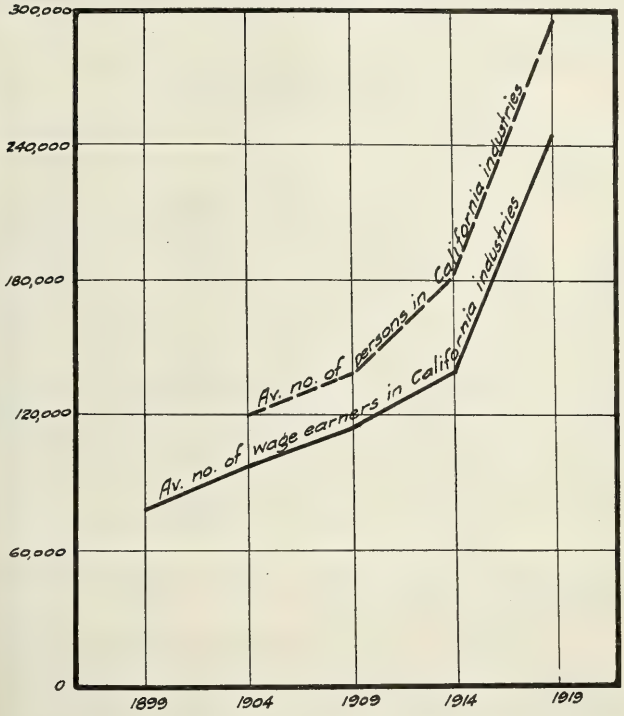
Years	Establishments			Persons engaged in manufactures					
				Total			Wage earners		
	Number	Increase		Number	Increase		Average number	Increase	
		Number	Per cent		Number	Per cent		Number	Per cent
1899	4,997			*			77,224		
1904	6,839	1,842	36.9	120,040			100,335	23,111	30 0
1909	7,659	820	12.0	141,576	21,536	18 0	115,296	14,961	14 9
1914	10,057	2,398	31.3	176,547	34,971	24 7	139,481	24,185	21 0
1919	11,942	1,885	18 7	296,858	120,311	68 1	243,692	104,211	74 7

*Figures not available.

In 1919, twenty years later, according to the figures of the United States census, the number of wage earners engaged in manufactures has increased to 243,692, an increase of 166,468 or 216 per cent. In other words, for each person in the state in 1900 there were 2.31 persons in 1920, while for each wage earner in 1899 there were 3.16 wage earners in 1919.

The increase in the number of persons and in the number of wage earners engaged in manufactures in California is shown graphically in the accompanying diagram (Diagram 5).

DIAGRAM 5—Number of Persons and of Wage Earners Engaged in California Industries, from 1899 to 1919, According to the United States Census of Manufactures.



The number of wage earners, it will be observed, has increased in 1919 at a greater rate than has the total number of persons engaged in manufactures. Thus the percentages of increase in 1919 over 1914 were 68.1 and 74.7, respectively, for all persons engaged in manufactures and for the wage earners.

In 1919 the number of establishments was 11,942, as compared with 10,067 in 1914, an increase of 1,885 establishments or of 18.7 per cent in five years.

The next table (Table 25) shows the distribution by classes of employment and by sex, of all persons engaged in manufactures. Of the total number 296,858 persons engaged in manufactures in 1919, 23,601 or 8 per cent were proprietors and officials; 29,565 or 10 per cent, were clerks and other subordinate salaried employees; while the 243,692 or 82 per cent were wage earners. The following are the outstanding points of interest shown in Table 25:

TABLE 25—Number and Per Cent Increase of Persons Engaged in Manufactures in California from 1909 to 1919, by Classes of Employment and by Sex.

(Computed from U. S. 14th Census Data.)

Classes of employment	Census years						Percentages of increase	
	1909		1914		1919			
	Number	Per cent	Number	Per cent	Number	Per cent	1909–1914	1914–1919
All classes	141,576	100 0	179,547	100 0	296,858	100 0	12 5	16 8
Male	123,929	87 5	151,532	85 8	248,940	83 9	12 2	16 4
Female	17,647	12 5	25,015	14 2	47,918	16 1	14 2	19 1
Proprietors and officials	13,640	100 0	17,169	100 0	23,601	100 0	12 6	13 7
Male	13,293	97 5	16,606	96 7	22,605	95 8	12 5	12 5
Female	347	2 5	563	3 3	996	4 2	16 2	17 7
Proprietors and firm members	8,077	100 0	10,429	100 0	12,452	100 0	12 9	11 9
Male	7,826	96 9	10,027	96 1	11,912	95 7	12 8	11 9
Female	251	3 1	402	3 9	540	4 3	21 5	13 4
Salaries officers of corporations	2,103	100 0	2,793	100 0	3,456	100.0	13 3	12 4
Male	2,036	96 8	2,677	95 9	3,271	94 6	13 1	12 2
Female	67	3 2	113	4 1	185	5 4	16 9	16 4
Superintendents and managers	3,460	100 0	3,950	100 0	7,693	100 0	11 4	19 5
Male	3,431	99 2	3,902	98 8	7,422	96 5	11 4	19 0
Female	29	0 8	48	1 2	271	3 5	16 6	56 5
Clerks and other subordinate salaried employees	12,640	100 0	19,897	100 0	29,565	100 0	15 7	14 9
Male	9,672	76 5	15,625	78 5	19,766	66 9	16 2	12 7
Female	2,968	23 5	4,272	21 5	9,799	33 1	14 4	22 9
Wage earners (average number)	115,296	100 0	139,481	100 0	243,692	100 0	12 1	17 5
Male	100,964	87 6	119,301	85 5	206,569	84 8	11 8	17 3
Female	14,332	12 4	20,180	14 5	37,123	15 2	14 1	18 4

1. The proportion of female persons to the total number engaged in manufactures has steadily increased from 12.5 in 1908 to 14.2 per cent in 1914, and to 16.1 per cent in 1919.

2. The number of female persons engaged in manufactures in 1909 was 17,647. In 1919 this number had increased to 47,918, an increase of 171.5 per cent. During approximately the same period, from 1910 to 1920, the number of female persons 16 years of age and over has increased from 768,455 to 1,188,038, an increase of 419,583, or of 54.6 per cent. The women of this state have thus been entering industry at a more rapid rate than has been the rate of their increase in the state.

3. The proportion of female wage earners engaged in manufactures was in 1919 less than half the proportion of women engaged in clerical occupations. Thus, in 1919 of the total average number of wage earners engaged in manufactures 15.2 per cent were females while 84.8 per cent were males. In the same year of the total number of persons engaged as clerks and other subordinate employees, 33.1 per cent were females while 66.9 per cent were males. It appears, therefore, that the clerical occupations have gained the largest proportion of the women who have entered into industry.

In the next table (Table 26) are presented figures showing the size of manufacturing establishments by the average number of wage earners employed. It will be seen that 54.3 per cent of all manufacturing establishments employed between 1 to 5 wage earners.

TABLE 26—Size of Manufacturing Establishments, by Average Number of Wage Earners Employed, California, 1919.

(Computed from U. S. 14th Census Data.)

Size of establishments	Establishments having specified number of wage earners					
	Establishments		Wage earners		Cumulative percentage of	
	Number	Percentage distribution	Number	Percentage distribution	Establishments	Wage earners
Total	11,942	100.0	243,692	100.0		
No. wage earners	1,586	13.3			13.0	
1 to 5 wage earners	6,484	54.3	14,210	5.8	67.6	5.7
6 to 20 wage earners	2,266	19.0	24,772	10.2	86.7	15.9
21 to 50 wage earners	880	7.3	28,463	11.6	93.7	27.6
51 to 100 wage earners	341	2.8	24,493	10.1	96.6	37.6
101 to 250 wage earners	252	2.1	40,065	16.5	98.8	54.2
251 to 500 wage earners	81	0.7	28,509	11.7	99.5	65.9
501 to 1,000 wage earners	30	0.3	20,508	8.4	99.8	74.3
Over 1,000 wage earners	22	0.2	62,670	25.7	100.0	100.0

However, more than one-fourth (25.7 per cent) of all wage earners were employed in establishments employing over 1,000 employees. Further examination of Table 26 shows that 67.6 per cent of all establishments employed 5.7 per cent of all wage earners and that 98.8 per cent of all establishments employed 54.2 per cent of all wage earners.

Table 27 shows the numerical and proportionate distribution of wage earners in California industries.

TABLE 27 Distribution of Wage Earners in California Industries in 1919 Compared with 1914.

(Computed from U. S. 14th Census Data.)

Rank	Industries	Average number of wage earners				
		1919	1914	Per cent increase or (—) decrease, 1914-1919	1919 Percentage distribution	1914 Percentage distribution
1	Shipbuilding, steel[1]	46,052	3,096	1,387 5	18 9	2 2
2	Canning and preserving, fruits and vegetables	19,575	11,029	77 4	8 0	7 9
3	Lumber and timber products	16,937	15,087	12 4	6 9	10 8
4	Cars and general construction and repairs by steam railroad companies	16,213	11,563	40 2	6 7	8 2
5	Foundry and machine shop products[2]	10,118	5,273	91 8	4 1	3 8
6	Lumber, planing-mill products, not including planing mills connected with sawmills	6,215	6,109	1 7	2 6	4 4
7	Automobile repairing	5,992	1,532	291 1	2 5	1 1
8	Bread and other bakery products	5,394	4,851	11 2	2 2	3 5
9	Petroleum refining	5,132	1,930	165 9	2 1	1 4
10	Printing and publishing, newspapers and periodicals	4,770	4,334	10 1	2 0	3 1
11	Confectionery and ice cream[3]	4,214	2,104	100 3	1 7	1 5
12	Printing and publishing, book and job	3,818	3,172	20 4	1 6	2 2
13	Iron and steel, steel works and rolling mills	3,476	1,244	179 4	1 4	0 9
14	Slaughtering and meat packing	3,405	2,172	56 8	1 4	1 5
15	Clothing, women's	3,124	1,060	194 7	1 3	0 8
16	Canning and preserving, fish	2,989	747	300 1	1 2	0 6
17	Tinware, not elsewhere specified[4]	2,915			1 2	
18	Furniture	2,883	1,601	80 1	1 2	1 1
19	Gas, illuminating and heating	2,444	2,317	5 5	1 0	1 6
20	Clothing, men's	2,411	2,037	18 4	1 0	1 4
21	Engines, steam, gas and water	2,231	813	174 4	0 9	0 7
22	Electrical machinery, apparatus and supplies	2,008	780	157 4	0 8	0 6
23	Flour mill and grist mill products	1,779	1,067	66 7	0 7	0 8
24	Brick and tile, terra-cotta and fine clay products	1,747	2,387	—26 8	0 7	1 7
25	Cars and general shop construction and repairs by electric railroad companies	1,731	2,086	—17 0	0 7	1 5
26	Pickles, preserves and sauces	1,719	896	—91 9	0 7	0 7
27	Automobiles, bodies and parts	1,681	439	282 9	0 7	0 3
28	Tobaccos, cigars and cigarettes	1,677	1,507	11 3	0 7	1 1
29	Boxes, wooden, packing, except cigar boxes	1,657	1,156	43 3	0 7	0 8
30	Agricultural implements	1,578	704	124 1	0 7	0 5
31	Ice, manufactured	1,535	1,139	34 8	0 6	0 8
32	Sugar, beet	1,512	2,009	—24 7	0 6	1 4
33	Shipbuilding, wooden, including boat building	1,478	361	309 4	0 6	0 3
34	Chemicals	1,466	257	470 4	0 6	0 2
35	Copper, tin and sheet-iron work	1,462	1,246	17 3	0 6	0 9
36	Leather, tanned, curried and finished	1,453	1,361	6 8	0 6	1 0
37	All other industries	48,881	40,015	22 1	20 1	28 7
	All industries	243,692	139,481		100 0	100 0

[1]The number of wage earners in the shipbuilding industry has very considerably declined since 1919, the year of the U. S. 14th census.
[2]Includes "iron and steel tempering," etc., "machine tools" and "steel barrels, drums and tanks."
[3]Includes "chewing gum."
[4]Not shown separately in 1914.

Although the shipbuilding industry is shown to rank first highest among the industries in California in 1919, it no longer occupies that position today. The year 1919, when the census of manufactures was taken by the federal government, was so close to the war year of 1918 that the shipbuilding industry was still employing the largest number of wage earners in the state. Outside of the shipbuilding industry it will be seen that the following industries, in order named, rank highest as regards the proportion of wage earners employed.

First—The canning and preserving of fruits and vegetables.
Second—Lumber and timber products.
Third—Cars and general construction and repairs by steam railroad companies.
Fourth—Foundry and machine shop products.
Fifth—Lumber, planing-mill products, not including planing mills connected with sawmills, and
Sixth—Automobile repairing, etc.

The following industries, it will be observed, show in order named, the highest percentages of increase in the number of workers employed from 1914 to 1919, steel shipbuilding omitted:

First—Chemicals, an increase of 470.4 per cent.
Second—Shipbuilding, wooden, including boat building, an increase of 309.4 per cent.
Third—Canning and preserving of fish, an increase of 300.1 per cent.
Fourth—Automobile repairing, an increase of 291.1 per cent.
Fifth—Automobile bodies and parts, an increase of 282.9 per cent.
Sixth—Women's clothing, an increase of 194.7 per cent.
Seventh—Iron and steel, steel works and rolling mills, an increase of 179.4 per cent.
Eighth—Engines, steam, gas and water, an increase of 174.4 per cent.
Ninth—Petroleum refining, an increase of 165.9 per cent.

Among the other industries showing an increase of over 100 per cent in the average number of wage earners employed in 1919 compared with 1914 are the following: (1) The electrical machinery apparatus and supplies industry; (2) the agricultural implements industry; and (3) the confectionery and ice cream industry. The doubling of the number of wage earners in the last named industry might be ascribed to the banishment of John Barleycorn.

The table next following (Table 28) shows the average number of male and female wage earners employed in the principal California industries in the census years of 1914 and 1919. Of the total number of wage earners 16 years of age and over, employed in the California industries in 1919, 15.0 per cent were females, while 84.4 per cent were males. The remainder, 0.6 per cent, were persons under 16 years of age. The proportion of women employed in the following California industries in 1919 was greater than was the proportion of women employed in all California industries in 1919.

Industry	Per cent women of total wage earners employed in 1919
All industries	15.0
Men's clothing	83.5
Women's clothing	83.2
Pickles, preserves and quinces	60.6
Confectionery and ice cream	57.6
Canning and preserving of fish	50.8
Canning and preserving of fruits and vegetables	47.8
Tobacco, cigars and cigarettes	43.1
Electric machinery, apparatus and supplies	41.0
Tinware	31.0
Bread and other bakery products	26.0
Printing and publishing, book and job	24.7

The data contained in the following table (Table 29) like several tables preceding it, were computed from the United States 14th census data.

TABLE 28—Average Number of Wage Earners in Specified California Industries in 1914 and 1919, by Years and by Sex.

(From U. S. 14th Census Data.)

Industry	Census year	Wage earners (average number)	Per cent of total		
			16 years of age and over		Under 16 years of age
			Male	Female	
All industries	1919	243,692	84 4	15 0	0 6
	1914	139,481	85 1	14 0	0 9
	1909	115,296	86 9	12 2	0 9
Agricultural implements	1919	1,578	98 5	1 4	0 1
	1914	704	99 4	0 3	0 3
Automobiles—bodies and parts	1919	1,681	96 5	3 3	0 2
	1914	439	96 8	3 0	0 2
Automobile repairing	1919	5,992	98 9	0 7	0 4
	1914	1,532	99 7	0 3	0 1
Boxes, wooden, packing, except cigar boxes	1919	1,657	88 4	11 0	0 6
	1914	1,156	94 6	4 8	0 5
Bread and other bakery products	1919	5,394	73 3	26 0	0 7
	1914	4,851	78 7	20 7	0 6
Brick and tile, terra-cotta and fire clay	1919	1,747	96 8	2 6	0 6
	1914	2,387	99 2	0 6	0 2
Canning and preserving, fish	1919	2,989	49 1	50 8	0 1
	1914	747	55 6	44 4	.....
Canning and preserving, fruits and vegetables	1919	19,575	49 0	47 8	3 2
	1914	11,029	38 6	55 5	5 9
Cars and general shop construction and repairs by electric railroad companies	1919	1,731	98 8	1 2	.....
	1914	2,086	100 0	.....	.....
Cars and general construction and repairs by steam railroad companies	1919	16,213	99 3	0 7	.....
	1914	11,563	100 0	.....	(a)
Chemicals	1919	1,466	98 5	1 4	0 1
	1914	257	99 2	0 4	0 4
Clothing, men's	1919	2,411	16 1	83 5	0 5
	1914	2,037	21 1	78 3	0 6
Clothing, women's	1919	3,124	16 2	83 2	0 6
	1914	1,060	36 8	63 2	.....
Confectionery and ice cream[1]	1919	4,214	41 9	57 6	0 5
	1914	2,104	35 2	57 5	7 4
Copper, tin and sheet iron work	1919	1,462	96 8	3 2	.....
	1914	1,246	98 1	1 3	0 6
Electrical machinery, apparatus and supplies	1919	2,008	58 8	41 0	0 1
	1914	780	69 6	29 9	0 5
Engines, steam, gas and water	1919	2,231	98 7	1 2	0 1
	1914	813	99 0	0 1	0 9
Flour mill and grist mill products	1919	1,579	91 8	8 0	0 1
	1914	1,067	94 6	4 6	0 8
Foundry and machine shop products[2]	1919	10,118	98 9	1 0	0 1
	1914	5,273	99 3	0 4	0 3
Furniture	1919	2,883	91 6	7 5	0 9
	1914	1,601	97 6	1 6	0 8
Gas, illuminating and heating	1919	2,444	99 9	0 1	(a)
	1914	2,317	99 9	.....	0 1
Ice, manufactured	1919	1,535	99 5	0 3	0 3
	1914	1,139	99 9	.....	0 1

TABLE 28—Average Number of Wage Earners in Specified California Industries in 1914 and 1919, by Years and by Sex—Continued.

(From U. S. 14th Census Data.)

Industry	Census year	Wage earners (average number)	Per cent of total		
			16 years of age and over		Under 16 years of age
			Male	Female	
Iron and steel, steel works and rolling mills	1919	3,476	99.2	0.7	(2)
	1914	1,244	99.9	0.1	----------
Leather, tanned, curried and finished	1919	1,453	96.9	2.9	0.2
	1914	1,361	99.8	0.2	----------
Lumber and timber products	1919	16,957	97.1	2.8	0.2
	1914	15,087	99.4	0.5	0.2
Lumber, planing mill products, not including planing mills connected with sawmills	1919	6,215	98.0	1.8	0.2
	1914	6,109	99.6	0.1	0.3
Petroleum, refining	1919	5,132	97.6	2.4	----------
	1914	1,930	99.9	0.1	----------
Pickles, preserves and sauces	1919	1,719	39.1	60.6	0.3
	1914	896	40.4	58.5	1.1
Printing and publishing, book and job	1919	3,818	73.6	24.7	1.7
	1914	3,172	74.8	23.8	1.4
Printing and publishing, newspapers and periodicals	1919	4,770	86.3	6.6	7.1
	1914	4,334	90.4	7.8	1.8
Shipbuilding, steel	1919	46,052	99.9	0.1	----------
	1914	3,096	100.0	----------	----------
Shipbuilding, wooden, including boat building	1919	1,478	99.9	0.1	----------
	1914	361	97.2	2.2	0.6
Slaughtering and meat packing	1919	3,405	93.8	6.0	0.1
	1914	2,172	96.5	3.0	0.4
Sugar, beet	1919	1,512	97.0	3.0	0.1
	1914	2,009	99.2	0.7	0.1
Tinware, not elsewhere specified[4]	1919	2,915	69.0	31.0	----------
Tobaccos, cigars and cigarettes	1919	1,677	52.9	46.1	1.0
	1914	1,507	68.9	30.6	0.5
All other industries	1919	48,881	78.4	21.1	0.5
	1914	40,015	84.9	14.8	0.4

[1]Includes "chewing gum."
[2]Includes "iron and steel, tempering, welding, etc.," "machine tools," and "steel barrels, drums and tanks."
[3]Less than one-tenth of one per cent
[4]Not shown separately in 1914.

TABLE 29—Per Cent of Wage Earners Sixteen Years of Age and Over [1] of Total Population, Fifteen Years of Age and Over [2]—California, 1919, by Cities and Sex.

(Computed from U. S. Fourteenth Census Data.)

City	Population 15 years of age and over			Average wage earners 16 years of age and over					
	Number			Number			Per cent of population 15 years of age and over		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
The 19 cities	1,477,445	758,652	718,793	158,514	131,974	26,540	10 7	17 4	3 7
Alameda	21,672	10,440	11,232	6,787	6,746	41	31 3	64 6	0 4
Bakersfield	13,857	7,600	6,257	1,178	1,158	20	8 5	15 2	0 3
Berkeley	43,294	19,810	23,484	2,261	1,779	482	5 2	9 0	0 2
Eureka	9,837	5,255	4,582	940	921	19	9 6	17 5	0 4
Fresno	33,757	17,943	15,814	3,854	3,134	720	11 4	17 5	4 6
Long Beach	45,079	20,927	24,152	3,769	3,307	462	8 4	15 8	1 1
Los Angeles	461,338	227,455	233,883	46,960	38,643	8,317	10 2	17 0	3 6
Oakland	167,217	87,404	79,813	23,212	20,548	2,664	13 9	23 5	3 4
Pasadena	36,572	15,388	21,184	1,023	785	238	2 8	5 1	1 1
Pomona	10,146	4,775	5,371	526	381	145	5 2	8 0	2 7
Riverside	14,429	6,952	7,477	417	359	58	2 9	5 2	0 8
Sacramento	50,945	27,083	23,862	6,211	5,425	786	12 2	20 0	3 3
San Bernardino	13,634	7,021	6,613	2,087	2,027	60	15 3	28 9	0 9
San Diego	59,408	29,130	30,278	3,414	2,752	662	5 7	9 5	2 2
San Francisco	408,813	223,704	185,109	48,324	37,784	10,540	11 8	16 9	5 7
San Jose	29,945	14,501	15,444	3,018	2,090	928	10 1	14 4	6 1
Santa Cruz	8,501	4,008	4,493	552	461	91	6 5	11 5	2 0
Stockton	31,374	17,182	14,192	3,505	3,213	292	11 2	18 7	2 1
Vallejo	17,627	12,074	5,553	476	461	15	2 7	3 8	0 3

[1] Excludes "clerks and other subordinate salaried employes."
[2] Population figures are for 1920.

Only 19 California cities are included in this table because data for other cities were not available at the time the computing of this table was done. An attempt has here been made to find out to what extent the several cities were industrial in character. The cities having the largest proportions of its population as wage earners are considered the most industrial in character.

It will be seen from the table referred to that the average number of wage earners 16 years of age and over in the 19 cities tabulated, constituted 10.7 per cent of the population of approximately the same age group. Thus, the total number of persons 15 years of age and over in the 19 cities tabulated was 1,477,445 in 1920. The number of wage earners in these 19 cities was in 1919, 158,514, or 10.7 per cent of the total population 15 years of age and over. Although the age groups of the wage earners and of the population are not identically the same, they are sufficiently close as to fully justify the comparisons presented in Table 29. The following cities, in order named, show the highest percentages of wage earners in the total population:

1. Oakland.
2. Sacramento.
3. San Francisco.
4. Fresno.
5. Stockton.
6. Los Angeles.
7. San Jose.

The industrial character of the smaller cities is no doubt due to the existence therein of one or more large industrial plants. In Alameda, for instance, there was in 1919 one plant which employed 6033 wage earners, nearly all of the 6787 wage earners reported for that city. In San Bernardino, again, there was in 1919 one plant which employed 1531 wage earners. The large number of wage earners in Oakland reported in 1919 was also due to the operation of a shipbuilding plant in that city in 1919.

The Value of Manufactured Products.

In the following table (Table 30) is shown the value of manufactured products for the state as a whole and for each of the twenty cities separately.

TABLE 30—Value of Manufactured Products in California Cities of 10,000 Inhabitants or More, from 1909-1919.

(Computed from U. S. Fourteenth Census, 1919.)

Cities	Value of products						
	1909	1914	1919	Increase or [1]decrease (—)			
				Number 1909-1914	Number 1914-1919	Per cent 1909-1914	Per cent 1914-1919
The state	$529,760,528	$712,800,764	$1,981,204,701	$183,040,236	$1,268,403,937	34 6	177 9
The 20 cities	293,364,393	388,431,253	1,110,548,686	95,066,860	722,117,430	32 4	185 9
Alameda	$2,554,417	$2,786,176	$25,440,598	$231,759	$22,654,419	9 1	813 1
Bakersfield	2,818,744	2,928,373	5,699,051	109,629	2,770,678	3 9	94 6
Berkeley	4,435,374	7,321,044	28,331,212	2,885,670	21,010,168	65 1	287 0
Eureka	3,011,682	2,480,374	3,960,268	—531,308	1,479,894	—17 6	37 4
Fresno	11,090,195	16,520,109	48,943,823	5,429,914	32,423,714	49 0	19 6
Long Beach	927,180	2,944,888	14,382,769	2,017,708	11,437,881	217 6	388 4
Los Angeles	68,886,274	103,457,993	278,184,143	34,871,719	174,726,150	50 8	168 9
Oakland	22,342,926	28,521,828	134,755,470	6,178,902	106,233,642	27 7	372 5
Pasadena	1,724,364	1,971 801	5,767,527	247,527	3,795,636	14 4	192 5
Pomona	559,661	825,000	3,754,153	265,339	2,929,153	47 4	355 0
Riverside	1,012,675	1,021,929	2,354,476	9,254	1,332,547	0 9	130 4
Sacramento	14,006,303	16,382,670	34,198,980	2,376,367	17,816,310	17 0	108 8
San Bernardino	1,659,705	2,612,669	7,473,789	952,964	4,861,120	57 4	186 1
San Diego	4,740,990	9,020,895	20,225,725	4,279,905	11,204,828	90 3	124 2
San Francisco	133,041,069	162,299,795	417,321,277	29,258,726	255,021,482	22 0	157 1
San Jose	5,482,747	10,806,117	25,135,500	5,323,370	14,329,383	97 1	132 6
Santa Barbara	842,831	843,673	1,943,533	842	1,099,860	0 1	130 4
Santa Cruz	1,161,269	1,320,427	3,944,114	159,158	2,623,687	13 7	198 7
Stockton	11,470,425	11,293,483	30,675,898	176,942	19,382,415	1 5	171 6
Vallejo	1,895,562	3,071,919	18,056,382	1,176,357	14,984,463	62 1	487 8

[1]The shrinkage of the dollar in 1919 as compared with 1914 should be considered in connection with these statistics.

It will be observed that between 1909-1914, the value of products manufactured in California increased 34.6 per cent, while during 1914-1919 the value of manufactured products increased 177.9 per cent.

Since prices were considerably higher in 1919, the actual increase in value was not as high as indicated by these percentages. The following large cities show the highest percentages of increase in 1919 in the value of manufactured products: Oakland, 372.5 per cent; San Francisco, 157.1 per cent; and Los Angeles, 168.9 per cent. Although Los Angeles shows a higher percentage increase than San Francisco, the value of the San Francisco manufactured products in 1919 exceeded the value of Los Angeles products by $139,137,134, or by about 50 per cent.

Omitting the shipbuilding industry, which has been considerably reduced since 1919, the following twelve California industries ranked highest in 1919 according to the values of their manufactured products:

1. Petroleum refining.
2. Canning and preserving, fruits and vegetables.
3. Slaughtering and meat packing.
4. Flour mills and grist mill products.
5. Foundry and machine shop products.
6. Bread and other bakery products.
7. Lumber and timber products.
8. Lumber, planing mill products, not including planing mills connected with saw mills.
9. Car and general shop construction and repairs by steam railroad companies.
10. Butter.
11. Automobiles, and
12. Printing and publishing, newspapers and periodicals.

Earnings of California Wage Earners.

The data pertaining to the earnings of California wage earners, submitted in the following tables, are based upon the state census of manufactures annually made by the bureau. This census is obtained by sending out questionnaires to establishments employing more than five employes. Owing to the bureau's limited appropriations, it is impossible to send out field agents to check up the accuracy of certain schedules filled out and returned by the manufacturers. All schedules are carefully edited and those which are badly and inaccurately filled out are not used in the compilation of the statistics. The data submitted below have been compiled from questionnaires entitled Annual Statistics of Manufactures, 1921, covering that calendar year. The detailed data covering each industry separately will be found in Part II of this report.

The following summary tables contain comparative data for the years 1918 and 1921. The wage statistics submitted are based, in both years, upon reports of weekly earnings as of the middle of December of each year. The comparison between 1918 and 1921 is considered especially significant in view of the fact that they respectively represent years of industrial prosperity and depression.

The number of establishments included in the 1921 census of manufactures was 2124 compared with 2370 establishments in 1918. This decrease of 246 establishments is accounted for by the fact that 1921 was a

year of much less industrial activity than was 1918. The number of wage earners of both sexes for whom information was secured in 1921 was 141,549. According to the United States fourteenth census of manufactures, the average number of wage earners in California in 1919 was 243,692. Assuming that there were about the same number of wage earners employed in 1921, the bureau's census covered about 58 per cent of the wage earners of the state. This is considered a sufficiently large sample to warrant the presentation of the data and the general conclusions drawn therefrom.

Table 31 shows the number and proportion of California wage earners earning specified weekly earnings in 1921 compared with 1918.

TABLE 31 Number and Per Cent of California Wage Earners Earning Specified Weekly Earnings in 1921, Compared with 1918.

Weekly earnings	1918			1921		
	Number of wage earners	Per cent of total	Cumulative per-centages	Number of wage earners	Per cent of total	Cumulative per-centages
Totals	210,593	100 0	100 0	141,549	100 0	100 0
Under $5	2,419	1 1	1 1	1,661	1 2	1 2
$5 to $5.99	930	5	1 6	833	6	1 8
$6 to $6.99	1,303	6	2 2	667	5	2 3
$7 to $7.99	1,895	9	3 1	743	5	2 8
$8 to $9.99	6,136	2 9	6 0	1,402	1 0	3 8
$10 to $11.99	10,371	4 9	10 9	2,019	1 4	5 2
$12 to $13.99	10,798	5 1	16 0	3,793	2 7	7 9
$14 to $15.99	8,611	4 1	20 1	5,300	3 8	11 7
$16 to $17.99	8,059	3 8	23 9	14,715	10 4	22 1
$18 to $19.99	13 834	6 6	30 5	10,683	7 5	29 6
$20 to $21.99	16,569	7 9	38 4	12,203	8 6	38 2
$22 to $24.99	30,726	14 6	53 0	17,304	12 2	50 4
$25 to $29.99	37,221	17 7	70 7	22,084	15 6	66 0
$30 to $34.99	24,618	11 7	82 4	17,610	12 4	78 4
$35 to $39.99	25,454	12 1	94 5	14,419	10 2	88 6
$40 and over	11,649	5 5	100 0	16,113	11 4	100 0

It will be noticed that in 1921, 11.7 per cent of all wage earners earned less than $16 per week, while in 1918, 20.1 per cent of all wage earners earned less than $16 per week. In both years, about 38 per cent of all wage earners earned less than $22 per week. It will be observed further that in 1921 the proportion of workers earnings $30 or more was greater than in 1918, while the percentage earning $40 and over in 1921 was a little more than twice as great as the proportion earning $40 and over in 1918.

It will be observed that in 1921 the proportion of wage earners whose weekly earnings were between $16 to $17.99 was 10.4 per cent compared with 3.8 per cent who were in this earnings group in 1918. This increase in the proportion of wage earners in the $16 to $17.99 group in 1921 is obviously due to the decrease in the proportion of wage earners earning less than $16 and is apparently the result of the operation of the State Minimum Wage Law. Table 32 shows that the minimum wage order of $16 established by the Industrial Welfare Commission in 1920 has had the effect of greatly reducing the proportion of women earning less than this amount.

TABLE 32—Number and Per Cent of California Wage Earners 18 Years of Age and Over, Earning Specified Weekly Earnings in 1921, Compared with 1918, by Sex.

Weekly earnings	Males 18 Years of Age and Over					
	1918			1921		
	Number of wage earners	Per cent of total	Cumulative per-centages	Number of wage earners	Per cent of total	Cumulative per-centages
Totals	165,378	100.0	100.0	102,672	100.0	100.0
Under $5	1,061	.7	.7	547	.5	.5
$5 to $5.99	312	.2	.9	484	.5	1.0
$6 to $6.99	333	.2	1.1	285	.3	1.3
$7 to $7.99	195	.1	1.2	247	.2	1.5
$8 to $8.99	505	.3	1.5	303	.3	1.8
$10 to $11.99	771	.5	2.0	390	.4	2.2
$12 to $13.99	1,562	.9	2.9	755	.7	2.9
$14 to $15.99	2,298	1.4	4.3	1,335	1.3	4.2
$16 to $17.99	5,071	3.1	7.4	3,233	3.1	7.3
$18 to $19.99	11,318	6.8	14.2	5,620	5.5	12.8
$20 to $21.99	14,898	9.0	23.2	8,841	8.6	21.4
$22 to $24.99	29,425	17.8	41.0	14,476	14.1	35.5
$25 to $29.99	36,282	21.9	62.9	19,724	19.2	54.7
$30 to $34.99	24,374	14.7	77.6	16,487	16.1	70.8
$35 to $39.99	25,367	15.3	92.9	14,086	13.8	84.6
$40 and over	11,606	7.1	100.0	15,859	15.4	100.0

Weekly earnings	Females 18 Years of Age and Over					
	1918			1921		
Totals	38,474	100.0	100.0	36,072	100.0	100.0
Under $5	827	2.2	2.2	873	2.4	2.4
$5 to $5.99	350	.9	3.1	267	.7	3.1
$6 to $6.99	600	1.5	4.6	299	.8	3.9
$7 to $7.99	1,176	3.0	7.6	412	1.1	5.0
$8 to $9.99	4,278	11.1	18.7	922	2.6	7.6
$10 to $11.99	8,447	22.0	40.7	1,351	3.8	11.4
$12 to $13.99	8,261	21.5	62.2	2,536	7.0	18.4
$14 to $15.99	5,739	14.9	77.1	3,542	9.8	28.2
$16 to $17.99	2,617	6.8	83.9	10,958	30.4	58.6
$18 to $19.99	2,275	5.9	89.8	4,917	13.6	72.2
$20 to $21.99	1,568	4.1	93.9	3,289	9.1	81.3
$22 to $24.99	1,066	2.8	96.7	2,777	7.7	89.0
$25 to $29.99	914	2.4	99.1	2,292	6.4	95.4
$30 to $34.99	234	.6	99.7	1,095	3.1	98.5
$35 to $39.99	82	.2	99.9	299	.8	99.3
$40 and over	40	.1	100.0	243	.7	100.0

In 1918, 77.1 per cent of females 18 years of age and over, earned less than $16, while in 1921, only 28.2 per cent earned less than $16. It should be remembered in this connection that the term, "weekly earnings" is not synonymous with "weekly rates." The rate may be $16 per week or more, but lack of steady employment may result in lower earnings.

An interesting fact revealed by these statistics is that the percentages of males 18 years of age and over earning under $16 and under $18 have remained practically the same in 1921 as in 1918.

The data presented indicates a general increase in the earnings of wage earners in 1921 compared with 1918. This is shown clearly by a study of the cumulative percentages in Tables 31, 32 and 33.

Table 31, preceding, shows that the proportions of workers earning less than $22 was very nearly the same in 1918 and in 1921. But the percentage of workers earning less than $25 in 1918 was 53.0, while in 1921

it was 50.4. Again, the percentage of workers earning less than $40 per week in 1918 was 94.5, compared with 88.6 in 1921. Table 32 also shows that in 1921, 16.1 per cent of male wage earners, 18 years of age and over, for whom information was secured earned between $30 and $34.99, while only 14.7 per cent of these wage earners were in the same earnings group in 1918.

The earnings of wage earners under 18 years of age is shown in Table 33, next presented.

TABLE 33—Number and Per Cent of California Wage Earners Under 18 Years of Age Earning Specified Weekly Earnings in 1921, Compared with 1918, by Sex.

Weekly earnings	Males Under 18 Years of Age					
	1918			1921		
	Number of wage earners	Per cent of total	Cumulative per-centages	Number of wage earners	Per cent of total	Cumulative per-centages
Totals	3,548	100 0	100 0	1,152	100 0	100 0
Under $5	256	7 2	7 2	87	7 5	7 5
$5 to $5.99	47	1 3	8 5	18	1 6	9 1
$6 to $6.99	118	3 3	11 8	17	1 5	10 6
$7 to $7.99	197	5 6	17 4	23	2 0	12 6
$8 to $9.99	559	15 8	33 2	40	3 5	16 1
$10 to $11.99	556	15 7	48 9	120	10 4	26 5
$12 to $13.99	588	16 6	65 5	189	16 4	42 9
$14 to $15.99	411	11 6	77 1	243	21 1	64 0
$16 to $17.99	281	7 9	85 0	176	15 3	79 3
$18 to $19.99	185	5 2	90 2	61	5 3	84 6
$20 to $21.99	82	2 3	92 5	34	2 9	87 5
$22 to $24.99	227	6 4	98 9	32	2 8	90 3
$25 to $29.99	23	6	99 5	47	4 1	94 4
$30 to $34.99	10	3	99 8	21	1 8	96 2
$35 to $39.99	5	1	99 9	33	2 9	99 1
$40 and over	3	1	100 0	11	9	100 0

Weekly earnings	Females Under 18 Years of Age					
	1918			1921		
Totals	3,193	100 0	100 0	1,653	100 0	100 0
Under $5	275	8 6	8 6	154	9 3	9 3
$5 to $5.99	221	6 9	15 5	64	3 9	13 2
$6 to $6.99	252	7 9	23 4	66	4 0	17 2
$7 to $7.99	327	10 2	33 6	61	3 7	20 9
$8 to $9.99	794	24 9	58 5	137	8 3	29 2
$10 to $11.99	597	18 7	77 2	158	9 6	38 8
$12 to $13.99	387	12 1	89 3	313	18 9	57 7
$14 to $15.99	163	5 1	94 4	180	10 9	68 6
$16 to $17.99	90	2 8	97 2	348	21 1	89 7
$18 to $19.99	56	1 8	99 0	85	5 1	94 8
$20 to $21.99	21	7	99 7	39	2 3	97 1
$22 to $24.99	8	2	99 9	19	1 1	98 2
$25 to $29.99	2	1	100 0	21	1 3	99 5
$30 to $34.99				7	4	99 9
$35 to $39.99				1	1	100 0
$40 and over						

This table also shows an increase in the percentage of workers in the higher earnings groups. Almost twice the proportion of males under 18 years of age earned between $16 to $17.99 in 1921 than in 1918. Again, while 94.4 per cent of the females under 18 years of age earned under $16 in 1918, only 68.6 per cent earned less than that amount in 1921. This again points to the effectiveness of the State Minimum Wage Law.

In accordance with former practice, the bureau sent out questionnaires to all labor unions in the state. These questionnaires called for information regarding union membership, union hours of labor and union rates of wages in 1922. The number of unions returning these questionnaires was considerably less this year than during the year 1920.

At least one reason for the smaller number of returns is found in the fact that a large number of unions have been, and at this writing still are, on strike against threatened reductions in their standard of living. Officials of unions out on strike are usually too busy to fill out schedules which they would willingly do under normal conditions.

Table in Part II of this report shows union hours of labor and rates of wages prevailing in 1922 for such unions as have supplied this information. Altogether only 279 unions furnished membership information. The total membership reported for these unions for the year 1922 was 59,770. Owing to the small number of unions reporting, this number is not to be taken as an index of union membership.

More complete information regarding union membership is available in the reports of the State Federation of Labor. The following tabulation, taken from the Proceedings of the Twenty-third Annual Convention of the State Federation of Labor, held at Long Beach in October, 1922, shows the number of union members as well as the number of local unions and labor councils affiliated with the California State Federation of Labor.

TABLE 34—State Federation of Labor Membership Statistics.

October 1—	Local unions affiliated	Labor councils affiliated	Total affiliations	Total membership
1909	151	11	162	25,000
1910	244	12	256	45,000
1911	362	12	374	56,000
1912	429	15	444	62,000
1913	502	15	517	67,000
1914	512	18	530	69,000
1915	498	18	516	66,500
1916	481	21	502	68,000
1917	498	21	519	71,500
1918	486	21	507	78,000
1919	515	24	539	94,000
1920	549	27	576	104,200
1921	568	27	595	100,100
1922	664	27	691	91,000

Since the membership in this table is given in round numbers, it should be considered approximate rather than exact.

Compared with 1909, the union membership affiliated with the State Federation of Labor in 1922, shows an increase of 264 per cent. A study of the growth of union membership is presented in the next table (Table 35). This table shows that the union membership affiliated with the State Federation of Labor has been growing rather spasmodically.

TABLE 35—Average Annual Number and Per Cent Increase in the Union Membership Affiliated with the California State Federation of Labor, 1909-1911 to 1921-1922.

Three year periods	Approximate average annual membership		
	Number	Increase	
		Number	Per cent
1909-1911	42,000		
1912-1914	66,000	24,000	57 1
1915-1917	68,667	2,667	4 0
1918-1920	92,368	23,701	34 5
*1921-1922	95,550	3,182	3 4

*Two years period.

It will be observed that the average annual membership during 1912-1914 had increased 57 per cent compared with average annual membership in 1909-1911.

During the next three-year period, the average annual membership had increased only 4.0 per cent. Again the percentage increase in 1918-1920 was 34.5 compared with 3.4 per cent during the next two-year period. The retarded rate of increase in union membership in 1921-1922 is explained by the industrial depression during this period. A considerable increase in union membership may be expected with the improvement in the industrial situation.

PART II.
GENERAL TABLES.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1, 1922.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages		Hours of labor	
					Unit	Rates	On first 5 days	Weekly
		I. BUILDING, STONE WORKING, ETC.						
		(a) Stone Working.						
		Marble Workers—						
1	San Francisco	Marble Bed Rubbers' and Finishers' Union No. 9	Bed rubbers	Male	Day	[3]$6 50	8	44
			Polishers	Male	Day	6 00	8	44
		Paving Block Cutters—						
2	San Francisco	Paving Cutters' Union No. 69	Paving cutters	Male	per M.	18 50	8	44
		Quarrymen—						
3	Knowles	Quarry Workers' Union No. 35	Quarrymen	Male	Day	7 00	8	44
			Engineers	Male	Day	7 00	8	44
			Derrickmen	Male	Day	7 00	8	44
			Chainers	Male	Day	7 00	8	44
			Powdermen	Male	Day	7 00	8	44
			Toolsharpeners	Male	Day	9 00	8	44
			Laborers	Male	Day	5 50	8	44
		(b) Building and Paving Trades.						
		Bricklayers and Masons—						
4	Bakersfield	Bricklayers', Masons' and Plasterers' Union No. 3	Bricklayers	Male	Day	[3]10 00	8	44
			Masons	Male	Day	[3]10 00	8	44
			Plasterers	Male	Day	[3]10 00	8	44
			Cement finishers	Male	Day	[3]9 00	8	44
			Tile layers	Male	Day	[3]9 00	8	44
			Bricklayers	Male	Hour	[4]1 25	8	44
5	Long Beach	Bricklayers', Masons' and Plasterers' Union No. 13	Bricklayers	Male	Hour	1 25	8	44
6	Los Angeles	Bricklayers' Union No. 2	Bricklayers	Male	Hour	1 25	8	44
7	Oakland	Bricklayers' Union No. 8	Bricklayers	Male	Hour	1 25	Not	reported
8	Pasadena	Bricklayers', Masons' and Plasterers' Union No. 15	Bricklayers	Male	Hour	1 25		
		Carpenters and Joiners—						
9	Coalinga	Carpenters and Joiners' Union No. 855	Carpenters	Male	Day	[3]9 00	8	48
			Millmen	Male	Day	9 00	8	48
				Male	Day	8 00	8	48
10	Colusa	Carpenters and Joiners' Union No. 1481	Carpenters	Male	Day	[3]8 50	8	44
11	Fresno	Carpenters and Joiners' Union No. 701	Carpenters	Male	Day	8 00	8	44
12	Gilroy	Carpenters and Joiners' Union No. 354	Carpenters	Male	Hour	1 00	8	44
13	Glendale	Carpenters and Joiners' Union No. 563	Carpenters	Male	Hour	1 00	8	44
14	Los Angeles	Carpenters and Joiners' Union No. 426	Carpenters	Male	Day	8 00	8	44
15	Los Angeles	Millmen's Union No. 884	Millmen	Male	Day	8 00	Not	reported
16	Los Angeles	Carpenters and Joiners' Union No. 158	Carpenters	Male	Day	10 00	8	44
17	Los Angeles	Floorworkers' Union No. 2094	Layers	Male	Day	10 00	8	44
			Scrapers	Male	Day	10 00	8	44
			Finishers	Male	Day	10 00	8	44

18	Los Gatos	Carpenters and Joiners' Union No. 844	Carpenters	Male	Day	[7]8 00	8	44
19	Marysville	Carpenters and Joiners' Union No. 1570	Carpenters	Male	Day	8 00	8	44
20	Monterey	Carpenters and Joiners' Union No. 1451	House carpenters	Male	Day	8 00	8	44
			Millmen	Male	Day	7 00	8	48
21	Mountain View	Carpenters and Joiners' Union No. 1280	Carpenters	Male	Hour	[1]1 00	8	44
22	Oakland	Carpenters' Union No. 36	Carpenters	Male	Day	[8]8 35	8	44
23	Palo Alto	Carpenters and Joiners' Union No. 668	Carpenters	Male	Hour	1 00	8	44
24	Petaluma	Carpenters and Joiners' Union No. 981	Carpenters	Male	Day	[12]7 50	8	44
			Millmen	Male	Day	[12]7 00	8	44
25	Redlands	Carpenters and Joiners' Union No. 1343	Carpenters	Male	Day	7 00	8	48
26	Sacramento	Carpenters and Joiners' Union No. 2549	Carpenters	Male	Hour	1 04	8	44
			Millmen	Male	Hour	93	8	44
27	San Francisco	Carpenters and Joiners' Union No. 22	Carpenters	Male	Day	[13]8 35	8	44
28	San Jose	Carpenters' Union No. 316	Carpenters	Male	Day	[13]8 00	8	44
29	San Pedro	Carpenters and Joiners' Union No. 1140	Carpenters	Male	Hour	1 00	8	44
30	Santa Cruz	Carpenters and Joiners' Union No. 829	Carpenters	Male	Hour	1 00	8	44
31	Watsonville	Carpenters and Joiners' Union No. 771	Carpenters	Male	Hour	90	8	44
		Cement Workers—						
32	San Jose	Cement Workers' Union No. 270	Cement workers	Male	Week	35 75	8	44
		Electrical Workers—						
33	Fresno	Electrical Workers' Union No. 100	Inside wiremen	Male	Day	[10]9 25	8	44
			Fixture hangers	Male	Day	[10]9 25	8	44
			Shopmen	Male	Day	[10]9 25	8	44
34	Los Angeles	Electrical Workers' Union No. 83	Inside wiremen	Male	Hour	1 00	8	44
35	Los Angeles	Electrical Workers' Union No. 18	Linemen	Male	Day	6 40	8	44
			Stationary construction men	Male	Day	6 40	8	44
			Meter men	Male	Month	135 00-150 00	8	44
			Stationary operators	Male	Month	110 00-175 00	8	44
			Truck drivers	Male	Day	4 50-6 00	8	44
			Laborers	Male	Day	3 50-4 00	8	44
36	Martinez	Electrical Workers' Union No. 302	Linemen	Male	Day	7 00	8	48
37	Modesto	Electrical Workers' Union No. 684	Insidemen	Male	Day	7 00	8	48
			Inside wiremen	Male	Day	8 00	Not reported	
			Linemen	Male	Day	7 00	Not reported	
			Maintenance men	Male	Month	175 00	Not reported	
			Ameter winders	Male	Day	8 00	Not reported	
38	Sacramento	Electrical Workers' Union No. 340	Journeymen	Male	Day	9 25	8	44
			Helpers	Male	Day	5 00	8	44
39	San Bernardino	Electrical Workers' Union No. 477	Inside workers	Male	Day	8 00	8	44
			Outside linemen	Male	Day	5 60	8	48
			Telephone workers	Male	Month	160 00	8	48

[1]November 12, 1921, wages reduced from $7.00 per day.
[2]September 1, 1921, wages reduced from $11.00 per day.
[3]September 1, 1921, wages reduced from $10.30 per day.
[4]April 21, 1921, wages increased from $8.00 per day.
[5]July 1, 1920, wages increased from $8.00 per day.
[6]July 1, 1922, wages reduced from $9.50 per day.
[7]July 1, 1921, wages reduced from $9.00 per day.
[8]April 1, 1921, wages reduced from $9.00 per day.
[9]January 1, 1922, wages reduced from $9.00 per day.
[10]February 1, 1922, wages reduced from $8.00 per day.
[11]February 1, 1922, wages reduced from $7.50 per day.
[12]January 1, 1922, wages reduced from $9.00 per day.
[13]July 18, 1921, wages reduced from $9.00 per day.
[14]July 1, 1921, wages reduced from $10.25 per day.
[15]July 1, 1921, wages reduced from $10.25 per day.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1, 1922—Continued.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages		Hours of labor	
					Unit	Rates	On first 5 days	Weekly
		I. BUILDING, STONE WORKING, ETC.—Continued.						
		(b) BUILDING AND PAVING TRADES—Continued.						
		Electrical Workers—Continued.						
40	San Francisco	Electrical Workers' Union No. 6	Inside journeymen	Male	Day	[98] 8 00 up	8	44
			Fixture hangers	Male	Day	[97] 00 up	8	44
			Apprentices	Male	Day	2 50 up	8	44
41	San Jose	Electrical Workers' Union No. 332	Inside workers	Male	Day	[98] 00	8	44
42	Santa Rosa	Electrical Workers' Union No. 594	Journeymen wiremen	Male	Day	8 00	8	44
			Journeymen, linemen	Male	Day	7 00	8	44
43	Taft	Electrical Workers' Union No. 343	Linemen and wiremen	Male	Day	9 00	8	48
		Elevator Constructors—						
44	San Francisco	Elevator Constructors' Union No. 8	Mechanics	Male	Hour	[91] 00	8	44
			Helpers	Male	Hour	[87]5	8	44
		Housesmiths and Bridgemen—						
45	San Diego	Bridge, Structural and Ornamental Iron Workers' Union No. 229	Structural	Male	Day	7 00	8	44
			Rod work	Male	Day	[97] 00	8	44
		Lathers—						
46	San Diego	Wood, Wire and Metal Lathers' Union No. 260	Lathers	Male	Day	9 50	8	44
47	San Jose	Wood, Wire and Metal Lathers' Union No. 144	Lathers	Male	Day	[95] 00	8	40
48	Santa Rosa	Wood, Wire and Metal Lathers' Union No. 243	Lathers	Male	Week	45 00	8	44
		Painters and Decorators—						
49	Fresno	Sign Painters' Union No. 986	Sign painters	Male	Day	10 00	8	48
			Card writers	Male	Day	10 00	8	48
50	Hanford	Painters, Decorators and Paperhangers' Union No. 594	Painters	Male	Day	[99] 00	8	44
			Paperhangers	Male	Day	9 00	8	44
51	Lodi	Painters, Decorators and Paperhangers' Union No. 977	Painters	Male	Day	8 50	8	44
52	Los Angeles	Painters, Decorators and Paperhangers' Union No. 511	Painters	Male	Hour	1 00	8	44
53	Los Angeles	Painters, Decorators and Paperhangers' Union No. 202	Painters	Male	Week	44 00	8	44
			Paperhangers	Male	Week	44 00	8	44
54	Los Angeles	Painters, Decorators and Paperhangers' Union No. 831	Painters	Male	Week	50 00	8	44
55	Los Angeles	Automobile Painters' Union No. 792	Auto painters	Male	Day	8 00	8	44
			Finishers	Male	Day	8 00	8	44
			Color varnishers	Male	Day	6 50	8	44
			Assemblymen	Male	Day	5 50	8	44
			Gearmen	Male	Day	5 00	8	44
56	Martinez	Painters, Decorators and Paperhangers' Union No. 741	Painters	Male		Wages not reported	8	44
57	Monterey	Painters, Decorators and Paperhangers' Union No. 272	Painters	Male	Day	7 40	8	44
58	Napa	Painters, Decorators and Paperhangers' Union No. 262	Painters	Male	Week	38 50	8	44
59	San Diego	Painters, Decorators and Paperhangers' Union No. 333	Painters	Male	Day	8 00	8	44

			Paperhanger	Male	Day	8 00	8	44
			Decorator	Male	Day	8 00	8	44
			Glazier	Male	Day	7 00	8	44
60	San Francisco	Painters, Decorators and Paperhangers' Union No. 19	Housepainters	Male	Day	[18] 8 00	8	44
			Tinters	Male	Day	[18] 8 00	8	44
			Paperhangers	Male	Day	[18] 8 00	8	44
			Decorators	Male	Day	[18] 8 00	8	44
			Varnishers	Male	Day	[18] 8 00	8	44
			Polishers	Male	Day	[18] 8 00	8	44
			Varnishers, factory	Male	Day	[17] 7 00	8	44
			Polishers, factory	Male	Day	[17] 7 00	8	44
61	San Francisco	Sign, Scene and Pictorial Painters' Union No. 510	Sign painters	Male	Day	10 00	8	44
			Scene painters	Male	Day	10 00	8	44
			Pictorial painters	Male	Day	10 00	8	44
			Helpers	Male	Day	8 00	8	44
62	San Jose	Painters, Decorators and Paperhangers' Union No. 507	Painters	Male	Day	[18] 8 00	8	40
63	Stockton	Painters, Decorators and Paperhangers' Union No. 1115	Painters	Male	Day	8 50	8	44
64	Stockton	Painters, Decorators and Paperhangers' Union No. 1115	Painters	Male	Day	8 50	8	44
		Pavers and Rammermen—						
65	San Francisco	Pavers and Rammermen's Union No. 26	Rammermen	Male	Day	7 00	8	48
66	San Francisco	Pavers' Union No. 18	Pavers	Male	Day	8 00	8	48
		Plasterers—						
67	Fresno	Operative Plasterers and Cement Finishers' Union No. 188	Plasterers	Male	Day	[27] 11 00	8	44
			Cement finishers	Male	Day	[28] 9 00	8	44
68	Long Beach	Operative Plasterers and Cement Finishers' Union No. 343	Plasterers	Male	Day	[29] 10 00	8	44
69	Pasadena	Operative Plasterers and Cement Finishers' Union No. 194	Plasterers	Male	Day	10 00	8	44
70	San Jose	Operative Plasterers and Cement Finishers' Union No. 224	Plasterers	Male	Day	10 00	8	44
			Cement finishers	Male	Day	9 00	8	44
		Plumbers, Gas and Steam Fitters—						
71	Fresno	Gas and Water Workers' Union No. 17,273	Mechanics	Male	Day	[30] 6 50	8	48
			Mechanics' helpers	Male	Day	[31] 5 50	8	48
			Gas makers	Male	Day	[32] 6 75	8	48
			Operators	Male	Day	[33] 6 50	8	48
			Firemen	Male	Day	[34] 5 75	8	48
			Laborers	Male	Day	5 00	8	48
72	Hanford	Plumbers' Union No. 262	Plumbers	Male	Day	9 00	8	44
73	Los Angeles	Plumbers and Steamfitters' Union No. 78	Plumbers	Male	Day	9 00	8	44
			Steam fitters	Male	Day	9 00	8	44
74	Pasadena	Plumbers and Steam Fitters' Union No. 280	Plumbers	Male	Day	[35] 9 00	8	44
			Steam fitters	Male	Day	9 00	8	44

[16] June 13, 1921, wages reduced from $9.25 per day.
[17] October, 1921, wages reduced from $8.00 per day.
[18] July, 1921, wages reduced from $10.00 per day.
[19] October 1, 1921, wages increased from 98c per hour.
[20] October 1, 1921, wages increased from 99c per hour.
[21] August, 1921, wages reduced from $8.00 per day.
[22] July 18, 1921, wages reduced from $10.00 per day.
[23] January, 1920, wages increased from $8.00 per day.
[24] June 1, 1922, wages reduced from $8.35 per day.
[25] June 1, 1922, wages reduced from $7.35 per day.
[26] July 14, 1921, wages reduced from $9.00 per day.
[27] July 1, 1921, wages reduced from $12.00 per day.
[28] July 1, 1921, wages reduced from $10.00 per day.
[29] August 8, 1921, wages reduced from $12.00 per day.
[30] June 1, 1920, wages increased from $5.50 per day.
[31] June 1, 1920, wages increased from $4.50 per day.
[32] June 1, 1920, wages increased from $135.00 per month.
[33] June 1, 1920, wages increased from $125.00 per month.
[34] June 1, 1920, wages increased from $115.00 per month.
[35] October, 1921, wages increased from $8.00 per day.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1, 1922 Continued.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages		Hours of labor	
					Unit	Rates	On first 5 days	Weekly
		I. BUILDING, STONE WORKING, ETC.—Continued.						
		(b) Building and Paving Trades—Continued.						
		Plumbers, Gas and Steam Fitters—Continued.						
75	San Francisco	Plumbers and Steam Fitters' Union No. 509	Plumbers	Male	Day	9 00	8	44
76	San Jose	Plumbers and Steam Fitters' Union No. 393	Plumbers	Male	Day	*8 00	8	44
			Steam fitters	Male	Day	8 00	8	44
77	Santa Monica	Plumbers and Steam Fitters' Union No. 545	Plumbers	Male	Day	10 00	8	44
78	Vallejo	Plumbers and Steam Fitters' Union No. 343	Plumbers	Male	Day	10 00	8	44
		Roofers, Composition—						
79	Fresno	United Slate, Tile and Composition Roofers' Union No. 27	Composition roofers	Male	Hour	1 00 to 1 12½	8	44
80	Los Angeles	United Slate, Tile and Composition Roofers' Union No. 36	Foremen roofers	Male	Day	8 00	8	44
			Journeymen roofers	Male	Day	7 00	8	44
		Sheet Metal Workers—						
81	San Jose	Sheet Metal Workers' Union No. 399	Sheet metal workers	Male	Day	9 00	8	44
		Steam and Hot Water Fitters—						
82	Fresno	Steam and Operating Engineers' Union No. 330	Stationary engineers	Male	Day	6 00	8	44
			Hoisting engineers	Male	Day	9 00	8	44
83	San Jose	Steam and Operating Engineers' Union No. 842	Engineers	Male	Day	*9 00	8	44
			Firemen	Male	Day	*6 00	8	44
		Heat, Frost Insulators and Asbestos Workers—						
84	Los Angeles	Heat and Frost Insulators and Asbestos Workers' Union No. 5	Insulators	Male	Hour	1 00	8	44
85	San Francisco	Heat and Frost Insulators and Asbestos Workers' Union No. 16	Insulators	Male	Day	*7 00	8	44
		(c) Building and Street Labor.						
		General Building and Street Laborers—						
86	Fresno	Building and Common Laborers' Union No. 135	Building construction	Male	Day	*5 50	8	48
			Lumber yards	Male	Day	*5 00	8	48
			Plumbers' helpers	Male	Day	*6 50	8	48
			Marble tile helper	Male	Day	*6 50	8	48
			Roofers' helpers	Male	Day	*5 50-7 00	8	48
87	Fresno	Hod Carriers, Building and Common Laborers	Cement workers	Male	Day	7 00	8	44
			Cement machine workers	Male	Day	8 00	8	44
			Brick laborers	Male	Day	7 00	8	44
			Plaster laborers	Male	Day	8 00	8	44
88	Long Beach	Hod Carriers, Building and Common Laborers' Union No. 507	Plaster tenders	Male	Hour	1 00	8	44

89	Los Angeles	Hod Carriers, Building and Common Laborers' Union No. 300	Plaster tenders	Male	Day	9 00	8	40
			Mortar men	Male	Day	7 00	8	44
			Common laborers	Male	Day	5 00	8	48
90	Marysville	Hod Carriers, Building and Common Laborers' Union No. 121	Hod carriers	Male	Day	[36]6 00	8	48
			Common laborers	Male	Day	[41]7 00	8	44
			Cement workers	Male	Day	[46]7 40	8	44
91	San Diego	Hod Carriers, Building and Common Laborers' Union No. 89	Hod carriers	Male		Wages not reported	8	44
			Common laborers	Male		Wages not reported	8	44
92	San Jose	Hod Carriers' Union No. 234	Tending mason	Male	Day	7 50	8	44
			Tile setter	Male	Day	7 50	8	44
			Plasterers	Male	Day	7 50	8	44
93	San Jose	Building and Common Laborers' Union No. 234	Common laborers	Male	Day	5 50	8	44
94	San Jose	Material Handlers' Union No. 115	Lumber handlers	Male	Day	[45]5 50	8	44
95	San Mateo	Hod Carriers, Building and Common Laborers' Union No. 97	Plasterers' laborers	Male	Day	9 00	8	44
			Brick laborers	Male	Day	8 00	8	44
			Cement laborers	Male	Day	7 00	8	48
96	Santa Barbara	Hod Carriers, Building and Common Laborers' Union No. 195	Brick masons	Male	Day	[47]7 00	8	44
			Tenders	Male	Day	[47]7 00	8	44
			Plasterers	Male	Day	[48]7 00	8	44
			Tenders	Male	Day	[48]7 00	8	44

II. TRANSPORTATION.

(a) Railways.

		Street Railway Employees—						
97	Los Angeles	Brotherhood of Railway Carmen No. 1431	Carmen	Male	Hour	[49]67	8	48
			Carmen	Male	Hour	[50]80	8	48
			Carmen	Male	Hour	[51]72	8	48
			Carmen	Male	Hour	[52]63	8	48
98	San Francisco	Brotherhood of Railway Carmen No. 1319	Car builders	Male	Hour	[53]80	8	48
			Car repairers	Male	Hour	[53]80	8	48
			Car builders	Male	Hour	[54]72	8	48
			Car repairers	Male	Hour	72	8	48
99	San Francisco	Trackmen's Union No. 637	Municipal trackmen	Male	Hour	62½	8	44
		Trainmen, Road and Yard—						
100	Roseville	Railway Carmen's Union No. 937	Train yard	Male	Hour	[55]72	8	56
			Shops	Male	Hour	[55]72	8	48

[36]July 18, 1921, reduced from $10.00 per day.
[37]August, 1921, wages reduced from $10.00 per day.
[38]August, 1921, wages reduced from $7.00 per day.
[39]January 1, 1922, wages reduced from $8.50 per day.
[40]July 5, 1921, wages reduced from $6.50 per day.
[41]July 5, 1921, wages reduced from $6.00 per day.
[42]July 5, 1921, wages reduced from $7.50 per day.
[43]July 11, 1922, wages increased from $5.00 per day.
[44]July 11, 1922, wages increased from $6.00 per day.
[45]July 11, 1922, wages increased from $7.00 per day.
[46]July 18, 1921, wages reduced from $6.50 per day.
[47]July 1, 1921, wages reduced from $8.00 per day.
[48]July 1, 1921, wages reduced from $8.00 per day.
[49]May 1, 1919, wages increased from 58c per hour.
[50]May 1, 1920, wages increased from 67c per hour.
[51]July 1, 1921, wages reduced from 80c per hour.
[52]July 1, 1922, wages reduced from 72c per hour.
[53]July 1, 1920, increased from 67c per hour.
[54]July 1, 1921, decreased from 80c per hour.
[55]July 1, 1922, wages increased from 63c per hour.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1, 1922—Continued.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages		Hours of labor	
					Unit	Rates	On first 5 days	Weekly
		II. TRANSPORTATION—Continued.						
		(a) Railways—Continued.						
		Trainmen, Road and Yard—Continued.						
101	San Francisco	Brotherhood of Railway Carmen No. 736	Car inspectors	Male	Hour	[58]63	8	48
			Car repairers	Male	Hour	[58]63	8	48
			Painters	Male	Hour	[57]70	8	48
			Helpers	Male	Hour	[58]47	8	48
			Car cleaners	Male	Hour	[59]37	8	48
			Upholsterers	Male	Hour	[60]70	8	48
			Pipe fitters	Male	Hour	[60]70	8	48
102	Stockton	Brotherhood of Railway Carmen No. 918	Car inspectors	Male	Hour	[63]72	8	56
			Car repairers	Male	Hour	[60]72	8	48
			Blacksmiths	Male	Hour	[60]77	8	48
			Blacksmiths' helpers	Male	Hour	[59]54	8	43
			Locomotive carpenter	Male	Hour	[60]77	8	48
			Car carpenter	Male	Hour	[60]72	8	48
		(b) Navigation.						
		Cooks and Stewards, Marine—						
103	San Francisco	Marine Cooks and Stewards Association of the Pacific Coast	Cooks	Male	Month	[60]95 00	Not reported	
104	San Pedro		Waiters	Male	Month	[61]70 00	Not reported	
		Firemen, Oilers and Watertenders, Marine—						
104	San Pedro	Marine Transport Workers No. 1	Stevedores	Male	Hour	[68]80	8	48
			Dock workers	Male	Hour	[60]70	8	48
		Seamen—	Passengers and Car Ferries—					
105	San Francisco	Ferryboatmen's Union of California	Captains	Male	Month	$250 00	.....	.....
			First officers	Male	Month	160 00	.....	.....
			Second officers	Male	Month	137 00	.....	.....
			Chief engineers	Male	Month	225 00	.....	.....
			Assistant chief engineers	Male	Month	213 75	.....	.....
			First assistant chief engineer	Male	Month	195 00	.....	.....
			Car ferries Contra Costa and Solano—					
			First assistant engineer	Male	Month	165 00	.....	.....
			Firemen	Male	Month	126 35	.....	.....

			Deckhands	Male	Month	119 40		
			Cabin watchman	Male	Month	119 40		
			Night watchman	Male	Month	100 00		
			Matrons	Male	Month	75 00		
			Tugs Towing Car Floats—					
			Captains	Male	Month	225 00		
			Mates	Male	Month	160 00		
			Chief engineers	Male	Month	200 00		
			Assistant chief engineers	Male	Month	190 00		
			Firemen	Male	Month	126 35		
			Deckhands	Male	Month	119 40		
			Drawbridge Tending Boats—					
			Captains	Male	Month	175 00		
			Chief engineers	Male	Month	165 00		
			Assistant chief engineers	Male	Month	156 75		
			Fire Boats—					
			Captains	Male	Month	150 00		
			Mates	Male	Month	106 65		
			Chief engineers	Male	Month	133 35		
			Assistant chief engineers	Male	Month	126 65		
			Firemen	Male	Month	84 25		
			Deckhands	Male	Month	79 50		
			Ferry Boat "Marine"—					
			Captains	Male	Month	195 00		
			Chief engineers	Male	Month	190 00		
			Assistant chief engineers	Male	Month	180 50		
			Deckhands	Male	Month	119 40		
106	San Francisco	Alaska Fishermen's Union	Fishermen	Male	Per fish	03	8	48
		Submarine Divers and Tenders—						
107	San Francisco	Submarine Divers and Tenders' Union No. 16139	Tenders	Male	Day	9 00	8	48
			Divers	Male	4 hr. day	19 00		
					9 hr. day	29 00		

[56] July 1, 1921, wages reduced from 80c per hour.
[57] July 1, 1921, wages reduced from 85c per hour.
[58] July 1, 1921, wages reduced from 62c per hour.
[59] July 1, 1921, wages reduced from 50c per hour.
[60] July 1, 1921, wages reduced from 85c per hour.
[61] July 1, 1921, wages reduced from 80c per hour.
[62] July 1, 1921, wages reduced from 85c per hour.
[63] July 1, 1921, wages reduced from 64c per hour.
[64] July 1, 1921, wages reduced from 85c per hour.
[65] July 1, 1921, wages reduced from 80c per hour.
[66] July 29, 1921, wages reduced from $110.00 per month.
[67] July 29, 1921, wages increased from $45.00 per month.
[68] August 10, 1921, wages reduced from 90c per hour.
[69] August 10, 1921, wages reduced from 80c per hour.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1, 1922—Continued.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages		Hours of labor	
					Unit	Rates	On first 5 days	Weekly
		H. TRANSPORTATION Continued.						
		(c) Teaming and Car Driving.						
		Building Material Drivers—						
108	Bakersfield	Teamsters and Truckdrivers' Union No. 280	6 horse teamsters	Male	Day	$7 00	8	48
			4 horse teamsters	Male	Day	6 50	8	48
			2 horse teamsters	Male	Day	6 00	8	48
			2 horse heavy trucks or drays	Male	Day	6 00	8	48
			2 horse light delivery wagons	Male	Day	5 50	8	48
			1 horse light delivery wagons	Male	Day	5 00	8	48
			Helpers	Male	Day	5 00	8	48
			Auto trucks of less than 2,500 lbs. carrying capacity	Male	Day	5 00	8	48
			Auto truck over 2,500 lbs. and less than 4,500 lbs. carrying capacity	Male	Day	5 50	8	48
			Auto trucks over 4,500 lbs. and less than 7,000 lbs. carrying capacity	Male	Day	6 00	8	48
			Auto truck over7,000lbs. carrying capacity	Male	Day	6 50	8	48
			Helpers	Male	Day	5 00	8	48
		Cabmen and Coach Drivers—						
109	Oakland	Brotherhood of Teamsters No. 70	Four horse teamsters	Male	Day	6 50	8	48
			Two horse truckmen	Male	Day	6 00	8	48
			Fruit teamsters	Male	Day	6 50	8	48
			Wagons of 4 ton capacity	Male	Day	6 00	8	48
			Wagons of 2 ton capacity	Male	Day	5 50	8	48
			Two horse wagons under 2 tons	Male	Day	5 00	8	48
			Auto trucks of less than 2,500 lbs. carrying capacity	Male	Day	5 00	8	48
			Over 2,500 lbs. and less than 4,500 lbs. carrying capacity	Male	Day	5 50	8	48
			Over 4,500 lbs. and less than 6,500 lbs. carrying capacity	Male	Day	6 00	8	48
			6,500 lbs. carrying capacity and less than 10,000 lbs.	Male	Day	6 50	8	48
			10,000 lbs. carrying capacity and over	Male	Day	7 00	8	48

		Delivery Wagon Drivers—						
110	San Francisco	Retail Delivery Drivers' Union No. 278	Chauffeurs, department store	Male	Month	143 00	8	48
			Grocery drivers	Male	Month	143 00	8	48
			Soda drivers	Male	Month	143 00	8	48
			Tea drivers	Male	Month	143 00	8	48
			Ice cream drivers	Male	Month	143 00	8	48
			Motorcycle drivers	Male	Month	143 00	8	48
		Ice Handlers—						
111	Bakersfield	Teamsters and Truckdrivers' Union No. 280	Ice wagon drivers	Male	Month	140 00	8	48
			Helpers	Male	Month	140 00	8	48
112	Sacramento	Icemen's Union No. 230	Wholesale drivers	Male	Day	6 00	9	54
			Retail drivers	Male	Day	5 00	9	54
			Helpers	Male	Day	5 00	9	54
			Ice pullers	Male	Day	5 50	8	48
113	Oakland	Ice Wagon Drivers' Union No. 610	Drivers	Male	Month	[70]150 00	9	56
		Laundry Wagon Drivers—						
114	San Francisco	Laundry Wagon Drivers' Union No. 256	Drivers	Male	Week	$30 00 to 32 00	Not	given
		Team Drivers—						
115	Fresno	General Teamsters' Union No. 431	Material drivers	Male	Day	[71]6 00	8	48
			Transfer drivers	Male	Day	[71]5 40	9	54
116	Oakland	Ice Wagon Drivers and Helpers' Union No. 610	Drivers	Male	Month	[72]150 00	9	48
117	Sacramento	Truck and Heavy Wagon Drivers' Union No. 557	Heavy truck drivers	Male	Week	[73]33 50	9	54
			Two horse team drivers	Male	Week	[73]33 50	9	54
			Light truck	Male	Week	31 50	9	54
			One horse drivers	Male	Week	31 50	9	54
118	San Diego	Teamsters and Chauffeurs' Union No. 548	Furniture drivers	Male	Week	[74]24 00	9	54
			Baggage drivers	Male	Week	[74]24 00		70
			Wholesale grocery	Male	Month	[74]120 00		50
			Piano moving	Male	Week	36 00		54
			Building material	Male	Week	[74]20 00		60
119	San Francisco	Brotherhood of Teamsters, Chauffeurs, Stablemen and Helpers No. 85	Four horse teamsters	Male	Day	6 50	9	52½
			Two horse teamsters	Male	Day	6 00	9	52½
			Fruit teamsters	Male	Day	6 50	9	52½
			Four ton wagons	Male	Day	5 50	9	52½
			Two ton wagons	Male	Day	5 00	9	52½
			Auto trucks, less than 2,500 lbs. carrying capacity	Male	Day	5 00	9	52½
			Over 2,500 lbs and less than 4,500 lbs.	Male	Day	5 50	9	52½
			Over 4,500 lbs. and less than 6,500 lbs.	Male	Day	6 00	9	52½
			Over 6,500 lbs.	Male	Day	6 50	9	52½

[70] April 1, 1922, wages reduced from $160.00 per month.
[71] July 5, 1921, wages reduced from $7.00 per day.
[72] July 5, 1921, wages reduced from $6.00 per day
[73] April 1, 1922, wages reduced from $160.00 per month.
[74] July 1, 1920, wages increased from $30.00 per week.
[75] July 1, 1920, wages increased from $27.50 per week.
[76] April 1, 1921, wages reduced from $30.00 per week.
[77] April 1, 1921, wages reduced from $130.00 per month.
[78] April 1, 1921, wages reduced from $25.00 per week.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1, 1922—Continued.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages: Unit	Rates of wages: Rates	Hours of labor: On first 5 days	Hours of labor: Weekly
		II. TRANSPORTATION—Continued.						
		(c) TEAMING AND CAR DRIVING—Continued.						
		Team Drivers—Continued.						
120	San Francisco	Ice Wagon Drivers and Helpers' No. 519	Wholesale truck drivers	Male	Day	$6 00	8	48
			Route drivers	Male	Day	[2]5 50	8	48
			Helpers	Male	Day	[2]5 50	8	48
121	Vallejo	Teamsters and Chauffeurs' Union No. 498	Teamsters	Male	Day	[3]5 00-5 50	8	48
			Chauffeurs	Male	Day	[3]5 50-6 00	8	48
			Stablemen	Male	Day	[3]5 00	8	48
			Helpers	Male	Day	[3]5 00	8	48
		Bakery Wagon Drivers—						
122	San Francisco	Bakery Wagon Drivers and Salesmen No. 184	Drivers	Male	Week	42 00	8	48
			Salesmen	Male	Week	42 00	8	48
		Beer Drivers and Stablemen—						
123	San Francisco	Beer Drivers and Stablemen's Union No. 227	Drivers	Male	Week	[3]33 00	8½	51
			Helpers	Male	Week	[3]33 00	8½	51
		III. CLOTHING AND TEXTILES.						
		(a) GARMENTS.						
		Shirt and Overall Workers—						
124	Los Angeles	United Garment Workers' No. 125	Mechanical	Female	Day	[3]Piece work	8	44
125	Los Angeles	Garment Cutters' Union No. 36	Shirt cutters	Male	Week	$38 50	8	44
			Overall cutters	Male	Week	38 50	8	44
126	Los Angeles	United Garment Workers' No. 125	Shirt Makers	Both	.....	[3]Piece work	8	44
127	San Francisco	United Garment Workers' No. 131	Overalls, shirts, working pants, play suits and white duck suits	Both	.....	Piece work	8	44
		Tailors—						
128	Sacramento	Journeymen Tailors' Union No. 107	Journeymen tailors	Both	Week	$36 00	8	48
			Helpers, experienced	Both	Week	24 00	8	48
			Helpers, apprentice	Both	Week	15 00	8	48
129	San Diego	Tailors' Union No. 277	Tailors	Male	Week	36 00	8	48
			Tailors	Female	Week	24 00	8	48
130	San Jose	Tailors' Union No. 108	Tailors	Male	Week	42 00	8	48
			Tailors	Female	Week	24 00	8	48
131	Woodland	Journeymen Tailors' Union No. 243	Tailors	Male	Week	[3]36 00	8	48

		Ladies Garments—						
132	San Francisco	Garment Cutters' Union No. 45	Cutters	Male	Week	42 00	8	44
		(b) LAUNDRY WORKERS.						
		Laundry Workers—						
133	San Jose	Shirt Waist and Laundry Workers' Union No. 33	Head marker and distributor	Both	Week	31 75	8	44
			Markers and distributors	Both	Week	27 25	8	44
			Head washer	Both	Week	31 75	8	44
			Washers	Both	Week	27 25	8	44
			Helpers	Both	Week	24 25	8	44
			Wringerman	Both	Week	27 25	8	44
			Starch Room—					
			Head starchers	Both	Week	25 00	8	44
			Starchers	Both	Week	18 00	8	44
			Dry House—					
			Dry house hands	Both	Week	18 00	8	44
			Operators on dry tumbler	Both	Week	19 00	8	44
			Shirt Department—					
			Shirt finishers	Both	Week	20 00	8	44
			Cuff and neck band operators on press machine	Both	Week	17 00	8	44
			Bosom operators on press machine	Both	Week	20 00	8	44
			Shirt polishers	Both	Week	20 00	8	44
			Body operators on press machine	Both	Week	17 00	8	44
			Sleeve machine operators	Both	Week	17 00	8	44
			Flannel folder	Both	Week	18 00	8	44
			Seamstress	Both	Week	17 00	8	44
			Ironing Room—					
			Head ironer	Both	Week	22 50	8	44
			Ironers	Both	Week	20 00	8	44
			Inexperienced ironer	Both	Week	16 00	8	44
			Press machine operators on starch work	Both	Week	18 50	8	44
			Press machine operators on flannels	Both	Week	18 50	8	44
			Body ironers	Both	Week	19 50	8	44
			Head collar ironers	Both	Week	20 00	8	44
			Collar ironers	Both	Week	16 50	8	44

[74]May 1, 1922, wages reduced from $6.00 per day.
[83]June 1, 1922, wages reduced from $5.50 to $6.00 per day.
[84]June 1, 1922, wages reduced from $6.00 to $7.00 per day.
[85]June 1, 1922, wages reduced from $5.50 per day.

[88]June 1, 1922, wages reduced from $5.50 per day.
[94]May 25, 1922, wages reduced from $36.00 per week.
[95]February 16, 1920, 20 per cent increase in wages.
[96]1919, wages increased from $25.00 per week.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1, 1922—Continued.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages		Hours of labor	
					Unit	Rates	On first 5 days	Weekly
		III. CLOTHING AND TEXTILES—Continued.						
		(b) LAUNDRY WORKERS—Continued.						
		Laundry Workers—Continued.						
			Mangle Department					
			Forelady on mangle	Both	Week	$19 00	8	44
			Experienced mangle hands	Both	Week	17 00	8	44
			Inexperienced (1st 6 mos.)	Both	Week	15 50	8	44
			Inexperienced (6-12 months)	Both	Week	16 50	8	44
			Head shaker	Both	Week	18 00	8	44
			Shakers	Both	Week	16 00	8	44
			Operator on tumbler	Both	Week	18 00	8	44
			Head assorter on family wash	Both	Week	21 00	8	44
			Assistant assorter on family wash	Both	Week	17 50	8	44
			Counter on family wash	Both	Week	18 00	8	44
			Apprentices in marking room,					
			1st 6 months	Both	Week	16 00	8	44
			6 to 12 months	Both	Week	19 00	8	44
134	San Francisco	Laundry Workers' Union No. 26	Head markers and distributors	Both	Week	31 75	8	48
			Markers and distributors	Both	Week	27 25	8	48
			Head washer	Both	Week	31 75	8	48
			Washer	Both	Week	27 25	8	48
			Weighers in wash house	Both	Week	27 25	8	48
			Sorters in wash house	Both	Week	27 25	8	48
			Helpers in wash house	Both	Week	24 25	8	48
			Wringermen		Week	27 25	8	48
			Distributors on plain work in mangle room	Both	Week	27 25	8	48
			Shirt finishers	Both	Week	24 00	8	48
			Steam press machine	Both	Week	19 50	8	48
			Tiler ironers	Both	Week	24 00	8	48
			Fluters	Both	Week	19 00	8	48
			Ironers, first six months	Both	Week	18 50	8	48
			Ironers, over six months	Both	Week	20 50	8	48
			Jumbo ironers	Both	Week	20 50	8	48
			Polishers	Both	Week	22 50	8	48
			Shirt press operators	Both	Week	22 50	8	48
			Cuff press operators	Both	Week	18 00	8	48
			Shirt band on neck band	Both	Week	18 00	8	48
			Wrist band machine	Both	Week	18 00	8	48
			Yoke machine or tiler on yokes	Both	Week	18 00	8	48
			Sleeve machine hands	Both	Week	18 00	8	48

			Shirt body ironer	Both	Week	$19 50	8	48
			Starch body ironer	Both	Week	19 50	8	48
			Flannel body ironer	Both	Week	19 50	8	48
			Shirt waist machine	Both	Week	18 00	8	48
			Head collar ironers	Both	Week	20 00	8	48
			Collar ironers	Both	Week	18 00	8	48
			Seamstress	Both	Week	18 50	8	48
			Head starchers	Both	Week	25 00	8	48
			Starcher on ladies' work	Both	Week	19 00	8	48
			Shirt dippers	Both	Week	18 50	8	48
			Shirt dippers, auto dry house	Both	Week	18 50	8	48
			Shirt rubbers	Both	Week	18 50	8	48
			Shirt rubbers on shirt starching machine	Both	Week	18 50	8	48
			Collar rubbers, auto dry house	Both	Week	18 50	8	48
			Collar rubbers	Both	Week	18 50	8	48
			Mangle girls	Both	Week	17 50	8	48
			Tiers on plain work in mangle room	Both	Week	19 00	8	48
			Shakers on mangle	Both	Week	17 00	8	48
			Operator on tumbler	Both	Week	19 00	8	48
			Dampeners on all work	Both	Week	19 00	8	48
			Folders on all work	Both	Week	18 00	8	48
			Dry house hands	Both	Week	19 00	8	48
			Dry house steam tumbler	Both	Week	19 00	8	84
135	Visalia	Laundry Workers' Union No. 234	Laundry workers	Female	Week	[86]18 00	8	48
		(c) Hats and Caps.						
		Hat and Cap Workers—						
136	Los Angeles	Hatters' Union No. 41	Finishers	Male	Hour	1 00	8	48
			Flangers	Male	Hour	1 00	8	48
137	San Francisco	Hatters' Union No. 23	Finishers	Male	Week	[87]44 00	8	48
			Flangers	Male	Week	[87]44 00	8	48
		(d) Boots, Shoes and Gloves.						
		Boot and Shoe Workers—						
138	Fresno	Boot and Shoe Workers' Union No. 264	Repairers	Male	Week	36 00	8	48
		IV. METALS, MACHINERY AND SHIPBUILDING.						
		(a) Iron and Steel.						
		Architectural Iron Workers—						
139	Sacramento	Bridge and Structural Iron Workers' Union No. 118	Structural iron workers	Male	Hour	[88]1 12½	8	44
			Housesmiths	Male	Hour	[89]1 04⅝	8	44

[86] July 1, 1921, wages increased from $16.50 per week.
[87] June 1, 1921, wages reduced from $50.00 per week.
[88] August 1, 1922, wages reduced from $1.25 per hour.
[89] August 1, 1922, wages reduced from $1.12½ per hour.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1, 1922—Continued.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages		Hours of labor	
					Unit	Rates	On first 5 days	Weekly
		IV. METALS, MACHINERY AND SHIPBUILDING—Continued.						
		(a) IRON AND STEEL—Continued.						
		Blacksmith—						
140	Vallejo	Brotherhood of Blacksmiths, Drop Forgers and Helpers No. 82	Blacksmiths	Male	Hour	$0 80	8	40
			Drop Forgers	Male	Hour	88	8	40
			Blacksmith helpers	Male	Hour	56	8	40
		Boilermakers—						
141	Los Angeles	Boilermakers, Iron Ship Builders and Helpers' Union No. 92	Mechanics, shop	Male	Hour	75	8	48
			Helpers	Male	Hour	50	8	48
			Mechanics, outside	Male	Hour	80	8	48
			Helpers, outside	Male	Hour	65	8	48
			Mechanics, outside	Male	Hour	90	8	48
			Helpers, outside	Male	Hour	80	8	48
142	Los Angeles	Boilermakers, Iron Ship Builders and Helpers' Union No. 723	Boilermakers	Male	Hour	[w]77	8	48
			Helpers	Male	Hour	[w]55	8	48
			Apprentices	Male	Hour	[w]34	8	48
143	Richmond	Boilermakers, Iron ship Builders and Helpers' Union No. 317	Mechanics	Male	Hour	90	8	48
			First class helpers	Male	Hour	$73\frac{3}{4}$	8	48
			Second class helpers	Male	Hour	$70\frac{1}{4}$	8	48
			Apprentices start with	Male	Hour	$46\frac{1}{4}$	8	48
		Horseshoers—						
144	San Francisco	Journeymen Horseshoers No. 25	Horseshoers	Male	Day	8 00	8	48
		Machinists—						
145	Eureka	Machinists' Union No. 540	Machinists	Male	Hour	75	8	50
146	Oakland	Machinists' Union No. 284	Machinists	Male	Hour	[w]80	8	44
			Specialists	Male	Hour	[w]63	8	44
			Helpers	Male	Hour	[w]57	8	44
			Apprentices	Male	Hour	[w]20–52	8	44
147	Oakland	Auto Mechanics' Union No. 1546	Journeymen mechanics	Male	Hour	$81\frac{1}{4}$	8	48
			Advance apprentices	Male	Hour	50c to 75c	8	48
			Apprentices	Male	Hour	25c to 50c	8	48
148	Sacramento	Machinists' Union No. 33	Railroad machinists	Male	Hour	[w]72	8	48
			Contract shop	Male	Hour	90c to 1 00	8	44
149	San Francisco	Machinists' Union No. 68	Machinists, minimum	Male	Day	6 40 to 8 00	8	44
			Specialists	Male	Day	5 12	8	44
			Helpers	Male	Day	4 96	8	44
		Molders and Coremakers—						
150	San Diego	Molders' Union No. 387	Coremaker	Male	Hour	80	8	48
			Molder	Male	Hour	80	8	48
151	San Francisco	Molders' Union No. 164	Molders	Male	Hour	[w]80	8	44

		Sheet Metal Workers—							
152	San Mateo	Amalgamated Sheet Metal Workers' Union No. 272	Sheet metal workers	Male	Hour	[99]$1 25	8	44
153	Santa Cruz	Amalgamated Sheet Metal Workers' Union No. 304	General	Male	Hour	[100]1 00	8	44
		(a) SHIPBUILDING.							
		Shipwrights, Joiners and Caulkers—							
154	San Francisco	Ship Joiners' Union No. 449	Ship joiners	Male	Day	[101]6 24	8	44
		V. PRINTING, BINDING, ETC.							
		(a) BOOKBINDERS.							
		Bookbinders—							
155	Los Angeles	Bookbinders' Union No. 63	Forwarders	Male	Week	[102]42 00	8	44
			Rulers	Male	Week	[102]42 00	8	44
			Finishers	Male	Week	[102]42 00	8	44
			Cutters	Male	Week	[102]42 00	8	44
			Table girls	Female	Week	[103]20 00	8	44
			Machine girls	Female	Week	[103]20 00	8	44
156	San Francisco	Bookbinders' and Bindery Women's Union No. 31-125	Bookbinders	Male	Hour	[101]1 04½	8	44
			Bookbinders	Female	Hour	[103]50	8	44
		(b) COMPOSITORS.							
		Compositors—							
157	Bakersfield	Typographical Union No. 439	Newspaper floormen	Male	Day	7 50	8	48
			Linotype operators	Male	Day	7 50	8	45
			Job men	Male	Day	7 50	8	44
			Newspaper floormen	Male	Night	8 00	8	48
			Linotype operators	Male	Night	8 00	8	45
			Job men	Male	Night	8 00	8	44
158	Eureka	Typographical Union No. 207	Handman job	Male	Day	[104]6 25	8	44
			Machine man	Male	Day	[104]6 25	8	44
			Handman, job, newspaper	Male	Night	7 00	8	44
			Machine man, newspaper	Male	Day	6 50	8	44
			machine man, newspaper	Male	Night	7 00	8	44
159	Maricopa	Typographical Union No. 811	Compositors, day	Male	Week	45 00	8	44
			Compositors, night	Male	Week	48 00	8	44
160	Modesto	Typographical Union No. 689	Printer, job	Male	Week	46 00	8	44
			Printer, newspaper, day	Male	Week	47 00	7½	45
			Printer, newspaper, night	Male	Week	50 00	7½	45

[90]July 1, 1921, wages reduced from 85c per hour.
[91]July 1, 1921, wages reduced from 63c per hour.
[92]July 1, 1921, wages reduced from 42c per hour.
[93]January 1, 1921, wages reduced from 88c per hour.
[94]January 1, 1921, wages reduced from 70c per hour.
[95]January 1, 1921, wages reduced from 66c per hour.
[96]January 1, 1921, wages reduced from 22c to 57c per hour.
[97]July 1, 1922, wages reduced from 78c per hour.
[98]January 1, 1922, wages reduced from $8.00 per day.

[99]June 1, 1920, wages increased from $9.00 per day.
[100]September 1, 1921, wages reduced from $9.00 per day of eight hours.
[101]September 1, 1921, wages reduced from $7.68 per day.
[102]January 1, 1921, wages increased from $38.00 per week.
[103]January 1, 1921, wages increased from $18.00 per week.
[104]September 1, 1920, wages increased from $39.00 per week.
[105]September 1, 1920, wages increased from $18.00 per week.
[106]May 1, 1921, wages reduced from $6.50 per day.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1, 1922—Continued.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages		Hours of labor	
					Unit	Rates	On first 5 days	Weekly
		V. PRINTING, BINDING, ETC.—Continued.						
		(b) Compositors—Continued.						
		Compositors—Continued.	Newspaper	Male	Day	[16]$8 58½	7½	45
161	Palo Alto	Typographical Union No. 521	Job	Male	Day	[16]8 08⅓	8	44
			Newspaper printers, day	Male	Hour	[16]1 00	8	45
162	Pasadena	Typographical Union No. 583	Newspaper printers, night	Male	----	6c per hour above day work.		
			Job printers	Male	Hour	[16]1 00	8	44
			Machine	Male	Day	[16]9 50	8	44
163	Petaluma	Typographical Union No. 600	Floor	Male	Day	[16]9 00	8	44
			Newspaper, day	Male	Week	48 50	8	45
164	Sacramento	Typographical Union No. 46	Newspaper, night	Male	Week	51 50	8	45
			Job, day	Male	Week	46 00	8	44
			Job, night	Male	Week	49 00	8	44
			Day work	Male	Week	42 00	8	44
165	San Francisco	Typographical Union No. 589	Night work	Male	Week	48 00	8	45
			Grave yard shift	Male	Week	51 00	8	48
			Commercial, day	Male	Week	[16]46 00	8	44
166	San Francisco	Typographical Union No. 21	Commercial, night	Male	Week	[16]49 00	8	44
			Newspaper, day	Male	Week	[16]48 50	7½	45
			Newspaper, night	Male	Week	[16]51 50	7½	45
			Newspaper, morning	Male	Week	[16]51 50	8	44
167	San Jose	Typographical Union No. 231	Newspaper, evening	Male	Week	[16]48 50	8	44
			Job, day	Male	Week	[16]46 00	8	44
			Night newspaper, machine	Male	Week	38 50	8	44
168	Santa Rosa	Typographical Union No. 577	Night newspaper, floor	Male	Week	35 75	8	44
			Day newspaper, machine	Male	Week	35 75	8	44
			Day newspaper, floor	Male	Week	33 00	8	44
			Job offices	Male	Week	33 00	8	44
			Floor men	Male	Week	[16]33 00	8	44
169	San Rafael	Typographical Union No. 729	Machine operators	Male	Week	39 00	8	44
			Newspaper, day	Male	Day	8 00	7½	45
170	Stockton	Typographical Union No. 56	Newspaper, night	Male	Night	8 50	7½	45
			Printers	Male	Week	45 00	8	44
171	Taft	Typographical Union No. 811	Linotype operators, day	Male	Week	[16]39 00	7½	44
172	Visalia	Typographical Union No. 549	Linotype operators, night	Male	Week	[16]42 00	7½	44
			Floor men, day	Male	Week	[16]39 00	7½	44
			Floor men, night	Male	Week	[16]42 00	7½	44
173	Woodland	Typographical Union No. 830	Job printer	Male	Week	39 00	8	44
			Paper printer	Male	Week	42 00	8	48

		(c) ELECTROTYPERS AND STEREOTYPERS.						
		Electrotypers and Stereotypers—						
174	Los Angeles	Stereotypers' Union No. 58	Stereotypers	Male	Week	[107]42 00	8	48
175	Los Angeles	Electrotypers' Union No. 137	Electrotypers	Male	Week	[108]38 00	8	48
176	Sacramento	Stereotypers and Electrotypers' Union No. 86	Stereotypers	Male	Week	46 00	8	48
		(d) LITHOGRAPHERS.						
		Lithographers—						
177	San Francisco	Amalgamated Lithographers of America No. 17	Transferers	Male	Week	50 00	8	48
			Artists	Male	Week	50 00	8	48
			Letter artists and engravers	Male	Week	50 00	8	48
			Designers	Male	Week	52 50	8	48
			Provers	Male	Week	52 50	8	48
			Stone and plate preparers	Male	Week	40 00	8	48
			Pressmen, stone and flat bed	Male	Week	45 00	8	48
			Single rotary	Male	Week	50 00	8	48
			Two color pressmen	Male	Week	[124]57 50	8	48
			Offset pressmen, 17x22	Male	Week	[124]52 50	8	48
			Offset pressmen, 22x34	Male	Week	[124]55 00	8	48
			Offset pressmen, 32x48	Male	Week	[124]57 50	8	48
			Offset pressmen, 46x64	Male	Week	[124]60 00	8	48
			Offset pressmen, 46x70	Male	Week	[124]62 50	8	48
			All two color offset presses	Male		[124]$5 00 more per week than single color, as per size		
			High speed single rotary	Male	Week	[124]55 00	8	48
			High speed two color	Male	Week	[124]62 50	8	48
			Feeders, automatic, including 32 x 48	Male	Week	[124]28 00	8	48
			Feeders, automatic, including 44 x 64	Male	Week	[124]30 00	8	48
			Feeders, automatic, including over 44 x 64	Male	Week	[124]32 50	8	48
			Feeders, flat bed hand	Male	Week	[124]30 00	8	48
			Feeders, rotary	Male	Week	[124]32 50	8	48
			Two color offsets	Male	Week	[124]$2.50 per week more than single offsets, as per size		

[107]May 1, 1920, wages increased from $46.00 per week.
[108]May 1, 1920, wages increased from $42.00 per week.
[109]May 1, 1921, wages increased from 87c per hour.
[110]May 1, 1921, wages increased from 75c per hour.
[111]September 1, 1921, 50c reduction on all wages.
[112]September 1, 1920, wages increased from $39.00.
[113]September 1, 1920, wages increased from $42.00.
[114]September 1, 1920, wages increased from $45.00.
[115]Wages increased from $42.00 per week.
[116]Wages increased from $39.00 per week.
[117]Wages increased from $29.00 per week.
[118]May 1, 1920 wages increased from $18.00 per week.
[119]May 1, 1920, wages increased from $24.00 per week.
[120]May 1, 1920, wages increased from $33.00 per week.
[121]May 1, 1920, wages increased from $35.00 per week.
[122]May 1, 1921, wages increased from $39.00 per week.
[123]January 1, 1920, wages increased from $30.00 per week.
[124]January 1, 1922, wages reduced 12½ per cent.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1 1922—Continued.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages		Hours of labor	
					Unit	Rates	On first 5 days	Weekly
		(e) MAILERS.						
		Mailers –						
178	Los Angeles	Mailers' Union No. 9	Mailers	Male	Week	1922$35 00	8	48
179	Richmond	Typographical Union No. 738	Newspapers	Male	Week	1921 45 00	8	44
180	San Francisco	Mailers' Union No. 18	Mailers	Male	Day	1921 6 75	8	48
181	Visalia	Typographical Union No. 519	Linotype operators	Male	Week	1920 39 00	$7\frac{1}{2}$	44
			Job man	Male	Week	1920 39 00	$7\frac{1}{2}$	44
			Makeup	Male	Week	1920 39 00	$7\frac{1}{2}$	44
			Ad men	Male	Week	1920 39 00	$7\frac{1}{2}$	44
			Job office	Male	Week	39 00	8	45
182	Watsonville	Typographical Union No. 543	Newspaper	Male	Week	42 00	8	48
		(f) PHOTO ENGRAVERS.						
		Photo Engravers—						
183	San Diego	Photo Engravers' Union No. 69	Photographer	Male	Week	50 00	$8\frac{3}{4}$	48
			Zinc etcher	Male	Week	50 00	$8\frac{3}{4}$	48
			Copper etcher	Male	Week	50 00	$8\frac{3}{4}$	48
			Blocker	Male	Week	50 00	$8\frac{3}{4}$	48
184	San Francisco	Photo Engravers' Union No. 8	Day workers	Male	Week	48 50	8	44
			Night workers	Male	Week	51 50	8	44
		(g) PRESSMEN.						
		Pressmen—						
185	Eureka	Printing Pressmen's Union No. 279	Pressmen	Male	Week	36 00-40 00	8	48
				Female	Week	24 00	8	48
186	Fresno	Printing Pressmen and Assistants' Union No. 159	Flat bed pressmen	Male	Week	1949 00	8	44
			Flat bed pressmen	Male	Week	1943 00	8	44
			Web pressmen	Male	Week	1958 00	8	44
			Web pressmen	Male	Week	1950 00	8	44
			Web pressmen	Male	Week	1951 50	8	48
187	Los Angeles	Printing Pressmen and Assistants' Union No. 78	Pressmen, operating 1 or 2 single cylinder presses	Male	Week	42 00	8	44
			1 Cox duplex, or Goss, flat-bed perfecting press	Male	Week	43 50	8	44
			1 single Harris press	Male	Week	42 00	8	44
			2 single Harris presses	Male	Week	43 00	8	44
			1 or 2 Auto or Kelly presses	Male	Week	42 00	8	44
			1 two-color Harris press	Male	Week	42 00	8	44
			1 wrapper roll press	Male	Week	42 00	8	44
			2 automatic fed platens	Male	Week	36 00	8	44
			1 automatic fed and 2 hand fed platen presses	Male	Week	36 00	8	44
			3 or less platen presses	Male	Week	36 00	8	44

			4 platen presses	Male	Week	37 00	8	44
			1 cylinder press and not more than 2 platens	Male	Week	42 00	8	44
			1 offset press	Male	Week	50 00	8	44
			Foreman, 3 or more cylinder presses, not less than	Male	Week	45 00	8	44
			Foremen, 2 cylinder presses with platen presses in connection	Male	Week	45 00	8	44
			Foremen, where 2 or more platen pressmen are employed, the foreman having charge of more than 4 platen presses	Male	Week	39 00	8	44
			Apprentice cylinder pressmen (third year)	Male	Week	36 00	8	44
			Apprentice cylinder pressmen (fourth year)	Male	Week	38 00	8	44
			Apprentice platen pressmen (third year)	Male	Week	31 00	8	44
			Apprentice platen pressmen (fourth year)	Male	Week	33 00	8	44
			Cylinder feeders	Male	Week	33 00	8	48
			Combination feeders (cylinder and platen)	Male	Week	33 00	8	48
			Offset assistants	Male	Week	33 00	8	48
			Universal or Colt feeders	Male	Week	28 00	8	48
			Feeders working on both Universal and platen presses	Male	Week	28 00	8	48
			Platen feeders	Male	Week	27 00	8	48
188	Los Angeles	Printing Pressmen and Assistants' Union No. 18	Newspaper, journeymen	Male	Day	7 00	8	48
			Tension men	Male	Day	7 25	8	48
			Man in charge	Male	Day	7 50	8	48
			Foreman, day side	Male	Week	50 00	8	48
			Foreman, night side	Male	Week	55 00	8	48
			Apprentice	Male	Day	5 16⅔	8	48
189	Sacramento	Pressmen's Union No. 60	Pressmen	Male	Week	[134]46 00	8	44
			Feeders, cylinder	Male	Week	[135]30 00	8	44
			Feeders, platen	Male	Week	[135]25 50	8	44
190	San Diego	Printing Pressmen and Assistants' Union No. 140	Cylinder pressmen	Male	Week	[137]36 50	8	44
			Cylinder feeder	Male	Week	[138]30 00	8	44
			Platen pressmen	Male	Week	[139]34 00	8	44
			Platen feeder	Male	Week	[140]24 00	8	44

[125]April 23, 1922, wages increased from $30.00 per week.
[126]January 1, 1921, wages increased from $36.00 per week.
[127]August 1, 1921, wages increased from $4.75 per day.
[128]August 1, 1921, wages increased from $5.00 per day.
[129]September 6, 1921, wages increased from $33.00 per week for day work and $36.00 for night work.
[130]May 1, 1922, wages increased from $44.00 per week.
[131]May 1, 1922, wages increased from $39.00 per week.
[132]November 20, wages increased from $51.00 per week.
[133]November 20, wages increased from $43.50 per week.
[134]November 20, wages increased from $45.00 per week.
[135]May 1, 1921, wages increased from $39.00 per week.
[136]May 1, 1921, wages increased from $21.00 per week.
[137]May 1, 1921, wages reduced from $38.00 per week.
[138]May 1, 1921, wages reduced from $32.50 per week.
[139]May 1, 1921, wages reduced from $36.00 per week.
[140]May 1, 1921, wages reduced from $27.50 per week.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1, 1922—Continued.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages		Hours of labor	
					Unit	Rates	On first 5 days	Weekly
		V. PRINTING, BINDING, ETC.—Continued.						
		(g) PRESSMEN—Continued.						
		Pressmen—Continued.						
191	San Francisco	Printing Pressmen and Assistants' Union No. 24	Cylinder press	Male	Week	$46 00	8	44
			Cylinder assistant	Male	Week	27 00-30 00	8	44
			Platen pressmen	Male	Week	43 00	8	44
			Platen assistant	Male	Week	25 00	8	44
192	San Francisco	Web Pressmen's Union No. 4	Operator	Male	Week	47 50	8	48
			Journeymen	Male	Week	44 50	8	48
			Apprentice, 1st year	Male	Week	24 00	8	48
			Apprentice, 2d year	Male	Week	27 00	8	48
			Apprentice, 3d, 4th, 5th year	Male	Week	30 00	8	48
193	San Jose	Printing Pressmen's Union No. 146	Cylinder pressmen	Male	Week	1946 00	8	44
			Web pressmen, day	Male	Week	1945 50	8	44
			Web pressmen, night	Male	Week	1948 50	8	44
			Platen pressmen	Male	Week	1943 00	8	44
		VI. WOODWORKING AND FURNITURE.						
		(a) BOXMAKERS AND SAWYERS.						
		Boxmakers and Sawyers—						
194	Oakland	Boxmakers and Sawyers' Union No. 1187	Boxmakers	Male	Week	30 00	8	48
			Sawyers	Male	Week	32 50	8	48
		(b) BROOMMAKERS.						
		Broommakers—						
195	Los Angeles	Broom and Whisk Makers' Union No. 28	Broommakers	Male	Week	33 00	8	44
		(d) COOPERS.						
		Coopers—						
196	San Francisco	Coopers' Union No. 65	Machine	Male	Day	5 30-7 50	8	48
			Hand	Male	Day	6 50	8	48
		(f) UPHOLSTERERS.						
		Upholsterers—						
197	San Francisco	Carpet Workers' Union No. 1	Carpet layers	Male	Day	8 00	8	44
			Cutters and measurers	Male	Day	8 00	8	44
			Carpet sewers	Male	Day	8 00	8	44

		(g) Reed and Rattan Workers.						
		Reed and Rattan Workers—						
198	Los Angeles	Reed and Rattan Workers' Union No. 15053	Reed and rattan workers	Male	Day	5 to 6 00	8½	48
		(h) Wood Carvers.						
		Wood Carvers—						
199	San Francisco	Woodcarvers' Union	Woodcarver	Male	Day	[140]8 to 9 00	8	44
		VII. FOOD AND LIQUORS.						
		(a) Food Products.						
		Bakers and Confectioners—						
200	Eureka	Bakery and Confectionery Workers' Union No. 195	Foreman	Male	Week	[141]42 00	8	48
			Bench hands	Male	Week	[141]39 00	8	48
			Apprentices, 1st 6 months	Male	Week	21 00	8	48
			Apprentices, 2d 6 months	Male	Week	[141]24 00	8	48
			Apprentices, 2d year	Male	Week	27 00	8	48
			Helpers, 1st year	Male	Week	[141]27 00	8	48
			Helpers, after 2d year	Male	Week	30 00	8	48
201	Los Angeles	Bakers' Union No. 37	Foremen, working alone	Male	Week	40 00	8	48
			Foremen, with 1 or more	Male	Week	43 00	8	48
			Bench or machine men	Male	Week	36 00	8	48
			Steady oven men	Male	Week	40 00	8	48
			Dough mixers	Male	Week	40 00	8	48
			Bench or machine jobbers	Male	Day	7 00	8	48
			Foremen, mixers and oven jobbers	Male	Day	8 00	8	48
			Apprentices, 1st 6 months	Male	Week	20 00	8	48
			Apprentices, 2d 6 months	Male	Week	25 00	8	48
			Females working in shop:					
			First 6 months	Female	Week	17 00	8	48
			Second 6 months	Female	Week	21 00	8	48
			Thereafter	Female	Week	26 00	8	48
202	Sacramento	Bakers and Confectionery Workers' Union No. 85	Foreman	Male	Day	8 00	8	48
			Ovenman	Male	Week	43 00	8	48
			Bench hands	Male	Week	42 00	8	48
			Dough man	Male	Week	45 00	8	48
			Machine men	Male	Week	42 00	8	48
			Helper	Male	Week	18 00-25 00	8	48

[141]May 1, 1921, wages increased from $39.00 per week.
[142]May 1, 1921, wages increased from $42.00 per week.
[143]May 1, 1921, wages increased from $36.00 per week.
[144]May 20, 1921, wages increased from $7.50 to $8.00 per day.

[145]May 1, 1920, wages increased from $36.00 per week.
[146]May 1, 1920, wages increased from $33.00 per week.
[147]May 1, 1920, wages increased from $21.00 per week.
[148]May 1, 1920, wages increased from $18.00 per week.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1, 1922—Continued.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages		Hours of labor	
					Unit	Rates	On first 5 days	Weekly
		VII. FOOD AND LIQUORS—Continued.						
		(a) Food Products—Continued.						
		Bakers and Confectioners—Continued.						
203	San Francisco	Bakers' Union No. 24	Bread bakers	Male	Week	$40 00	8	48
			Cake baker	Male	Week	40 00	8	48
			Helpers	Male	Week	28 00	8	48
			Female helper	Female	Week	18 00	8	48
		Butchers and Meat Cutters—						
204	Sacramento	Meat Cutters and Butcher Workmen's Union No. 498	Meat cutters	Male	Week	[14]38 00	9	54
			Sausage makers	Male	Week	[14]38 00	9	54
			Beef butchers	Male	Week	[14]40 40	9	54
			Beef splitter	Male	Week	[14]46 15	9	54
			Beef header	Male	Week	[13]35 00	9	54
			Head boner	Male	Week	[13]35 00	9	54
			Sheep and hog butchers	Male	Week	[14]38 00	9	54
			Foreman pork cutter and curing man	Male	Week	[14]50 00	9	54
			Pork cutter	Male	Week	[14]38 00	9	54
			Ham boner	Male	Week	[14]40 00	9	54
			Casing man	Male	Week	[14]40 00	9	54
			Casing man helper	Male	Week	[14]30 00	9	54
			Tripe cleaner	Male	Week	[14]32 00	9	54
			Wholesale block men and wool men	Male	Week	[14]38 00	9	54
205	San Francisco	Butchers' Union No. 508	Slaughterhouse butchers	Male	Month	[15]$165 to 200 00	8	45
206	San Francisco	Meat Cutters and Butcher Workmen's Union No. 203	Sausage makers	Male		Wages not reported	8	48
207	Santa Ana	Meat Cutters' Union No. 217	Meat cutters	Male	Week	$35 to 37 50	9½	54
		(b) Beverages.						
		Brewery Employees, Beer Drivers and Bottlers—						
208	San Francisco	Bottlers' Union No. 293	Brewery bottlers	Male	Week	[15]33 00	8	48
			Soda bottlers	Male	Week	[15]33 00	8	48
		Brewery Employees, Brewers and Malsters—						
209	Los Angeles	Flour and Cereal Workers' Union No. 204	Millworker	Male	Day	[14]5 00-5 50	8	48
210	San Francisco	Warehouse and Cereal Workers' Union No. 38				Wages and hours not reported		
211	San Francisco	Brewery Workmen's Union No. 7	Brewers and malters	Male	Week	[15]37 00	8	48
			Yeast and extract workers	Male	Week	[15]35 00	8	48

VIII. THEATERS AND MUSIC.

(a) Moving Picture and projecting Machine Operators.

212	Eureka	Theatrical Employees and Picture Operators' Union No. 430	Picture operators	Male	Week	37 50	8	48
			Stage carpenters	Male	Week	37 50	8	48
			Stage flyman	Male	Week	27 50	8	48
			Stage propertyman	Male	Week	35 00	8	48
			Stage electrician	Male	Week	35 00	8	48
213	Fresno	Motion Picture Machine Operators' Union No. 599	Operators	Male	Hour	1 00	8	56
214	Los Angeles	Moving Picture Operators' Union No. 150	*Class of Theatre:*					
			A	Male	Week	[146]47 00	6	-------
			B	Male	Week	[151]42 50	6	-------
			C	Male	Week	[151]42 50	7	-------
			D	Male	Week	[148]37 50	7	-------
			E	Male	Week	32 50	4	-------
			F	Male	Week	26 00	3½	-------
215	San Francisco	Moving Picture Machine Operators' Union No. 162	Operators	Male	Day	8 00	8	-------
216	San Jose	Stage Employees and Moving Picture Machine Operators No. 134	Stage employees	Male	Week	50 85	8	48

(b) Musicians.

217	Bakersfield	Musicians' Union	Musicians	Male	Hour	*	-------	-------
218	San Leandro	Musicians' Union No. 510	Musicians	Male	Hour	1 25	Not	reported
219	Stockton	Musicians' Mutual Protective Union No. 189	Musicians	Male		Too detailed to report.		

(c) Stage Mechanics.

220	Fresno	Theatrical Stage Employees and Moving Picture Machine Operators' Union No. 158	Carpenter	Male	Week	47 00	8	48
			Assistant carpenter	Male	Week	45 00	8	48
			Property man	Male	Week	47 00	8	48
			Assistant property man	Male	Week	42 00	8	48
			Flyman	Male	Week	45 00	8	48
			Electrician	Male	Week	47 00	8	48
			Assistant electrician	Male	Week	42 00	8	48
			Heads of departments	Male	Perf'ce	8 00	8	48
			Flyman and second hands	Male	Perf'ce	5 00	8	48
			Assistant property man	Male	Perf'ce	3 00	8	48
			Assistant electrician	Male	Perf'ce	4 00	8	48
			Electrical clearers and operators	Male	Perf'ce	3 00	8	48
			Grips or night hands	Male	Perf'ce	3 50	8	48
			Front light operators	Male	Perf'ce	3 50	8	48
			Property clearers	Male	Perf'ce	1 50	8	48

[148]September 1, 1921, wages reduced $10.00 per month.
[150]September 1, 1921, wages reduced from $190 to $215 per month.
[151]May 15, 1922, wages reduced from $36.00 per week.
[152]June 1, 1922, wages reduced from $36.00 per week.
[153]February 8, 1920, wages reduced from $5.50 to $6.00 per day.
[154]May 15, 1921, wages reduced from $40.00 per week.

[155]August 1, 1921, wages reduced from $38.00 per week.
[156]January 1, 1921, wages increased from $42.00 per week.
[157]January 1, 1921, wages increased from $35.00 per week.
[158]January 1. 1921, wages increased from $30.00 per week.
*$3.50 for first hour; $2.00 each additional hour; 10 per cent extra for leader.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1, 1922—Continued.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages		Hours of labor	
					Unit	Rates	On first 5 days	Weekly
		VIII. THEATERS AND MUSIC—Continued.						
		(c) Stage Mechanics—Continued.						
221	Oakland	Theatrical Stage Employees' Union No. 107	Theatre:					
			Master carpenter	Male	Week	$50 00	8	48
			Assistant carpenter	Male	Week	45 00	8	48
			Propertyman master	Male	Week	50 00	8	48
			Assistant propertyman	Male	Week	45 00	8	48
			Head electrician	Male	Week	50 00	8	48
			Assistant electrician	Male	Week	45 00	8	48
			Swing man	Male	Perf'ce	4 00	8	48
			Head flyman	Male	Perf'ce	4 00	8	48
			Front light operators	Male	Perf'ce	4 00	8	48
			Grips, extra flymen, clearers, light operators	Male	Perf'ce	3 50	8	48
			Motion picture.					
			Master carpenter	Male	Week	62 50	8	48
			Propertyman, master	Male	Week	62 50	8	48
			Head electrician	Male	Week	62 50	8	48
222	Sacramento	Theatrical Stage Employees' Union No. 252	Moving picture operators	Male	Hour	1 00	6	36
			Relief operators	Male	Hour	1 25	8	48
223	Sacramento	Theatrical Stage Employees' Union No. 50	Stage workers	Male		Wages not reported	8	48
224	San Francisco	Theatrical Stage Employees and Moving Picture Machine Operators No. 16	Carpenters, electricians, propertymen and assistants	Male		Wages not reported	8	48
225	Stockton	Theatrical Protective Union No. 90	Master carpenters	Male	Week	45 00	8	48
			Assistant carpenters	Male	Week	42 50	8	48
			Master propertyman	Male	Week	45 00	8	48
			Assistant propertyman	Male	Week	42 50	8	48
			Master electrician	Male	Week	45 00	8	48
			Assistant electrician	Male	Week	42 50	8	48
			Head flyman	Male	Week	42 50	8	48
			Head flyman (where pin rail is on stage floor)	Male	Week	45 00	8	48

IX. TOBACCO.

(a) Cigarmakers.

226	Bakersfield	Cigarmakers' Union No. 469	Cigarmakers and strippers	Female		Wages not reported	8	48
			Cigarmakers and strippers	Male		Wages not reported	10	
227	Eureka	Cigarmakers' Union No. 338	Cigarmakers	Male	Week	[152]$30 00	8	44
228	Sacramento	Cigarmakers' Union No. 238	Cigarmakers	Male	Week	20 00-30 00	8	44
229	San Diego	Cigarmakers' Union No. 332	Cigarmakers	Male	Week	30 00	8	48
230	San Francisco	Cigarmakers' Union No. 228	Cigarmakers	Both		Piecework	8	44

X. RESTAURANTS AND TRADES.

(a) Hotels and Restaurants.

Bartenders—

231	Los Angeles	Beverage Dispensers' Union No. 284	Beverage dispensers	Male	Week	$27 50	8	48

Cooks, Waiters and Waitresses—

232	Bakersfield	Hotel and Restaurant Employees No. 550	Waitresses, dining room	Female	Week	21 00	8	48
			Waitresses, counter	Female	Week	25 00	8	48
			Cooks	Female	Week	38 00	8	48
			Cooks	Female	Week	40 00	8	48
			Cooks, helpers	Male	Week	20 00	8	48
			Waiters, dining room	Male	Week	20 00	8	48
			Waiters, counter	Male	Week	25 00	8	48
			Cooks, male	Male	Week	32 50-40 00	8	48
233	Los Angeles	Waiters' Union No. 17	Waiters (cafes)	Male	Day	3 00	8	54
			Waiters (hotels)	Male	Day	2 50	8	54
234	Modesto	Cooks, Waiters and Waitresses' Union No. 542	Waiters	Male	Day	4 00	8	48
			Waitresses	Female	Day	4 00	8	48
			Cooks	Male	Day	6 00	8	48
235	Oakland	Cooks, Waiters and Waitresses' Union No. 31	Waitresses	Female	Week	[160]18 00	8	48
			Waiters	Male	Week	[161]24 00	8	48
			Cooks	Male	Week	[162]32 50	8	48
			Helpers	Male	Week	[161]21 00	8	48
			Cafeteria workers	Male	Week	18 00	8	48
236	San Diego	Hotel and Restaurant Employees No. 402	Cooks	Male	Week	25 00-40 00	8	54
			Waiters	Male	Week	16 00-21 00	8	54
			Waitresses	Female	Week	15 00-16 00	8	48
			Helpers	Male	Week	16 00-18 00	8	48
237	San Jose	Cooks, Waiters and Waitresses' Union No. 180	Cooks			Wages not reported	8	48
			Waiters					
			Waitresses					
238	San Francisco	Waiters' Union No. 30	Waiters and countermen in dairy lunches and cafeterias, Class B	Male	Day	4 00	8	48
			Waiters, Class A	Male	Day	3 00	8	54

[152]April 1, 1920, wages increased from $25.00 per week.
[160]June 21, 1920, wages increased from $16.00 per week.
[161]June 21, 1920, wages increased from $18.00 per week.
[162]June 21, 1920, wages increased from $28.00 per week.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1, 1922—Continued.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages		Hours of labor	
					Unit	Rates	On first 5 days	Weekly
		X. RESTAURANTS AND TRADES Continued.						
		(a) Hotels and Restaurants—Continued.						
		Cooks, Waiters and Waitresses—Continued.						
239	San Pedro	Hotel and Restaurant Employees and Bartenders' Union No. 754	Cooks, dinner	Male	Day	$6 00	8	.....
			Cooks, fry	Male	Day	5 00	8	.....
			Waiters	Male	Day	3 50	8	.....
			Waitresses	Male	Day	3 50	8	.....
			Miscellaneous	Male	Day	3 00	8	.....
240	Stockton	Cooks and Waiters' Union No. 572	Cooks	Male	Week	30 00	8	48
			Waiters	Male	Week	22 50	8	48
			Waitresses	Female	Week	20 00	8	48
			Dishwashers	Female	Week	18 00	8	48
			Bus-workers	Male	Week	15 00	8	48
241	Taft	Cooks, Waiters and Watresses' Union No. 771	Chef or head cook	Male	Shift	7 00	8	56
			Second cook	Male	Shift	6 00	8	56
			Bakers	Male	Shift	6 00	8	56
			Fry cooks, combination	Male	Shift	5 50	8	56
			Waiters	Male	Week	30 00	8	56
			Pantry Man	Male	Week	28 00	8	56
			Night waitresses	Female	Week	25 00	8	48
			Counter waitresses	Female	Week	25 00	8	48
			Table waitresses	Female	Week	21 00	8	48
			Dishwashers	Male	Shift	3 50	8	56
		(b) Barbering.						
242	Bakersfield	Barbers' Union No. 317	Barbers	Male	Week	$25; 60% over $35	9	58
243	Dinuba	Barbers' Union No. 795	Barbers	Male	Week	$30; 70% comm.	9½	59
244	El Centro	Barbers' Union No. 733	Barbers	Male	Week	$25; 60% over $40	10	62½
245	Eureka	Barbers' Union No. 431	Barbers	Male	Week	16@22 00	9	57
246	Fullerton	Barbers' Union No. 766	Barbers	Male	Week	16@30; 60% over $40 00	9	56½
247	Jackson	Journeyman Barbers' No. 533	Barbers	Male	Week	16@30 00	11	68
248	Long Beach	Barbers' Union No. 622	Barbers	Male	Week	Wages not reported	9	48
249	Los Angeles	Barbers' Union No. 295	Barbers	Male	.....	Wages not reported	10½	64
250	Pasadena	Barbers' Union No. 603	Barbers	Male	Week	$20 00 plus	10	62
251	Petaluma	Barbers' Union No. 419	Barbers	Male	Week	$30; 60% over $40	8½	53½
252	Richmond	Barbers' Union No. 508	Barbers	Male	Week	25 00	10	62
253	Riverside	Journeymen Barbers' Union No. 171	Barbers	Male	Week	$28; 60% over $40	Not	reported
254	Sacramento	Barbers' Union No. 112	Barbers	Male	Week	16@$25; 60% over $35 00	9	54

255	San Bernardino	Barbers' Union No. 253	Barbers	Male	Week	[162]$27; 65% over $40 00	9½	59½
256	San Francisco	Barbers' Union No. 148	Barbers	Male	Week	[163]35 00	8½	63
257	San Jose	Barbers' Union No. 252	Barbers	Male	Week	$30; 60% over $42	9	54
258	Santa Rosa	Journeymen Barbers' Union No. 159	Barbers	Male	Week	30 00	9	66
259	Stockton	Barbers' Union No. 312	Barbers	Male	Week	25 00	10	72
260	Taft	Barbers' Union No. 869	Barbers	Male	Week	[164]$40; 60% over $55 00	9½	58½

XI. PUBLIC EMPLOYMENT.

(a) United States Employees.

Post Office Clerks—

261	Berkeley	Post Office Clerks' Union No. 47	Clerks	Male	Year	$1400-$1800	8	48
262	Sacramento	Post Office Clerks' Union No. 86	Clerks	Male	Year	1400-1800	8	48
263	San Francisco	Letter Carriers' Union No. 214	Letter Carriers	Male	Year	1400-1800	8	48
264	San Mateo	Post Office Clerks' Union No. 191	Clerks	Male	Month	150 00	8	48

(b) *Other Federal Employees—*

265	Tiburon	Federal Employees' Union No. 219	Leadingman	Male	Day	[170]7 04	8	40
			Leadingman, laborer	Male	Day	[171]4 48	8	40
			Joiners	Male	Day	[172]5 84	8	40
			Machinists	Male	Day	[172]5 84	8	40
			Electricians	Male	Day	[172]5 84	8	40
			Boilermakers	Male	Day	[172]5 84	8	40
			Shipsmith	Male	Day	[172]5 84	8	40
			Riggers, enginemen	Male	Day	[172]5 84	8	40
			Firemen	Male	Day	[173]4 16	8	40
			Chauffeur	Male	Day	[174]3 92	8	40
			Helpers	Male	Day	[175]3 84	8	40
			Laborers	Male	Day	[176]3 28	8	40
			Clerks	Male	Day	[177]6 00	8	40
			Clerks	Male	Day	[178]3 60	8	40
266	Vallejo	Federal Employees' Union No. 76	Clerks	Male	Day	[178]3 60	7	35
			Stenographers	Male	Day	[178]3 60	7	35
			Typists	Male	Day	[178]3 60	7	35
			Checkers	Male	Day	[178]3 60	7	35
			Switchmen	Male	Day	[179]3 28	8	40
			Fireman	Male	Day	[180]4 16	8	40
			Helper molders	Male	Day	[181]3 84	8	40

[162]May 20, 1918, wages increased from $18.00 per week.
[163]October, 1921, wages increased from $20.00 per week; 60 per cent over $25.00.
[164]July 1, 1921, wages increased from $25.00 per week.
[165]February 7, 1920, wages increased from $[illegible].00 per week; 60 per cent over $27.00.
[166]July 1, 1920, wages increased from $26.0[illegible] per week; 60 per cent over $40.00.
[168]April 6, 1920, wages increased from $30.00 per week.
[169]January 1, 1921, wages increased from $30.00 per week.
[170]September 16, 1921, wages reduced from $8.96 per day.
[171]September 16, 1921, wages reduced from $5.92 per day.
[172]September 16, 1921, wages reduced from $6.72 per day.
[173]September 16, 1921, wages reduced from $4.88 per day.
[174]September 16, 1921, wages reduced from $4.64 per day.
[175]September 16, 1921, wages reduced from $4.40 per day.
[176]September 16, 1921, wages reduced from $6.48 per day.
[177]September 16, 1921, wages reduced from $5.04 per day.
[178]September 16, 1921, wages reduced from $4.56 per day.
[179]September 16, 1921, wages reduced from $3.84 per day.
[180]September 16, 1921, wages reduced from $4.64 per day.
[181]September 16, 1921, wages reduced from $4.80 per day.

LABOR ORGANIZATIONS: SHOWING RATES OF WAGES AND HOURS OF LABOR SINCE JANUARY 1, 1922—Concluded.

No.	Locality	Trade and organization	Occupation	Sex	Rates of wages		Hours of labor	
					Unit	Rates	On first 5 days	Weekly
		XI. PUBLIC EMPLOYMENT—Continued.						
		(c) City Employees.						
267	San Francisco	Office Employees' Association No. 1318	Clerks	Both	Month	$175 00	8	44
			Stenographers	Both	Month	150 00	8	44
			Copyists	Both	Month	165 00	8	44
268	Richmond	City Fire Fighters' No. 188	Mechanics	Male	Month	170 00	8	48
			Electrician	Male	Month	170 00	8	48
			Officers, chief	Male	Month	245 00	8	48
			Assistant chief	Male	Month	195 00	8	48
			Captains	Male	Month	175 00	8	48
			Lieutenants	Male	Month	170 00	8	48
			Firemen and operators	Male	Month	160 00	8	48
		XII. STATIONARY ENGINE MEN.						
		(b) Engineers.						
269	Sacramento	Steam and Operating Engineers No. 210	Stationary engineers	Male	Day	7 20	8	48
270	San Francisco	Steam and Operating Engineers No. 59	Hoisting and portable engineers	Male	Day	[1]8 35	8	44
271	San Francisco	Steam and Operating Engineers No. 64	Engineers	Male	Month	170 00	8	48
272	San Jose	Hoisting and Portable Engineers No. 842	Engineers	Male	Day	9 00	8	48
			Crane men	Male	Day	7 00	8	48
			Donkey engineer	Male	Day	7 00	8	48
			Firemen	Male	Day	6 00	8	48
273	Santa Rosa	Steam and Operating Engineers No. 147	Engineers	Male	Month	150 00	8	48
		XIII. MISCELLANEOUS.						
		(a) Leather and Leather Goods.						
274	Los Angeles	*Leather Workers—* Leather Workers' Union No. 8	Trunkmakers	Male	Day	[1]5 00	8¾	48

		(c) Clay Products.						
275	Millbrae	*Pottery Workers—* Brotherhood of Operative Potters No. 105	Potters	Male	Week	55 00	8	48
276	Richmond	Brotherhood of Potters No. 89	Kilnmen	Male	Week	$50 00-$65 00	8	48
			Pressers	Male	Week	45 00-60 00	8	48
			Dippers	Male	Week	42 00-65 00	8	48
		(d) Other Distinct Trades.						
277	Huntington Beach	*Oil and Gas Workers—* Oil Field, Gas Well and Refinery Workers No. 123				Wages not reported	8	56
278	Martinez	Oil Field, Gas Well and Refinery Workers No. 5	Pipe fitter	Male	Day	[184]7 00	8	48
			Pipe fitter, helper	Male	Day	[185]5 25	8	48
			Stillmen	Male	Day	[186]7 00	8	48
			Helpers	Male	Day	[187]5 25	8	48
			Helpers	Male	Day	[188]5 25	8	48
			Stovehouse, etc.	Male	Day	[189]5 00-5 75	8	48

[182]October 1, 1921, wages reduced from $9.00 per day.
[183]January 1, 1921, wages reduced from $6.50 per day.
[184]September 1, 1921, wages reduced from $8.00 per day.
[185]September 1, 1921, wages reduced from $6.25 per day.
[186]September 1, 1921, wages reduced from $8.00 per day.
[187]September 1, 1921, wages reduced from $6.25 per day.
[188]September 1, 1921, wages reduced from $6.75 per day.
[189]September 1, 1921, wages reduced from $6.00 per day.

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TABLE No. 1. PRIVATE EMPLOYMENT AGENCIES IN THE

Class of agency	Number of agencies	Males						Average net fee
		Applicants referred	Fees charged	Refunds		Positions furnished		
				Number	Amount	Number	Net fees	
Commercial (Totals)	40	12,013	$166,730 23	1,831	$15,047 48	10,182	$151,682 75	$14 90
San Francisco	17	3,614	69,311 69	440	4,553 85	3,174	64,757 84	20 40
Los Angeles	17	5,661	86,854 88	1,252	9,970 28	4,429	76,864 60	17 35
Fresno	2	2,423	4,665 88	150	403 00	2,273	4,262 88	1 87
Pasadena	1	127	1,169 05	6	28 00	121	1,141 05	9 43
San Diego	3	188	4,748 73	3	92 35	185	4,656 38	25 17
Domestic (Totals)	11	207	$965 00	53	$294 60	154	$670 40	$4 35
San Francisco	1							
Los Angeles	2	72	236 05	5	18 00	67	218 05	3 25
Oakland	1	41	274 50	6	29 00	35	245 50	7 01
Pasadena	3	20	37 25			20	37 25	1 86
Sacramento	1							
San Diego	1	74	417 20	42	247 60	32	169 60	5 30
All other towns	2							
General (Totals)	99	249,097	$531,509 76	37,464	$98,124 78	211,633	$433,384 98	$2 05
San Francisco	17	73,052	162,703 70	16,299	40,030 86	56,753	122,672 84	2 16
Los Angeles	22	64,195	151,911 63	13,686	42,270 39	50,509	109,641 24	2 17
Oakland	4	911	3,648 70	128	504 85	783	3,143 85	4 02
Fresno	1	5,602	13,495 11	501	1,409 00	5,101	12,086 11	2 37
Sacramento	17	62,873	125,319 90	4,296	8,912 15	58,577	116,407 75	1 99
San Diego	5	8,718	15,072 40	753	1,192 75	7,965	13,879 65	1 49
Stockton	7	18,778	37,753 25	1,041	2,438 46	17,737	35,314 79	1 99
All other towns	26	14,968	23,605 07	760	1,366 32	14,208	22,238 75	1 57
Hotel (Totals)	5	10,334	$42,096 67	5,087	$21,077 90	5,247	$21,018 77	$4 01
San Francisco	4	8,868	36,364 90	4,876	20,220 50	3,992	16,144 40	4 04
Los Angeles	1	1,466	5,731 77	211	857 40	1,255	4,874 37	3 88
Nurses (Totals)	5	37	$227 20			37	$227 20	$6 14
Los Angeles	4	37	227 20			37	227 20	6 14
All other towns	1							
Oriental (Totals)	22	13,056	$42,529 61	441	$3,055 10	12,615	$39,474 51	$3 13
San Francisco	10	3,827	25,719 59	367	2,766 60	3,460	22,952 99	6 63
Los Angeles	4	6,200	12,918 27	61	209 70	6,229	12,708 57	2 01
Oakland	2	335	1,871 45	13	78 80	322	1,792 65	5 57
Pasadena	1	65	424 35			65	424 35	6 53
Sacramento	1	136	650 50			136	650 50	4 78
All other towns	4	2,493	945 45			2,493	945 45	0 39
Teachers (Totals)	10	429	$33,158 55			429	$33,158 55	$77 29
San Francisco	1	59	5,667 25			59	5,667 25	96 06
Los Angeles	4	241	15,987 80			241	15,987 80	66 34
Berkeley	4	120	11,081 06			120	11,081 06	92 34
San Diego	1	9	422 44			9	422 44	46 94
All Agencies	192	285,173	$817,217 02	44,876	$137,599 86	240,297	$679,617 16	$2 83
Recapitulation.								
Commercial	40	12,013	$166,730 23	1,831	$15,047 48	10,182	$151,682 75	$14 90
Domestic	11	207	965 00	53	294 60	154	670 40	4 35
General	99	249,097	531,509 76	37,464	98,124 78	211,633	433,384 98	2 05
Hotels	5	10,334	42,096 67	5,087	21,077 90	5,247	21,018 77	4 01
Nurses	5	37	227 20			37	227 20	6 14
Oriental	22	13,056	42,529 61	441	3,055 10	12,615	39,474 51	3 13
Teachers	10	429	33,158 55			429	33,158 55	77 29
All Agencies	192	285,173	$817,217 02	44,876	$137,599 86	240,297	$679,617 16	$2 83

STATE: RECORD FOR ONE YEAR ENDING MARCH 31, 1921.

Females										
Expenses refunded		Applicants referred	Fees charged	Refunds		Positions furnished		Average net fee	Expenses refunded	
Number	Amount			Number	Amount	Number	Net fees		Number	Amount
		17,989	$202,844 00	1,568	$10,807 32	16,421	$192,036 68	$11 69		
		8,857	108,835 38	636	5,722 43	8,221	103,112 95	12 54		
		8,313	85,721 91	915	5,025 29	7,398	80,696 62	10 91		
		26	60 00	13	29 00	13	31 00	2 38		
		242	2,439 70	2	13 00	240	2,426 70	10 11		
		551	5,787 01	2	17 60	549	5,769 41	10 51		
		5,616	$24,905 50	1,199	$5,506 74	4,417	$19,398 76	$4 39		
		227	1,629 00	6	53 00	221	1,576 00	7 13		
		3,435	15,050 25	889	3,929 35	2,546	11,120 90	4 37		
		473	1,969 00	86	339 00	387	1,630 00	4 21		
		435	2,287 25	18	89 25	417	2,198 00	5 27		
		412	1,075 35			412	1,075 35	2 61		
		377	1,827 75	200	1,096 14	177	731 61	4 13		
		257	1,066 90			257	1,066 90	4 15		
149	$522 38	15,339	$44,586 01	2,263	$8,803 59	13,076	$35,682 42	$2 73	4	$8 26
36	148 45	1,415	6,941 20	231	965 15	1,184	5,976 05	5 05	2	4 00
34	49 22	8,756	25,859 21	1,361	6,006 55	7,395	19,852 66	2 68	2	4 26
		2,538	7,367 41	401	1,300 50	2,137	6,066 91	2 84		
		256	725 00	27	80 00	229	645 00	2 81		
66	278 58	13	31 00			13	31 00	2 38		
		1,068	1,627 20	75	187 75	993	1,439 45	1 45		
5	34 75	365	861 99	135	312 64	230	549 35	2 39		
8	11 38	928	1,173 00	33	51 00	895	1,122 00	1 25		
5	$16 64	6,443	$23,312 13	2,700	$9,901 40	3,743	$13,410 73	$3 58	1	$12 00
5	16 64	4,049	13,476 85	1,782	6,049 85	2,267	7,427 00	3 28	1	12 00
		2,394	9,835 28	918	3,851 55	1,476	5,983 73	4 05		
		2,123	$13,248 09	9	$57 00	2,114	$13,191 09	$6 24		
		1,762	11,337 84	9	57 00	1,753	11,280 84	6 44		
		361	1,910 25			361	1,910 25	5 29		
385	$169 00	40	$141 35	2	$15 00	38	$126 35	$3 32		
		7	37 50	2	15 00	5	22 50	4 50		
385	169 00	33	103 85			33	103 85	3 15		
		1,167	$71,180 51	3	$11 50	1,164	$71,169 01	$61 14		
		89	7,072 84			89	7,072 84	79 47		
		641	33,820 56	3	11 50	638	33,809 06	52 99		
		424	29,899 34			424	29,599 34	69 81		
		13	687 77			13	687 77	52 90		
539	$708 02	48,717	$380,217 59	7,744	$35,202 55	40,973	$345,015 04	$8 42	5	$20 26
		17,989	$202,844 00	1,568	$10,807 32	16,421	$192,036 68	$11 69		
		5,616	24,905 50	1,199	5,506 74	4,417	19,398 76	4 39		
149	$522 38	15,339	44,586 01	2,263	8,803 59	13,076	35,682 42	2 73	4	8 26
5	16 64	6,443	23,312 13	2,700	9,901 40	3,743	13,410 73	3 58	1	12 00
		2,123	13,248 09	9	57 00	2,114	13,191 09	6 24		
385	169 00	40	141 35	2	15 00	38	126 35	3 32		
		1,167	71,180 51	3	11 50	1,164	71,169 01	61 14		
539	$708 02	48,717	$380,217 59	7,744	$35,202 55	40,973	$345,015 04	$8 42	5	$20 26

TABLE No. 2. PRIVATE EMPLOYMENT AGENCIES IN THE

Class of agency	Number of agencies	Males						
		Applicants referred	Fees charged	Refunds		Positions furnished		Average net fee
				Number	Amount	Number	Net fees	
Commercial (Totals)	43	13,589	$134,579 94	1,070	$6,991 04	12,519	$127,588 90	$10 19
San Francisco	13	3,579	54,733 94	271	3,356 44	3,308	51,377 50	15 53
Los Angeles	19	3,744	60,883 44	199	2,029 85	3,545	58,853 59	16 60
San Diego	4	805	5,127 80	8	110 00	797	5,017 80	6 30
Sacramento	3	5,008	11,668 58	515	1,168 90	4,493	10,499 68	2 34
All other towns	4	453	2,166 18	77	325 85	376	1,840 33	4 89
Domestic (Totals)	18	2,672	$7,923 49	185	$857 15	2,487	$7,066 34	$2 84
San Francisco	3	53	426 50			53	426 50	8 05
Los Angeles	5	1,418	5,340 00	96	514 50	1,322	4,825 50	3 65
Oakland	3	570	1,722 39	77	324 90	493	1,397 49	2 83
Pasadena	3	6	36 50			6	36 50	6 08
All other towns	4	625	398 10	12	17 75	613	380 35	62
General (Totals)	75	190,813	$455,247 65	25,732	$74,711 32	165,081	$380,536 33	$2 31
San Francisco	13	45,755	126,599 85	8,937	25,286 47	36,818	101,313 38	2 75
Los Angeles	13	63,684	164,389 79	12,510	39,940 86	51,174	124,448 93	2 43
Oakland	2	297	1,807 00	21	135 50	276	1,671 50	6 06
Fresno	3	5,791	14,537 80	398	1,154 80	5,393	13,383 00	2 48
Sacramento	13	38,127	84,397 78	2,267	5,001 43	35,860	79,396 36	2 21
San Diego	3	5,177	7,164 55	201	532 75	5,776	6,630 80	1 15
Stockton	8	17,496	34,644 62	924	1,864 26	16,572	32,780 36	1 98
All other towns	20	13,686	21,707 26	474	795 25	13,212	20,912 01	1 58
Hotel (Totals)	11	23,587	$100,716 92	6,831	$29,770 86	16,756	$70,946 06	$4 23
San Francisco	7	15,826	69,146 39	5,366	23,112 54	10,460	46,033 85	4 40
Los Angeles	4	7,761	31,570 53	1,465	6,658 32	6,296	24,912 21	3 96
Nurses (Totals)	6	55	$180 38			55	$180 38	$3 28
Los Angeles	3	26	170 50			26	170 50	6 56
All other towns	3	29	9 88			29	9 88	34
Oriental (Totals)	21	13,108	$36,662 68	459	$1,492 35	12,649	$35,170 33	$2 78
San Francisco	8	2,992	19,235 22	168	916 00	2,824	18,319 22	6 49
Los Angeles	4	7,934	13,194 40	288	553 35	7,646	12,641 05	1 65
Pasadena	2	374	611 60			374	611 60	1 64
Oakland	2	448	2,353 70	1	7 00	447	2,386 70	5 34
Sacramento	1	79	380 05			79	380 05	4 81
All other towns	4	1,281	847 71	2	16 00	1,279	831 71	65
Teachers (Totals)	10	632	$35,623 81	16	$442 80	616	$35,181 01	$57 11
San Francisco	2	193	7,812 42	11	289 80	182	7,522 62	41 33
Los Angeles	4	222	14,386 28	2	39 50	220	14,346 78	65 21
Berkeley	4	217	13,425 11	3	113 50	214	13,311 61	62 20
All Agencies	184	244,456	$770,934 87	34,293	$114,265 52	210,163	$656,669 35	$3 12
Recapitulation –								
Commercial	43	13,589	$134,579 94	1,070	$6,991 04	12,519	$127,588 90	$10 19
Domestic	18	2,672	7,923 49	185	857 15	2,487	7,066 34	2 84
General	75	190,813	455,247 65	25,732	74,711 32	165,081	380,536 33	2 31
Hotels	11	23,587	100,716 92	6,831	29,770 86	16,756	70,946 06	4 23
Nurses	6	55	180 38			55	180 38	3 28
Oriental	21	13,108	36,662 68	459	1,492 35	12,649	35,170 33	2 78
Teachers	10	632	35,623 81	16	442 80	616	35,181 01	57 11
Totals	184	244,456	$770,934 87	34,293	$114,265 52	210,163	$656,669 35	$3 12

STATE: RECORD FOR ONE YEAR ENDING MARCH 31, 1922.

Expenses refunded		Females								
		Appli-cants referred	Fees charged	Refunds		Positions furnished		Average net fee	Expenses refunded	
Number	Amount			Number	Amount	Number	Net fees		Number	Amount
		19,449	$176,768 93	1,208	$9,089 12	18,241	$167,679 81	$9 19	5	$88 56
		7,687	74,633 09	313	2,868 93	7,374	71,764 16	9 73		
		8,639	89,525 79	669	5,393 75	7,970	84,132 04	10 56	4	78 56
		1,507	7,037 02	8	86 99	1,499	6,950 03	4 64		
		116	912 78			116	912 78	7 87		
		1,500	4,660 25	218	739 45	1,282	3,920 80	3 06	1	10 00
410	$175 15	9,816	$39,550 20	1,274	$5,570 15	8,542	$33,980 05	$3 98		
		1,013	6,449 63	11	69 00	1,002	6,380 63	6 37		
410	175 15	4,731	21,025 50	869	4,086 95	3,862	16,938 55	4 39		
		2,687	7,977 99	363	1,261 70	2,324	6,716 29	2 89		
		502	2,889 00	28	148 00	474	2,741 00	5 78		
		883	1,208 08	3	4 50	880	1,203 58	1 37		
110	$859 31	8,909	$30,142 36	1,756	$5,476 93	7,153	$24,665 43	$3 45	2	$3 00
40	558 03	1,447	8,366 35	335	1,505 90	1,112	6,860 45	6 17		
7	44 83	3,886	12,096 70	1,041	2,958 95	2,845	9,137 75	3 21	2	3 00
		689	2,928 00	90	361 00	599	2,567 00	4 29		
1	5 86	419	1,089 75	28	64 00	391	1,025 75	2 62		
54	234 49	45	139 25	43	132 75	2	6 50	3 25		
		1,308	1,628 05	51	111 50	1,257	1,516 55	1 21		
6	13 10	568	1,165 58	163	330 33	405	835 25	2 06		
2	3 00	547	2,728 68	5	12 50	542	2,716 18	5 01		
5	$14 00	21,083	$66,584 67	5,310	$18,095 97	15,773	$48,488 70	$3 07	2	$3 23
5	14 00	10,806	34,376 19	3,484	10,923 39	7,322	23,452 80	3 20	2	3 23
		10,277	32,208 48	1,826	7,172 58	8,451	25,035 90	2 96		
		1,880	$10,989 32	9	$50 75	1,871	$10,938 57	$5 85		
		1,373	8,815 00	9	50 75	1,364	8,764 25	6 43		
		507	2,174 32			507	2,174 32	4 29		
1	$4 00	124	$274 45	10	$11 40	114	$263 05	$2 31		
		14	64 00			14	64 00	4 57		
		101	171 65	10	11 40	91	160 25	1 76		
1	4 00	9	38 80			9	38 80	4 31		
1	87 80	1,858	$85,014 43	59	$1,522 45	1,799	$83,491 98	$46 41		
1	7 80	624	21,485 05	53	1,466 95	571	20,018 10	35 06		
		566	30,589 28	2	2 00	564	30,587 28	54 23		
		668	32,940 10	4	53 50	664	32,886 60	49 53		
527	$1,060 26	63,119	$409,324 36	9,626	$39,816 77	53,493	$369,507 59	$6 91	9	$94 79
		19,449	$176,768 93	1,208	$9,089 12	18,241	$167,679 81	$9 19	5	$88 56
410	$175 15	9,816	39,550 20	1,274	5,570 15	8,542	33,980 05	3 98		
110	859 31	8,909	30,142 36	1,756	5,476 93	7,153	24,665 43	3 45	2	3 00
5	14 00	21,083	66,584 67	5,310	18,095 97	15,773	48,488 70	3 07	2	3 23
		1,880	10,989 32	9	50 75	1,871	10,938 57	5 85		
1	4 00	124	274 45	10	11 40	114	263 05	2 31		
1	7 80	1,858	85,014 43	59	1,522 45	1,799	83,491 98	46 41		
527	$1,060 26	63,119	$409,324 36	9,626	$39,816 77	53,493	$369,507 59	$6 91	9	$94 79

TABLE No. 3. Number of Jobs Furnished to Male and Female Applicants by Selected Representative General Labor Agencies in San Francisco and Average Cost per Job to Applicants during Fiscal Years 1921 and 1922, by Sex and by Months.

Months	1920-1921					
	Data for 10 agencies			Data for 6 agencies		
	Male applicants			Female applicants		
	Number of jobs furnished	Percentage distribution	Average fee per job	Number of jobs furnished	Percentage distribution	Average fee per job
Totals	67,570	100 0	$2 24	4,5 0	100 0	$3 81
January	2,379	3 5	2 98	517	11 4	3 57
February	2,044	3 0	2 97	432	9 5	3 57
March	3,625	5 4	2 84	547	12 1	3 91
April	6,204	9 2	2 12	334	7 4	3 88
May	6,615	9 8	2 10	329	7 3	4 11
June	6,910	10 2	2 09	331	7 3	3 77
July	7,494	11 3	2 06	325	7 2	3 56
August	7,645	11 3	2 07	271	5 9	3 74
September	8,549	12 6	2 02	304	6 7	4 18
October	8,438	12 5	2 11	364	8 0	3 88
November	5,148	7 6	2 44	388	8 6	3 88
December	2,519	3 7	2 82	388	8 6	3 80
	1921-1922					
	Data for 11 agencies			Data for 8 agencies		
Totals	35,765	100 0	$2 81	7,917	100 0	$3 79
January	1,577	4 4	2 97	557	7 0	3 77
February	1,690	4 7	2 84	567	7 2	3 58
March	2,827	7 9	2 81	710	9 0	3 81
April	4,434	12 4	2 24	572	7 2	4 11
May	4,301	12 1	2 79	674	8 5	4 09
June	4,191	11 7	2 82	789	10 0	3 90
July	3,873	10 8	2 80	687	8 7	3 76
August	3,497	9 8	2 74	801	10 1	3 59
September	3,242	9 1	2 91	777	9 8	3 61
October	2,789	7 8	3 02	738	9 3	3 73
November	1,908	5 3	3 40	565	7 1	3 93
December	1,436	4 0	3 13	480	6 1	3 62

TABLE No. 4. Number of Jobs Furnished to Male and Female Applicants by Selected Representative General Labor Agencies in Los Angeles and Average Cost per Job to Applicants during Fiscal Years 1921 and 1922, by Sex and by Months.

Months	1920-1921					
	Data for 15 agencies			Data for 9 agencies		
	Male applicants			Female applicants		
	Number of jobs furnished	Percentage distribution	Average fee per job	Number of jobs furnished	Percentage distribution	Average fee per job
Totals	62,078	100.0	$2 37	11,254	100.0	$3 40
January	3,028	4.9	3 07	1,154	10 3	3 58
February	3,146	5.1	2 96	980	8.7	3 43
March	4,051	6.5	2 93	1,044	9.3	3 40
April	5,980	9.6	1 99	881	7.8	2 95
May	6,242	10.0	2 13	787	7.0	3 41
June	6,552	10.6	2 24	866	7.7	3 24
July	6,635	10.7	2 11	837	7.4	3 25
August	6,265	10.1	2 24	790	7.0	3 28
September	5,867	9.4	2 24	953	8.5	3 15
October	5,888	9.5	2 25	956	8.5	3 60
November	5,209	8.4	2 50	1,005	8.9	3 86
December	3,215	5.2	2 93	1,001	8.9	3 49
	1921-1922					
	Data for 12 agencies			Data for 8 agencies		
Totals	52,555	100.0	$2 34	13,169	100.0	$3 28
January	4,051	7.7	2 38	1,130	8.6	3 47
February	3,464	6.6	2 38	957	7.3	3 49
March	5,716	10.9	2 18	1,072	8.1	3 36
April	4,032	7.7	2 56	1,089	8.3	3 26
May	4,134	7.9	2 30	1,039	7.9	3 17
June	4,736	9.0	2 35	1,209	9.2	3 13
July	4,408	8.4	2 41	1,182	9.0	2 74
August	3,912	7.4	2 48	1,201	9.1	3 12
September	4,511	8.6	2 23	1,092	8.3	3 22
October	5,560	10.6	2 13	1,125	8.5	3 51
November	4,590	8.7	2 28	1,147	8.7	3 52
December	3,441	6.5	2 40	926	7.0	3 37

TABLE No. 5. Number of Jobs Furnished to Male Applicants by Selected Representative General Labor Agencies in Sacramento and Average Cost per Job to Applicants during Fiscal Years 1921 and 1922, by Months.

Months	1920-1921			1921-1922		
	Data for 12 agencies			Data for 7 agencies		
	Number of jobs furnished	Percentage distribution	Average fee per job	Number of jobs furnished	Percentage distribution	Average fee per job
Totals	55,259	100.0	$2 04	24,965	100.0	$2 24
January	1,564	2.8	2 74	859	3.4	2 32
February	1,724	3.1	2 61	740	3.0	2 36
March	2,944	5 3	2 44	1,380	5 5	2 31
April	6,365	11 5	1 90	3,113	12.5	2 32
May	6,396	11 6	1 87	3,151	12 6	2 18
June	6,407	11.6	1 89	2,696	10 8	2 23
July	6,195	11 2	1 93	2,433	9 8	2 30
August	5,954	10 8	1 88	2,623	10 5	2 18
September	5,721	10 4	1 91	2,593	10 4	2 20
October	5,857	10 6	2 02	2,900	11 6	2 15
November	4,297	7 8	2 23	1,741	7 6	2 24
December	1,835	3.3	2 66	736	2 9	2 32

TABLE No. 6. Number of Jobs Furnished to Male Applicants by Selected Representative General Labor Agencies in Stockton and Average Cost per Job to Applicants during Fiscal Years 1921 and 1922, by Months.

Months	1920-1921			1921-1922		
	Data for 6 agencies			Data for 5 agencies		
	Number of jobs furnished	Percentage distribution	Average fee per job	Number of jobs furnished	Percentage distribution	Average fee per job
Totals	18,665	100.0	$2 01	13,590	100.0	$2 01
January	970	5.2	2 27	677	5 0	1 98
February	966	5 2	2 32	503	3 7	2 05
March	1,467	7 9	2 19	1,202	8 8	1 94
April	1,357	7 3	1 94	1,563	11 5	2 06
May	1,834	9 8	1 94	1,588	11 7	2 01
June	1,978	10 6	2 10	1,869	13 7	2 08
July	1,978	10 6	1 98	1,448	10 7	1 98
August	1,723	9 2	1 90	1,020	7 5	2 07
September	2,022	10 8	1 83	953	7 0	2 04
October	1,880	10 1	1 86	1,164	8 6	1 92
November	1,583	8 5	1 97	841	6 2	2 05
December	907	4 8	2 21	762	5 6	1 93

TABLE No. 7. Number of Jobs Furnished to Male Applicants by Selected Representative General Labor Agencies in San Diego and Average Cost per Job to Applicants during Fiscal Years 1921 and 1922, by Months.

Months	1920-1921			1921-1922		
	Data for 3 agencies			Data for 3 agencies		
	Number of jobs furnished	Percentage distribution	Average fee per job	Number of jobs furnished	Percentage distribution	Average fee per job
Totals	7,336	100.0	$1 29	5,821	100.0	$1 14
January	399	5.3	1 38	374	6.4	1 24
February	535	7.3	1 17	303	5.2	1 00
March	508	6.9	1 32	596	10.2	1 02
April	542	7.4	1 41	541	9.3	1 23
May	559	7.6	1 67	535	9.2	1 10
June	631	8.6	1 34	583	10.0	1 36
July	801	10.9	1 26	483	8.3	1 01
August	667	9.1	1 24	526	9.1	1 23
September	649	8.9	1 20	507	8.7	1 07
October	749	10.2	1 30	467	8.0	1 24
November	619	8.4	1 23	496	8.5	1 02
December	677	9.2	1.01	410	7.1	1 08

TABLE No. 8. Number of Jobs Furnished to Male Applicants by Selected Representative Domestic and Hotel Employment Agencies in Oakland and Average Cost per Job to Applicants during Fiscal Years 1921 and 1922, by Months.

Months	1920-1921			1921-1922		
	Data for 4 agencies			Data for 3 agencies		
	Number of jobs furnished	Percentage distribution	Average fee per job	Number of jobs furnished	Percentage distribution	Average fee per job
Totals	911	100.0	$4 01	692	100.0	$3 82
January	60	6.6	4 32	45	6.5	3 89
February	53	5.8	4 07	45	6.5	3 53
March	62	6.8	4 02	47	6.8	3 28
April	77	8.5	3 37	88	12.7	3 64
May	69	7.6	4 31	74	10.7	4 12
June	82	9.0	3 91	63	9.1	3 98
July	84	9.2	4 18	44	6.4	4 72
August	102	11.2	3 75	64	9.2	3 53
September	90	9.9	3 93	76	11.0	3 48
October	83	9.1	4 38	50	7.2	4 30
November	65	7.1	4 82	50	7.2	3 51
December	84	9.2	3 36	46	6.7	4 14

TABLE No. 9. Number of Jobs Furnished to Male and Female Applicants by Selected Representative General Labor Agencies in All Other Towns and Average Cost per Job to Applicants during Fiscal Years 1921 and 1922, by Sex and by Months.

Months	1920-1921					
	Data for 9 agencies			Data for 14 agencies		
	Male applicants			Female applicants		
	Number of jobs furnished	Percentage distribution	Average fee per job	Number of jobs furnished	Percentage distribution	Average fee per job
Totals	17,429	100.0	$1 86	5,735	100.0	$2 39
January	1,011	5 8	1 91	577	10 1	2 34
February	1,205	6 9	2 01	459	8 0	2 45
March	1,892	10 9	1 99	490	8 5	2 47
April	1,587	9 1	1 88	413	7 2	2 46
May	1,639	9 4	1 80	393	6 9	2 57
June	1,768	10 2	1 76	420	7 3	2 55
July	1,463	8 4	1 97	503	8 8	2 40
August	1,535	8 8	1 86	533	9 3	2 26
September	1,695	9 7	1 65	501	8 7	2 34
October	1,467	8 4	1 89	516	9 0	2 23
November	1,132	6 5	1 86	455	7 9	2 48
December	1,035	5 9	1 71	475	8 3	2 15
	1921-1922					
	Data for 12 agencies			Data for 12 agencies		
Totals	16,075	100.0	$1 83	5,217	100.0	$2 34
January	810	5 0	1 89	408	7 8	2 44
February	878	5 5	1 86	416	7 8	2 17
March	1,455	9 0	1 84	477	9 2	2 22
April	1,834	11 4	2 11	396	7 6	2 47
May	1,753	10 9	1 89	387	7 4	2 56
June	1,629	10 1	1 90	467	9 0	2 48
July	1,365	8 5	1 82	425	8 2	2 25
August	1,315	8 2	1 74	468	9*0	2 23
September	1,728	10 8	1 66	500	9 6	2 25
October	1,689	10 5	1 52	458	8 8	2 38
November	944	5 9	1 86	402	7 7	2 54
December	677	4 2	1 97	411	7 9	2 22

TABLE No. 10. Number of Jobs Furnished to Male Applicants by Selected Representative Oriental General Labor Agencies in San Francisco and Average Cost per Job to Applicants during Fiscal Years 1921 and 1922, by Months.

Months	1920-1921			1921-1922		
	Data for 9 agencies			Data for 7 agencies		
	Number of jobs furnished	Percentage distribution	Average fee per job	Number of jobs furnished	Percentage distribution	Average fee per job
Totals	3,802	100.0	$6 74	2,687	100.0	$6 57
January	224	5 9	6 08	200	7 4	6 20
February	242	6 4	6 62	180	6 7	6 15
March	291	7 6	6 56	258	9 6	6 73
April	314	8 3	6 68	257	9 6	6 64
May	335	8 8	6 84	242	9 0	6 58
June	380	10 0	7 01	229	8 5	7 30
July	361	9 5	7 04	241	9 0	6 76
August	397	10 4	7 01	256	9 5	6 61
September	394	10 4	6 61	239	8 9	6 50
October	350	9 2	6 76	204	7 6	6 02
November	266	7 0	6 46	203	7 6	6 62
December	248	6 5	6 85	178	6 6	6 45

TABLE No. 11. Number of Jobs Furnished to Male Applicants by Selected Representative Oriental General Labor Agencies in Los Angeles and Average Cost per Job to Applicants during Fiscal Years 1921 and 1922, by Months.

Months	1920-1921			1921-1922		
	Data for 4 agencies			Data for 3 agencies		
	Number of jobs furnished	Percentage distribution	Average fee per job	Number of jobs furnished	Percentage distribution	Average fee per job
Totals	6,290	100.0	$2 05	5,689	100.0	$1 68
January	432	6.8	2 21	423	7.4	2 10
February	455	7.2	2 10	393	6.9	1 96
March	508	8.1	2 14	478	8.4	1 27
April	590	9.4	2 43	543	9.6	1 58
May	556	8.8	2 17	373	6.6	1 81
June	552	8.8	1 94	445	7.8	1 62
July	533	8.5	2 21	433	7.6	1 80
August	566	9.0	2 07	510	9.0	1 68
September	505	8.0	2 06	518	9.1	1 53
October	526	8.4	1 67	531	9.3	1 71
November	533	8.5	1 86	519	9.1	1 68
December	554	8.5	1 77	523	9.2	1 60

TABLE No. 12. Number of Jobs Furnished to Male Applicants by Selected Representative Oriental General Labor Agencies in All Other Towns and Average Cost per Job to Applicants during Fiscal Years 1921 and 1922, by Months.

Months	1920-1921			1921-1922		
	Data for 6 agencies			Data for 5 agencies		
	Number of jobs furnished	Percentage distribution	Average fee per job	Number of jobs furnished	Percentage distribution	Average fee per job
Totals	2,898	100.0	$1 28	1,906	100.0	$1 85
January	233	8.0	1 28	105	5.5	1 76
February	285	9.8	95	96	5.0	2 22
March	297	10.2	1 32	134	7.0	1 57
April	238	8.2	1 07	180	9.5	1 80
May	319	11.0	1 30	170	8.9	1 86
June	298	10.3	1 26	246	12.9	1 51
July	188	6.5	1 71	211	11.1	1 80
August	190	6.6	1 81	177	9.3	2 11
September	187	6.5	1 31	189	9.9	1 95
October	236	8.1	1 38	181	9.5	1 82
November	202	7.0	1 09	125	6.6	1 89
December	225	7.8	1 06	92	4.8	2 19

CLASSIFICATION OF INDUSTRIES.

*List of Tables.

Table 1. All Industries (Total).
Table 2. Agricultural Implements.
Table 3. Artificial Stone, Clay and Concrete Products.
Table 4. Automobiles (including Bodies and Parts).
Table 5. Awnings, Tents and Sails.
Table 6. Babbitt Metal and Solder.
Table 7. Bags, other than Paper.
Table 8. Bakery Products.
Table 9. Baking Powder and Yeast.
Table 10. Baskets, Fruit and Berry.
Table 11. Boilers and Tanks.
Table 12. Boots and Shoes.
Table 13. Boxes, Bags, Cartons, Etc., Paper.
Table 14. Boxes, Wood.
Table 15. Brass, Bronze and Copper Products.
Table 16. Brick and Tile.
Table 17. Brooms and Brushes.
Table 18. Butter, Cheese and Condensed Milk.
Table 19. Cans, Tin.
Table 20. Canning and Packing of Fish.
Table 21. Canning and Preserving of Fruit and Vegetables.
Table 22. Carbonated Beverages.
Table 23. Carriages, Wagons and Materials.
Table 24. Caskets and Undertakers' Supplies.
Table 25. Cement.
Table 26. Chemicals (including Chemical Fertilizers).
Table 27. Clothing, Men's.
Table 28. Clothing, Women's.
Table 29. Coffee and Spice Roasting and Grinding.
Table 30. Confectionery.
Table 31. Cooperage and Wooden Goods, not elsewhere specified.
Table 32. Electric Machinery, Apparatus and Supplies.
Table 33. Electroplating.
Table 34. Engines and Pumps—Gas, Gasoline, Etc.
Table 35. Explosives.
Table 36. Felt and Felt Products.
Table 37. Flour Mill and Grist Mill Products.
Table 38. Food Preparations.
Table 39. Foundry and Machine Shop Products.
Table 40. Furniture, Bank and Store Fixtures.
Table 41. Gas (in containers).
Table 42. Gas and Electric Fixtures.
Table 43. Glass, Cutting and Ornamenting (including Mirrors).

*Tables 6, 10, 12, 31, 33, 35, 54, and 88 are omitted because less than three establishments reported in these industries.

Table 44. Gloves, Leather.
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Table 46. Hats and Caps, Men's.
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Table 75. Roofing Materials and Building Paper.
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Table 79. Ship Building (including Boat Building).
Table 80. Slaughtering and Meat Packing.
Table 81. Smelting and Refining.
Table 82. Soap, Washing Powder, Etc.
Table 83. Stoves and Furnaces (not including Oil Stoves).
Table 84. Sugar Refining.
Table 85. Tanning.
Table 86. Tobacco Manufactures.
Table 87. Trunks, Valises, Etc.
Table 88. Window Shades.
Table 89. Wire Work (including Wire Rope, Netting, etc.)
Table 90. All Other Industries.

TABLE NO. 1. ALL INDUSTRIES.

(2124 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	5,720	273
Clerks, stenographers, salesmen, etc., 18 years of age and over	21,498	5,911
Clerks, stenographers, salesmen, etc., under 18 years of age	940	112
Totals	28,158	6,296
Wage earners:		
18 years of age and over	102,810	35,268
Under 18 years of age	1,119	1,785
Totals	103,929	37,053

Salary and wage payments—annual:	
Officers, superintendents and managers	$25,796,373
Clerks, stenographers, salesmen, etc.	46,281,671
Wage earners (including piece workers)	168,344,292
Total	$240,422,336

Weekly Wage Rates of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	547	873	87	154	1,661
$5 to $5.99	484	267	18	64	833
$6 to $6.99	285	299	17	66	667
$7 to $7.99	247	412	23	61	743
$8 to $9.99	303	922	40	137	1,402
$10 to $11.99	390	1,351	120	158	2,019
$12 to $13.99	755	2,536	189	313	3,793
$14 to $15.99	1,335	3,542	243	180	5,300
$16 to $17.99	3,233	10,958	176	348	14,715
$18 to $19.99	5,620	4,917	61	85	10,683
$20 to $21.99	8,841	3,289	34	39	12,203
$22 to $24.99	14,476	2,777	32	19	17,304
$25 to $29.99	19,724	2,292	47	21	22,084
$30 to $34.99	16,487	1,095	21	7	17,610
$35 to $39.99	14,086	299	33	1	14,419
$40 and over	15,859	243	11		16,113
Totals	102,672	36,072	1,152	1,653	141,549

Number of Wage Earners, by Months.

Months	Males	Females	Total
January	110,299	19,298	129,597
February	109,439	20,038	129,477
March	110,784	21,133	131,917
April	111,124	22,065	133,189
May	107,564	20,470	128,034
June	102,970	23,262	126,232
July	99,255	30,230	129,485
August	101,918	34,547	136,465
September	99,229	29,317	128,546
October	96,412	24,247	120,659
November	91,387	22,362	113,749
December	89,077	21,268	110,345

TABLE NO. 2. AGRICULTURAL IMPLEMENTS.

(11 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	38	3
Clerks, stenographers, salesmen, etc., 18 years of age and over	202	70
Clerks, stenographers, salesmen, etc., under 18 years of age	26	5
Totals	266	78
Wage earners:		
18 years of age and over	433	----
Under 18 years of age	2	----
Totals	435	----

Salary and wage payments—annual:	
Officers, superintendents and managers	$269,042
Clerks, stenographers, salesmen, etc.	524,787
Wage earners (including piece workers)	53,782
Total	$847,611

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99	3				3
$16 to $17.99	2		1		3
$18 to $19.99	12		1		13
$20 to $21.99	49				49
$22 to $24.99	109				109
$25 to $29.99	106				106
$30 to $34.99	97				97
$35 to $39.99	33				33
$40 and over	22				22
Totals	433		2		435

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,064	1	1,065
February	1,080	1	1,081
March	1,129	1	1,130
April	1,059	1	1,060
May	849	1	850
June	537	1	538
July	289	1	290
August	296	1	297
September	312	1	313
October	356	1	357
November	388	1	389
December	457	1	458

TABLE NO. 3. ARTIFICIAL STONE, CLAY AND CONCRETE PRODUCTS.

(14 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	28	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	19	8
Clerks, stenographers, salesmen, etc., under 18 years of age	3	1
Totals	50	10
Wage earners:		
18 years of age and over	614	16
Under 18 years of age	11	
Totals	625	16

Salary and wage payments—annual:	
Officers, superintendents and managers	$101,791
Clerks, stenographers, salesmen, etc.	97,146
Wage earners (including piece workers)	834,530
Total	$1,033,467

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99		6			6
$12 to $13.99		2			2
$14 to $15.99	1				1
$16 to $17.99	1	5			6
$18 to $19.99	26		1		27
$20 to $21.99	174	2			176
$22 to $24.99	50	7			57
$25 to $29.99	217	4	1		222
$30 to $34.99	76				76
$35 to $39.99	25				25
$40 and over	44				44
Totals	614	26	2		642

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	720	16	736
February	741	16	757
March	663	14	677
April	617	15	632
May	650	14	664
June	661	14	675
July	640	15	655
August	583	15	598
September	562	12	574
October	564	13	577
November	582	14	596
December	621	16	637

TABLE NO. 4. AUTOMOBILES (INCLUDING BODIES AND PARTS).

(58 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	186	7
Clerks, stenographers, salesmen, etc., 18 years of age and over	351	146
Clerks, stenographers, salesmen, etc., under 18 years of age	20	8
Totals	557	161
Wage earners:		
18 years of age and over	1,927	68
Under 18 years of age	48	
Totals	1,975	68

Salary and wage payments—annual:	
Officers, superintendents and managers	$731,819
Clerks, stenographers, salesmen, etc.	910,902
Wage earners (including piece workers)	2,998,357
Total	$4,641,078

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	26		4		30
$5 to $5.99	38		2		40
$6 to $6.99	31				31
$7 to $7.99	35				35
$8 to $9.99	2				2
$10 to $11.99	7				7
$12 to $13.99	13		5		18
$14 to $15.99	11	4	3		18
$16 to $17.99	10	11	6		27
$18 to $19.99	21	12	1		34
$20 to $21.99	87	19	1		107
$22 to $24.99	176	13			189
$25 to $29.99	273	7			280
$30 to $34.99	284	3			287
$35 to $39.99	437				437
$40 and over	485	3			488
Totals	1,936	72	22		2,030

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,845	68	1,913
February	1,822	62	1,884
March	1,878	49	1,927
April	1,979	61	2,040
May	1,922	55	1,977
June	1,797	63	1,860
July	1,788	62	1,846
August	1,817	57	1,874
September	1,913	68	1,981
October	1,950	67	2,017
November	1,951	77	2,028
December	1,814	39	1,853

TABLE NO. 5. AWNINGS, TENTS AND SAILS.

(4 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	5	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	3	1
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	8	2
Wage earners:		
18 years of age and over	23	28
Under 18 years of age		
Totals	23	28

Salary and wage payments—annual:	
Officers, superintendents and managers	$16,000
Clerks, stenographers, salesmen, etc	9,530
Wage earners (including piece workers)	75,640
Total	$101,170

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99	4				4
$10 to $11.99					
$12 to $13.99					
$14 to $15.99		5			5
$16 to $17.99		10			10
$18 to $19.99		8			8
$20 to $21.99	2	1			3
$22 to $24.99	2	3			5
$25 to $29.99	5	1			6
$30 to $34.99	5	1			6
$35 to $39.99	1				1
$40 and over	6				6
Totals	25	29			54

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	31	15	46
February	27	21	48
March	25	25	50
April	29	25	54
May	26	35	61
June	34	37	71
July	31	45	76
August	26	27	53
September	28	20	48
October	27	24	51
November	27	21	48
December	24	20	44

TABLE NO. 7. BAGS OTHER THAN PAPER.

(4 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	14	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	40	20
Clerks, stenographers, salesmen, etc., under 18 years of age	2	
Totals	56	21
Wage earners:		
18 years of age and over	144	192
Under 18 years of age	2	10
Totals	146	202

Salary and wage payments—annual:	
Officers, superintendents and managers	$94,738
Clerks, stenographers, salesmen, etc.	114,250
Wage earners (including piece workers)	429,191
Total	$638,179

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99				1	1
$12 to $13.99		7		5	12
$14 to $15.99	5	12		1	18
$16 to $17.99	10	88	1	3	102
$18 to $19.99		32			32
$20 to $21.99	5	19			24
$22 to $24.99	17	29	1		47
$25 to $29.99	25	3			28
$30 to $34.99	29	1			30
$35 to $39.99	35	1			36
$40 and over	18				18
Totals	144	192	2	10	348

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	156	205	361
February	181	243	424
March	164	226	390
April	162	222	384
May	165	251	416
June	170	230	400
July	166	228	394
August	169	259	428
September	166	236	402
October	157	227	384
November	147	202	349
December	136	165	301

TABLE NO. 8. BAKERY PRODUCTS.

(80 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	161	6
Clerks, stenographers, salesmen, etc., 18 years of age and over	883	218
Clerks, stenographers, salesmen, etc., under 18 years of age	3	1
Totals	1,047	225
Wage earners:		
18 years of age and over	1,929	885
Under 18 years of age	15	30
Totals	1,944	915

Salary and wage payments—annual:	
Officers, superintendents and managers	$723,009
Clerks, stenographers, salesmen, etc	2,044,819
Wage earners (including piece workers)	3,664,342
Total	$6,432,170

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	3	9			12
$5 to $5.99	2	4			6
$6 to $6.99	14				14
$7 to $7.99	5	1			6
$8 to $9.99	4	4			8
$10 to $11.99	6	6		4	16
$12 to $13.99	6	78		4	88
$14 to $15.99	17	100	4	2	123
$16 to $17.99	20	440	2	14	476
$18 to $19.99	70	180	4	7	261
$20 to $21.99	136	45	1		182
$22 to $24.99	206	28	1		235
$25 to $29.99	304	15	2		321
$30 to $34.99	351	11	1		363
$35 to $39.99	265				265
$40 and over	539				539
Totals	1,948	921	15	31	2,915

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,847	891	2,738
February	1,867	916	2,783
March	1,870	855	2,725
April	1,873	849	2,722
May	1,897	835	2,732
June	1,917	870	2,787
July	1,920	837	2,757
August	1,903	799	2,702
September	1,956	904	2,860
October	1,958	923	2,881
November	1,967	957	2,924
December	1,997	1,061	3,058

TABLE NO. 9. BAKING POWDER AND YEAST.

(3 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	5	
Clerks, stenographers, salesmen, etc., 18 years of age and over	29	8
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	34	8
Wage earners:		
18 years of age and over	96	3
Under 18 years of age		
Totals	96	3

Salary and wage payments—annual:	
Officers, superintendents and managers	$38,750
Clerks, stenographers, salesmen, etc.	84,914
Wage earners (including piece workers)	204,019
Total	$327,683

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99		1			1
$18 to $19.99		2			2
$20 to $21.99					
$22 to $24.99					
$25 to $29.99					
$30 to $34.99	18				18
$35 to $39.99	63				63
$40 and over	15				15
Totals	96	3			99

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	119	3	122
February	126	3	129
March	121	3	124
April	113	3	116
May	115	3	118
June	118	3	121
July	120	3	123
August	98	3	101
September	95	3	98
October	97	3	100
November	94	3	97
December	96	3	99

TABLE NO. 11. BOILERS AND TANKS.

(7 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	21	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	29	4
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	50	5
Wage earners:		
18 years of age and over	114	
Under 18 years of age		
Totals	114	

Salary and wage payments—annual:	
Officers, superintendents and managers	$104,570
Clerks, stenographers, salesmen, etc	21,115
Wage earners (including piece workers)	357,153
Total	$482,838

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	1				1
$12 to $13.99					
$14 to $15.99	1				1
$16 to $17.99	2				2
$18 to $19.99	2				2
$20 to $21.99	6				6
$22 to $24.99	28				28
$25 to $29.99	24				24
$30 to $34.99	26				26
$35 to $39.99	29				29
$40 and over	18				18
Totals	137				137

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	213		213
February	230		230
March	142		142
April	167		167
May	170		170
June	191		191
July	148		148
August	120		120
September	155		155
October	166		166
November	175		175
December	266		266

TABLE NO. 13. BOXES, BAGS, CARTONS, PAPER, ETC.

(22 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	72	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	72	47
Clerks, stenographers, salesmen, etc., under 18 years of age	2	
Totals	146	49
Wage earners:		
18 years of age and over	958	661
Under 18 years of age	16	44
Totals	974	705

Salary and wage payments—annual:	
Officers, superintendents and managers	$353,079
Clerks, stenographers, salesmen, etc.	179,408
Wage earners (including piece workers)	1,639,881
Total	$2,172,368

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	14	28			42
$5 to $5.99	5				5
$6 to $6.99	2				2
$7 to $7.99	2				2
$8 to $9.99					
$10 to $11.99		34	10		44
$12 to $13.99	39	72	6	13	130
$14 to $15.99	14	145	5	3	167
$16 to $17.99	17	265	8	7	297
$18 to $19.99	50	81		3	134
$20 to $21.99	183	26			209
$22 to $24.99	167	5	1		173
$25 to $29.99	194	1			195
$30 to $34.99	119	3			122
$35 to $39.99	62				62
$40 and over	77				77
Totals	945	660	30	26	1,661

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	824	480	1,304
February	815	480	1,295
March	792	494	1,286
April	830	524	1,354
May	820	536	1,356
June	804	551	1,355
July	775	539	1,314
August	780	561	1,341
September	804	648	1,452
October	876	735	1,611
November	917	776	1,639
December	962	717	1,679

TABLE NO. 14. BOXES, WOOD.

(20 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	50	3
Clerks, stenographers, salesmen, etc., 18 years of age and over	29	23
Clerks, stenographers, salesmen, etc., under 18 years of age		1
Totals	79	27
Wage earners:		
18 years of age and over	888	106
Under 18 years of age	3	4
Totals	891	110

Salary and wage payments—annual:	
Officers, superintendents and managers	$203,954
Clerks, stenographers, salesmen, etc	79,977
Wage earners (including piece workers)	995,423
Total	$1,279,354

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	15		2	1	18
$5 to $5.99	8				8
$6 to $6.99	2	1			3
$7 to $7.99	2				2
$8 to $9.99	1			1	2
$10 to $11.99	1	1			2
$12 to $13.99	17	11		1	29
$14 to $15.99	48	12	3		63
$16 to $17.99	32	49		1	82
$18 to $19.99	98	20	1		119
$20 to $21.99	79	12			91
$22 to $24.99	278	9			287
$25 to $29.99	152	4			156
$30 to $34.99	59				59
$35 to $39.99	50				50
$40 and over	25				25
Totals	867	119	6	4	996

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	762	96	858
February	868	86	954
March	916	102	1,018
April	951	106	1,057
May	956	98	1,054
June	830	80	910
July	797	85	882
August	856	67	923
September	918	83	1,001
October	920	95	1,015
November	900	122	1,022
December	886	105	991

TABLE NO. 15. BRASS, BRONZE AND COPPER PRODUCTS.

(18 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	33	4
Clerks, stenographers, salesmen, etc., 18 years of age and over	50	14
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	83	18
Wage earners:		
18 years of age and over	393	10
Under 18 years of age	22	
Totals	415	10

Salary and wage payments—annual:	
Officers, superintendents and managers	$138,233
Clerks, stenographers, salesmen, etc.	125,428
Wage earners (including piece workers)	617,597
Total	$881,258

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	65				65
$5 to $5.99	6				6
$6 to $6.99					
$7 to $7.99	1				1
$8 to $9.99	1	1			2
$10 to $11.99	1				1
$12 to $13.99	3				3
$14 to $15.99	3	1			4
$16 to $17.99	3	8	2		13
$18 to $19.99	12		3		15
$20 to $21.99	10	3			13
$22 to $24.99	36	7			43
$25 to $29.99	35	10			45
$30 to $34.99	40	7			47
$35 to $39.99	62	24			86
$40 and over	66	20			86
Totals	344	81	5		430

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	353	9	362
February	345	10	355
March	337	9	346
April	337	11	348
May	404	11	415
June	401	12	413
July	387	12	399
August	371	12	383
September	400	12	412
October	397	14	411
November	424	11	435
December	426	10	436

TABLE NO. 16. BRICK AND TILE.

(27 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	49	3
Clerks, stenographers, salesmen, etc., 18 years of age and over	49	8
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	99	11
Wage earners:		
18 years of age and over	1,513	75
Under 18 years of age	14	7
Totals	1,527	82

Salary and wage payments—annual:	
Officers, superintendents and managers	$153,192
Clerks, stenographers, salesmen, etc.	76,852
Wage earners (including piece workers)	1,713,538
Total	$1,943,582

Weekly Earnings of Wage Earne s.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	27				27
$5 to $5.99					
$6 to $6.99	7				7
$7 to $7.99	5				5
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	1	23			24
$14 to $15.99	12	9	9	3	33
$16 to $17.99	2	32	2	4	40
$18 to $19.99	80	7	1		88
$20 to $21.99	268	1	1		270
$22 to $24.99	460				460
$25 to $29.99	337	3			340
$30 to $34.99	155				155
$35 to $39.99	84				84
$40 and over	81				81
Totals	1,519	75	13	7	1,614

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,216	60	1,276
February	1,045	62	1,107
March	1,172	62	1,234
April	1,393	66	1,459
May	1,476	62	1,538
June	1,581	61	1,642
July	1,499	62	1,561
August	1,545	63	1,608
September	1,453	65	1,518
October	1,312	64	1,376
November	1,362	72	1,434
December	1,381	82	1,463

TABLE NO. 17. BROOMS AND BRUSHES.

(5 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	9	
Clerks, stenographers, salesmen, etc., 18 years of age and over	15	1
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	25	1
Wage earners:		
18 years of age and over	55	1
Under 18 years of age	1	
Totals	56	1

Salary and wage payments—annual:	
Officers, superintendents and managers	$33,250
Clerks, stenographers, salesmen, etc.	16,965
Wage earners (including piece workers)	77,686
Total	$127,901

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99			1		1
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99			1		1
$14 to $15.99					
$16 to $17.99					
$18 to $19.99	5				5
$20 to $21.99	3				3
$22 to $24.99	5				5
$25 to $29.99	7				7
$30 to $34.99	18				18
$35 to $39.99	16				16
$40 and over					
Totals	54		2		56

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	51		51
February	52		52
March	51		51
April	55		55
May	43		43
June	43		43
July	52		52
August	54		54
September	54		54
October	55		55
November	56		56
December	57		57

TABLE NO. 18. BUTTER, CHEESE AND CONDENSED MILK.

(33 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	74	6
Clerks, stenographers, salesmen, etc., 18 years of age and over	284	109
Clerks, stenographers, salesmen, etc., under 18 years of age	1	3
Totals	359	118
Wage earners:		
18 years of age and over	1,040	149
Under 18 years of age		4
Totals	1,040	153

Salary and wage payments—annual:	
Officers, superintendents and managers	$224,314
Clerks, stenographers, salesmen, etc	560,823
Wage earners (including piece workers)	1,452,905
Total	$2,238,042

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	4				4
$5 to $5.99	42				42
$6 to $6.99	6				6
$7 to $7.99	5				5
$8 to $9.99	1				1
$10 to $11.99	1				1
$12 to $13.99	1	2			3
$14 to $15.99	10	20	1		31
$16 to $17.99	11	72	1		84
$18 to $19.99	20	22	10		52
$20 to $21.99	53	10			63
$22 to $24.99	258	22			280
$25 to $29.99	271	1			272
$30 to $34.99	205				205
$35 to $39.99	82				82
$40 and over	74				74
Totals	1,044	149	12		1,205

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,007	153	1,160
February	941	129	1,070
March	1,043	152	1,195
April	1,142	192	1,334
May	1,193	190	1,383
June	1,182	292	1,474
July	1,174	183	1,357
August	1,096	191	1,287
September	1,033	175	1,208
October	1,008	155	1,163
November	971	153	1,124
December	970	151	1,121

TABLE NO. 19. CANS, TIN.

(9 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	17	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	49	11
Clerks, stenographers, salesmen, etc., under 18 years of age	2	
Totals	68	12
Wage earners:		
18 years of age and over	1,106	433
Under 18 years of age	6	2
Totals	1,112	435

Salary and wage payments—annual:	
Officers, superintendents and managers	$13,470
Clerks, stenographers, salesmen, etc.	92,045
Wage earners (including piece workers)	1,431,379
Total	$1,536,894

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99		6			6
$14 to $15.99	15	3	5	1	24
$16 to $17.99	146	399	1	1	547
$18 to $19.99	156	18			174
$20 to $21.99	171	3			174
$22 to $24.99	214	2			216
$25 to $29.99	173	1			174
$30 to $34.99	61				61
$35 to $39.99	84	1			85
$40 and over	86				86
Totals	1,106	433	6	2	1,547

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,037	362	1,399
February	1,096	377	1,473
March	1,181	498	1,679
April	1,202	531	1,733
May	1,032	449	1,481
June	907	356	1,263
July	1,087	398	1,485
August	1,425	661	2,086
September	1,255	541	1,796
October	1,066	478	1,544
November	981	395	1,376
December	987	365	1,352

TABLE NO. 20. CANNING AND PACKING OF FISH.

(14 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	37	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	30	11
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	67	12
Wage earners:		
18 years of age and over	699	800
Under 18 years of age	9	12
Totals	708	812

Salary and wage payments—annual:	
Officers, superintendents and managers	$117,889
Clerks, stenographers, salesmen, etc	43,554
Wage earners (including piece workers)	371,697
Total	$533,140

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	13	36			49
$5 to $5.99	2	8			10
$6 to $6.99	2	7			9
$7 to $7.99	5	4			9
$8 to $9.99	9	12			21
$10 to $11.99	7	21			28
$12 to $13.99	37	19			56
$14 to $15.99	22	10			32
$16 to $17.99	95	408	1	4	508
$18 to $19.99	85	126	5	5	221
$20 to $21.99	113	36			149
$22 to $24.99	97	60			157
$25 to $29.99	105	51			156
$30 to $34.99	49				49
$35 to $39.99	30	2			32
$40 and over	31				31
Totals	702	800	6	9	1,517

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	172	15	187
February	150	28	178
March	172	44	216
April	163	41	204
May	93	21	114
June	120	42	162
July	177	139	316
August	680	671	1,351
September	680	565	1,245
October	492	437	929
November	473	251	724
December	374	208	582

TABLE NO. 21. CANNING AND PRESERVING OF FRUITS AND VEGETABLES.

(103 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	278	20
Clerks, stenographers, salesmen, etc., 18 years of age and over	424	225
Clerks, stenographers, salesmen, etc., under 18 years of age	9	3
Totals	711	248
Wage earners:		
18 years of age and over	7,150	13,340
Under 18 years of age	316	1,262
Totals	7,466	14,602

Salary and wage payments—annual:	
Officers, superintendents and managers	$962,983
Clerks, stenographers, salesmen, etc.	985,992
Wage earners (including piece workers)	6,679,247
Total	$8,628,222

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	106	604	31	124	865
$5 to $5.99	26	199	13	46	284
$6 to $6.99	25	233	10	63	331
$7 to $7.99	47	313	15	57	432
$8 to $9.99	118	722	25	124	989
$10 to $11.99	83	919	35	127	1,164
$12 to $13.99	172	1,266	38	177	1,653
$14 to $15.99	172	1,458	33	99	1,762
$16 to $17.99	489	2,329	27	231	3,076
$18 to $19.99	744	1,503	4	37	2,288
$20 to $21.99	880	1,177	14	31	2,102
$22 to $24.99	1,103	1,246	3	14	2,366
$25 to $29.99	1,843	1,079		7	2,929
$30 to $34.99	935	444		2	1,381
$35 to $39.99	434	131			565
$40 and over	334	75	1		410
Totals	7,511	13,698	249	1,139	22,597

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,775	883	2,658
February	1,869	1,002	2,871
March	2,198	1,509	3,707
April	2,835	2,962	5,797
May	2,530	1,772	4,302
June	3,164	4,189	7,353
July	4,957	10,462	15,419
August	6,654	13,112	19,766
September	5,303	8,541	13,844
October	3,446	3,313	6,759
November	2,244	1,732	3,976
December	1,745	902	2,647

TABLE NO. 22. CARBONATED BEVERAGES.

(7 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	11	
Clerks, stenographers, salesmen, etc., 18 years of age and over	4	4
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	15	4
Wage earners:		
18 years of age and over	51	
Under 18 years of age		
Totals	51	

Salary and wage payments—annual:	
Officers, superintendents and managers	$31,128
Clerks, stenographers, salesmen, etc.	16,302
Wage earners (including piece workers)	97,432
Total	$144,862

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	1				1
$5 to $5.99	5				5
$6 to $6.99	1				1
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99					
$18 to $19.99	2				2
$20 to $21.99	1				1
$22 to $24.99					
$25 to $29.99	1				1
$30 to $34.99	31				31
$35 to $39.99	12				12
$40 and over	2				2
Totals	56				56

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	54	4	58
February	56	4	60
March	60	3	63
April	56	4	60
May	67	3	70
June	67	4	71
July	66	2	68
August	63		63
September	59	1	60
October	55		55
November	57		57
December	51		51

TABLE NO. 23. CARRIAGES, WAGONS AND MATERIALS.

(3 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	3	2
Clerks, stenographers, salesmen, etc., 18 years of age and over		
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	3	2
Wage earners:		
18 years of age and over	17	1
Under 18 years of age	1	
Totals	18	1

Salary and wage payments—annual:	
Officers, superintendents and managers	$8,550
Clerks, stenographers, salesmen, etc.	1,320
Wage earners (including piece workers)	31,015
Total	$40,885

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	1				1
$5 to $5.99					
$6 to $6.99	2				2
$7 to $7.99	1				1
$8 to $9.99	1				1
$10 to $11.99					
$12 to $13.99			1		1
$14 to $15.99					
$16 to $17.99					
$18 to $19.99	1				1
$20 to $21.99	1				1
$22 to $24.99	1				1
$25 to $29.99	1				1
$30 to $34.99	3				3
$35 to $39.99	1				1
$40 and over	4				4
Totals	17		1		18

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	18		18
February	15		15
March	18		18
April	18		18
May	17		17
June	15		15
July	16		16
August	19		19
September	20		20
October	21		21
November	17		17
December	16		16

TABLE NO. 24. CASKETS AND UNDERTAKERS' SUPPLIES.

(3 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	4	
Clerks, stenographers, salesmen, etc., 18 years of age and over	11	4
Clerks, stenographers, salesmen, etc., under 18 years of age		
Total's	15	4
Wage earners:		
18 years of age and over	49	19
Under 18 years of age		
Totals	49	19

Salary and wage payments—annual:	
Officers, superintendents and managers	$35,420
Clerks, stenographers, salesmen, etc	24,405
Wage earners (including piece workers)	96,427
Total	$156,252

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5		1			1
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99	1				1
$16 to $17.99					
$18 to $19.99	8	9			17
$20 to $21.99	3	5			8
$22 to $24.99	3				3
$25 to $29.99	2	3			5
$30 to $34.99	10				10
$35 to $39.99	19				19
$40 and over	3				3
Totals	49	18			67

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	47	19	66
February	49	18	67
March	50	19	69
April	52	18	70
May	49	18	67
June	51	14	65
July	48	13	61
August	48	16	64
September	48	17	65
October	54	17	71
November	52	17	69
December	49	17	66

TABLE NO. 25. CEMENT.

(7 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	34	
Clerks, stenographers, salesmen, etc., 18 years of age and over	208	32
Clerks, stenographers, salesmen, etc., under 18 years of age	3	
Totals	245	32
Wage earners:		
18 years of age and over	1,865	26
Under 18 years of age		
Totals	1 865	26

Salary and wage payments—annual:	
Officers, superintendents and managers	$197,000
Clerks, stenographers, salesmen, etc.	524,369
Wage earners (including piece workers)	2,876,262
Total	$3,597,631

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99	3	1			4
$8 to $9.99	2				2
$10 to $11.99	1				1
$12 to $13.99					
$14 to $15.99	3				3
$16 to $17.99	99	1		1	101
$18 to $19.99	56	1			57
$20 to $21.99	208	4	1		213
$22 to $24.99	329	1			330
$25 to $29.99	328	7	2	2	339
$30 to $34.99	309	4	2	2	317
$35 to $39.99	162			1	163
$40 and over	169				169
Totals	1,669	19	5	6	1,699

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,798	30	1,828
February	1,730	32	1,762
March	1,795	29	1,824
April	1,868	30	1,898
May	1,850	31	1,881
June	1,796	27	1,823
July	1,595	28	1,623
August	1,551	27	1,578
September	1,619	27	1,646
October	1,595	26	1,621
November	1,714	27	1,741
December	1,865	26	1,891

TABLE NO. 26. CHEMICALS (INCLUDING CHEMICAL FERTILIZERS).

(29 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	81	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	128	43
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	209	45
Wage earners:		
18 years of age and over	897	26
Under 18 years of age	1	
Totals	898	26

Salary and wage payments—annual:	
Officers, superintendents and managers	$313,751
Clerks, stenographers, salesmen, etc.	263,648
Wage earners (including piece workers)	1,114,864
Total	$1,692,263

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	6				6
$5 to $5.99	32				32
$6 to $6.99					
$7 to $7.99	2				2
$8 to $9.99	1				1
$10 to $11.99					
$12 to $13.99	1	1			2
$14 to $15.99					
$16 to $17.99	5	6			11
$18 to $19.99	65	10	1		76
$20 to $21.99	61	1			62
$22 to $24.99	87	8			95
$25 to $29.99	189	1			190
$30 to $34.99	216				216
$35 to $39.99	118				118
$40 and over	111				111
Totals	894	27	1		922

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	951	22	973
February	968	22	990
March	967	20	987
April	937	27	964
May	826	26	852
June	650	24	674
July	584	20	604
August	568	18	586
September	631	19	650
October	639	23	662
November	534	23	557
December	610	19	629

TABLE NO. 27. CLOTHING, MEN'S.

(37 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	77	7
Clerks, stenographers, salesmen, etc., 18 years of age and over	182	68
Clerks, stenographers, salesmen, etc., under 18 years of age	42	4
Totals	301	79
Wage earners:		
18 years of age and over	380	1,927
Under 18 years of age	7	39
Totals	387	1,966

Salary and wage payments—annual:	
Officers, superintendents and managers	$456,793
Clerks, stenographers, salesmen, etc.	427,675
Wage earners (including piece workers)	2,139,108
Total	$3,023,576

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	1	15		2	18
$5 to $5.99		10		1	11
$6 to $6.99		10		1	11
$7 to $7.99		13			13
$8 to $9.99		34			34
$10 to $11.99	1	48		3	52
$12 to $13.99	12	119	1	5	137
$14 to $15.99	13	165	4	8	190
$16 to $17.99	18	327	1	7	353
$18 to $19.99	18	186		2	206
$20 to $21.99	18	184		1	203
$22 to $24.99	19	192	1	2	214
$25 to $29.99	44	271	1	6	322
$30 to $34.99	45	146		1	192
$35 to $39.99	32	31			63
$40 and over	154	22			176
Totals	375	1,773	8	39	2,195

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	290	1,202	1,492
February	309	1,336	1,645
March	334	1,437	1,771
April	376	1,665	2,041
May	390	1,774	2,164
June	374	1,828	2,202
July	369	1,825	2,194
August	382	1,889	2,271
September	394	1,868	2,262
October	405	1,935	2,340
November	403	1,942	2,345
December	392	1,902	2,294

TABLE NO. 28. CLOTHING, WOMEN'S.

(49 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	68	11
Clerks, stenographers, salesmen, etc., 18 years of age and over	88	61
Clerks, stenographers, salesmen, etc., under 18 years of age	5	2
Totals	161	74
Wage earners:		
18 years of age and over	193	872
Under 18 years of age	5	4
Totals	198	876

Salary and wage payments—annual:	
Officers, superintendents and managers	$304,240
Clerks, stenographers, salesmen, etc	258,984
Wage earners (including piece workers)	1,313,530
Total	$1,876,754

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99		2			2
$6 to $6.99		1	1		2
$7 to $7.99		4			4
$8 to $9.99		11			11
$10 to $11.99		15	1	1	17
$12 to $13.99	15	52	2		69
$14 to $15.99	4	49		1	54
$16 to $17.99	18	286		2	306
$18 to $19.99	11	114	1		126
$20 to $21.99	8	108			116
$22 to $24.99	13	90			103
$25 to $29.99	15	69			84
$30 to $34.99	16	41			57
$35 to $39.99	15	14			29
$40 and over	105	18			123
Totals	220	874	5	4	1,103

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	180	796	976
February	190	927	1,117
March	182	892	1,074
April	182	1,021	1,203
May	202	1,000	1,202
June	210	1,013	1,223
July	194	1,001	1,195
August	203	1,011	1,214
September	209	1,015	1,224
October	205	1,056	1,261
November	194	989	1,183
December	193	876	1,069

TABLE NO. 29. COFFEE AND SPICE ROASTING AND GRINDING.

(11 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	39	4
Clerks, stenographers, salesmen, etc., 18 years of age and over	319	149
Clerks, stenographers, salesmen, etc., under 18 years of age	4	
Totals	362	153
Wage earners:		
18 years of age and over	333	206
Under 18 years of age	2	1
Totals	335	207

Salary and wage payments—annual:	
Officers, superintendents and managers	$263,978
Clerks, stenographers, salesmen, etc.	847,407
Wage earners (including piece workers)	608,270
Total	$1,719,655

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	1				1
$12 to $13.99					
$14 to $15.99	1	9			10
$16 to $17.99	4	124			128
$18 to $19.99	18	58			76
$20 to $21.99	16	15			31
$22 to $24.99	25	2			27
$25 to $29.99	93				93
$30 to $34.99	82				82
$35 to $39.99	66				66
$40 and over	25				25
Totals	331	208			539

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	261	201	462
February	260	205	465
March	263	201	464
April	273	209	482
May	283	207	490
June	289	216	505
July	281	218	499
August	296	229	525
September	296	240	536
October	306	223	529
November	303	201	504
December	332	204	536

TABLE NO. 30. CONFECTIONERY.

(73 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	162	17
Clerks, stenographers, salesmen, etc., 18 years of age and over	508	296
Clerks, stenographers, salesmen, etc., under 18 years of age	16	12
Totals	686	325
Wage earners:		
18 years of age and over	1,620	1,636
Under 18 years of age	20	23
Totals	1,640	1,659

Salary and wage payments—annual:	
Officers, superintendents and managers	$740,078
Clerks, stenographers, salesmen, etc	990,580
Wage earners (including piece workers)	3,016,049
Total	$4,746,707

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	4	3	1		8
$5 to $5.99					
$6 to $6.99	1	1			2
$7 to $7.99		13			13
$8 to $9.99	1	17			18
$10 to $11.99		16		1	17
$12 to $13.99	11	187	7	5	210
$14 to $15.99	32	195	10	3	240
$16 to $17.99	65	774	5	6	850
$18 to $19.99	92	202		3	297
$20 to $21.99	141	122			263
$22 to $24.99	198	79	1		278
$25 to $29.99	354	56	1		411
$30 to $34.99	275	5			280
$35 to $39.99	243	1			244
$40 and over	234				234
Totals	1,651	1,671	25	18	3,365

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,362	1,265	2,627
February	1,361	1,188	2,549
March	1,413	1,296	2,709
April	1,419	1,333	2,752
May	1,487	1,257	2,744
June	1,537	1,271	2,808
July	1,525	1,185	2,710
August	1,467	1,245	2,712
September	1,566	1,435	3,001
October	1,626	1,596	3,222
November	1,635	1,614	3,249
December	1,607	1,662	3,269

TABLE NO. 32. ELECTRIC MACHINERY, APPARATUS AND SUPPLIES.

(25 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	160	42
Clerks, stenographers, salesmen, etc., 18 years of age and over	141	109
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	301	151
Wage earners:		
18 years of age and over	984	481
Under 18 years of age	4	
Totals	988	481

Salary and wage payments—annual:	
Officers, superintendents and managers	$257,193
Clerks, stenographers, salesmen, etc.	579,817
Wage earners (including piece workers)	1,995,787
Total	$2,832,797

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	7		1		8
$5 to $5.99	9				9
$6 to $6.99	9				9
$7 to $7.99	13				13
$8 to $9.99	8				8
$10 to $11.99	3				3
$12 to $13.99	7	5		2	14
$14 to $15.99	37	69			106
$16 to $17.99	125	164		2	291
$18 to $19.99	131	102	1	2	236
$20 to $21.99	67	71	1	1	140
$22 to $24.99	102	72	1		175
$25 to $29.99	168	22	2		192
$30 to $34.99	92	11	4		107
$35 to $39.99	77	4			81
$40 and over	50	5			55
Totals	905	525	10	7	1,447

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,141	746	1,887
February	1,105	740	1,845
March	1,114	707	1,821
April	1,194	671	1,865
May	1,121	613	1,734
June	1,117	578	1,695
July	1,112	540	1,652
August	1,104	538	1,642
September	1,167	581	1,748
October	1,221	592	1,813
November	1,035	511	1,546
December	981	481	1,462

TABLE NO. 34. ENGINES AND PUMPS—GAS, GASOLINE, ETC.

(23 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	117	
Clerks, stenographers, salesmen, etc., 18 years of age and over	280	90
Clerks, stenographers, salesmen, etc., under 18 years of age	18	3
Totals	415	93
Wage earners:		
18 years of age and over	955	1
Under 18 years of age	6	2
Totals	961	3

Salary and wage payments—annual:	
Officers, superintendents and managers	$588,356
Clerks, stenographers, salesmen, etc.	786,971
Wage earners (including piece workers)	1,892,395
Total	$3,267,722

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	1				1
$5 to $5.99	1				1
$6 to $6.99					
$7 to $7.99	5				5
$8 to $9.99	3				3
$10 to $11.99	5		1		6
$12 to $13.99	7		1		8
$14 to $15.99	19		1		20
$16 to $17.99	19		3		22
$18 to $19.99	69	1			70
$20 to $21.99	39	2			41
$22 to $24.99	133				133
$25 to $29.99	147				147
$30 to $34.99	249				249
$35 to $39.99	185				185
$40 and over	72				72
Totals	954	3	6		963

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,716	5	1,721
February	1,704	4	1,708
March	1,732	2	1,734
April	1,509	6	1,515
May	1,286		1,286
June	1,054		1,054
July	977		977
August	889		889
September	752	3	755
October	819	3	822
November	840	3	843
December	957	4	961

TABLE NO. 35. EXPLOSIVES.

(4 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	23	
Clerks, stenographers, salesmen, etc., 18 years of age and over	60	13
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	83	13
Wage earners:		
18 years of age and over	378	28
Under 18 years of age	2	1
Totals	380	29

Salary and wage payments—annual:	
Officers, superintendents and managers	$102,222
Clerks, stenographers, salesmen, etc.	168,096
Wage earners (including piece workers)	626,752
Total	$897,070

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99	1				1
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	1				1
$14 to $15.99	7				7
$16 to $17.99	28	25	2	1	56
$18 to $19.99	7	3			10
$20 to $21.99	4				4
$22 to $24.99	31				31
$25 to $29.99	176				176
$30 to $34.99	47				47
$35 to $39.99	50				50
$40 and over	26				26
Totals	378	28	2	1	409

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	451	42	493
February	451	46	497
March	429	39	468
April	390	36	426
May	346	34	380
June	309	3	312
July	285	3	288
August	322	32	354
September	362	32	394
October	379	30	409
November	387	31	418
December	380	29	409

TABLE NO. 37. FLOUR MILL AND GRIST MILL PRODUCTS.

(56 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	93	5
Clerks, stenographers, salesmen, etc., 18 years of age and over	350	110
Clerks, stenographers, salesmen, etc., under 18 years of age		1
Totals	443	116
Wage earners:		
18 years of age and over	1,426	114
Under 18 years of age	2	
Totals	1,428	114

Salary and wage payments—annual:	
Officers, superintendents and managers	$392,659
Clerks, stenographers, salesmen, etc	809,940
Wage earners (including piece workers)	1,874,393
Total	$3,076,992

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	12	1			13
$5 to $5.99	4				4
$6 to $6.99	3				3
$7 to $7.99	3				3
$8 to $9.99	3				3
$10 to $11.99	1				1
$12 to $13.99	4				4
$14 to $15.99	4	18	1		23
$16 to $17.99	4	63			67
$18 to $19.99	42	24	1		67
$20 to $21.99	53	25			78
$22 to $24.99	372				372
$25 to $29.99	401	2			403
$30 to $34.99	356				356
$35 to $39.99	105				105
$40 and over	48				48
Totals	1,415	133	2		1,550

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,464	116	1,580
February	1,313	109	1,422
March	1,193	93	1,286
April	1,266	97	1,363
May	1,282	84	1,366
June	1,282	86	1,368
July	1,179	91	1,270
August	1,304	101	1,405
September	1,479	105	1,584
October	1,421	121	1,542
November	1,375	130	1,505
December	1,355	114	1,469

TABLE NO. 38. FOOD PREPARATIONS.

(40 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	81	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	104	58
Clerks, stenographers, salesmen, etc., under 18 years of age	1	1
Totals	186	61
Wage earners:		
18 years of age and over	626	772
Under 18 years of age	5	18
Totals	631	790

Salary and wage payments—annual:	
Officers, superintendents and managers	$266,281
Clerks, stenographers, salesmen, etc.	245,380
Wage earners (including piece workers)	1,114,270
Total	$1,625,931

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	8	12		10	30
$5 to $5.99	29	15		2	46
$6 to $6.99	1	22			23
$7 to $7.99		26			26
$8 to $9.99		31			31
$10 to $11.99		58	1		59
$12 to $13.99	1	57	2	6	66
$14 to $15.99	2	96	1		99
$16 to $17.99	1	231	9		241
$18 to $19.99	89	85	4		178
$20 to $21.99	30	63			93
$22 to $24.99	60	58			118
$25 to $29.99	171	6			177
$30 to $34.99	98				98
$35 to $39.99	90				90
$40 and over	43				43
Totals	623	760	17	18	1,418

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	581	777	1,358
February	507	773	1,280
March	555	784	1,339
April	553	176	729
May	503	152	655
June	566	159	725
July	541	181	722
August	513	154	667
September	538	195	733
October	536	208	744
November	531	697	1,228
December	593	793	1,386

TABLE NO. 39. FOUNDRY AND MACHINE SHOP PRODUCTS.

(127 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	317	11
Clerks, stenographers, salesmen, etc., 18 years of age and over	550	165
Clerks, stenographers, salesmen, etc., under 18 years of age	5	2
Totals	872	178
Wage earners:		
18 years of age and over	3,646	48
Under 18 years of age	29	1
Totals	3,675	49

Salary and wage payments—annual:	
Officers, superintendents and managers	$1,354,857
Clerks, stenographers, salesmen, etc.	1,402,077
Wage earners (including piece workers)	7,235,975
Total	$9,992,909

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	18		2		20
$5 to $5.99	17	1			18
$6 to $6.99	27				27
$7 to $7.99	26				26
$8 to $9.99	6	3	3		12
$10 to $11.99	9	1	4		14
$12 to $13.99	24		5		29
$14 to $15.99	24		5		29
$16 to $17.99	55	23	5		83
$18 to $19.99	92	3	1		96
$20 to $21.99	166	4			170
$22 to $24.99	485	9			494
$25 to $29.99	589	1			590
$30 to $34.99	598				598
$35 to $39.99	761	1			762
$40 and over	585	1			586
Totals	3,482	47	25		3,554

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	4,061	20	4,081
February	3,830	19	3,849
March	3,785	27	3,812
April	3,796	31	3,827
May	3,712	37	3,749
June	3,502	41	3,543
July	3,462	41	3,503
August	3,300	41	3,341
September	3,156	35	3,191
October	3,209	21	3,230
November	3,355	22	3,377
December	3,475	18	3,493

TABLE NO. 40. FURNITURE, BANK AND STORE FIXTURES.

(44 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	44	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	138	55
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	183	57
Wage earners:		
18 years of age and over	1,687	139
Under 18 years of age	27	3
Totals	1,714	142

Salary and wage payments—annual:	
Officers, superintendents and managers	$360,846
Clerks, stenographers, salesmen, etc.	332,015
Wage earners (including piece workers)	2,515,438
Total	$3,208,299

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99	4				4
$8 to $9.99	1				1
$10 to $11.99	15		4		19
$12 to $13.99	35	4	2		41
$14 to $15.99	25	7	3		35
$16 to $17.99	42	47	6	2	97
$18 to $19.99	104	28			132
$20 to $21.99	91	21			112
$22 to $24.99	227	9			236
$25 to $29.99	195	16			211
$30 to $34.99	180	4			184
$35 to $39.99	312	3			315
$40 and over	384	2			386
Totals	1,615	141	15	2	1,773

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,281	92	1,373
February	1,271	120	1,391
March	1,371	124	1,495
April	1,403	138	1,541
May	1,357	125	1,482
June	1,323	134	1,457
July	1,391	136	1,527
August	1,445	132	1,577
September	1,645	138	1,783
October	1,729	147	1,876
November	1,718	148	1,866
December	1,708	140	1,848

TABLE NO. 41. GAS (IN CONTAINERS).

(11 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	17	
Clerks, stenographers, salesmen, etc., 18 years of age and over	42	25
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	59	25
Wage earners:		
18 years of age and over	119	
Under 18 years of age		
Totals	119	

Salary and wage payments—annual:	
Officers, superintendents and managers	$50,485
Clerks, stenographers, salesmen, etc	95,499
Wage earners (including piece workers)	205,454
Total	$351,438

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99					
$18 to $19.99	4				4
$20 to $21.99	7				7
$22 to $24.99	9				9
$25 to $29.99	15				15
$30 to $34.99	40				40
$35 to $39.99	31				31
$40 and over	9				9
Totals	115				115

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	152		152
February	134		134
March	136		136
April	131		131
May	133		133
June	129		129
July	126		126
August	121		121
September	120		120
October	113		113
November	114		114
December	109		109

TABLE NO. 42. GAS AND ELECTRIC FIXTURES.

(5 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	15	
Clerks, stenographers, salesmen, etc., 18 years of age and over	29	7
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	44	7
Wage earners:		
18 years of age and over	82	15
Under 18 years of age		
Totals	82	15

Salary and wage payments—annual:	
Officers, superintendents and managers	$108,562
Clerks, stenographers, salesmen, etc.	80,230
Wage earners (including piece workers)	145,190
Total	$333,982

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99		1			1
$12 to $13.99	4	2			6
$14 to $15.99	4	1			5
$16 to $17.99	3	4			7
$18 to $19.99	4	2			6
$20 to $21.99	8				8
$22 to $24.99	6				6
$25 to $29.99	7	4			11
$30 to $34.99	11				11
$35 to $39.99	20				20
$40 and over	15	1			16
Totals	82	15			97

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	100	16	116
February	100	15	115
March	93	14	107
April	89	15	104
May	85	15	100
June	77	16	93
July	75	15	90
August	74	14	88
September	72	14	86
October	73	14	87
November	78	15	93
December	82	15	97

TABLE NO. 43. GLASS, CUTTING AND ORNAMENTING (INCLUDING MIRRORS).

(10 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	10	
Clerks, stenographers, salesmen, etc., 18 years of age and over	105	22
Clerks, stenographers, salesmen, etc., under 18 years of age	6	1
Totals	121	23
Wage earners:		
18 years of age and over	771	49
Under 18 years of age	1	
Totals	772	49

Salary and wage payments—annual:	
Officers, superintendents and managers	$95,423
Clerks, stenographers, salesmen, etc	222,116
Wage earners (including piece workers)	1,656,402
Total	$1,973,941

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99			1		1
$10 to $11.99					
$12 to $13.99		1			1
$14 to $15.99					
$16 to $17.99	1	19			20
$18 to $19.99	6	10			16
$20 to $21.99	2	9			11
$22 to $24.99	176	10			186
$25 to $29.99	105	2			107
$30 to $34.99	215	1			216
$35 to $39.99	94		1		95
$40 and over	172				172
Totals	771	52	2		825

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	747	64	811
February	593	50	643
March	625	54	679
April	724	55	779
May	670	54	724
June	709	53	762
July	760	54	814
August	752	52	804
September	825	87	912
October	882	95	977
November	854	93	947
December	770	84	854

TABLE NO. 44. GLOVES, LEATHER.

(9 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	26	
Clerks, stenographers, salesmen, etc., 18 years of age and over	40	9
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	66	9
Wage earners:		
18 years of age and over	113	115
Under 18 years of age	4	
Totals	117	115

Salary and wage payments—annual:	
Officers, superintendents and managers	$79,214
Clerks, stenographers, salesmen, etc.	70,165
Wage earners (including piece workers)	173,150
Total	$322,529

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5		2			2
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	1	1			2
$12 to $13.99			1		1
$14 to $15.99	1	8	1		10
$16 to $17.99	2	34	1		37
$18 to $19.99	1	50	1		52
$20 to $21.99	13	6			19
$22 to $24.99	16	10			26
$25 to $29.99	50	4			54
$30 to $34.99	17				17
$35 to $39.99	7				7
$40 and over	5				5
Totals	113	115	4		232

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	85	88	173
February	86	88	174
March	91	96	187
April	92	102	194
May	99	96	195
June	102	98	200
July	94	76	170
August	98	98	196
September	105	87	192
October	116	92	208
November	107	99	206
December	104	91	195

TABLE NO. 45. GLUE AND TALLOW.

(3 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	5	
Clerks, stenographers, salesmen, etc., 18 years of age and over	6	4
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	11	4
Wage earners:		
18 years of age and over	75	5
Under 18 years of age		
Totals	75	5

Salary and wage payments—annual:	
Officers, superintendents and managers	$13,520
Clerks, stenographers, salesmen, etc	16,495
Wage earners (including piece workers)	91,075
Total	$121,090

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99	9				9
$6 to $6.99					
$7 to $7.99	3				3
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99	1	6			7
$18 to $19.99	27				27
$20 to $21.99	7				7
$22 to $24.99	2				2
$25 to $29.99	13				13
$30 to $34.99	5				5
$35 to $39.99	4				4
$40 and over	2				2
Totals	73	6			79

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	83	6	89
February	72	6	78
March	72	6	78
April	50		50
May	74	6	80
June	72	6	78
July	71	5	76
August	70	5	75
September	54		54
October	72	5	77
November	73	6	79
December	75	5	80

TABLE NO. 46. HATS AND CAPS, MEN'S.

(4 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	6	
Clerks, stenographers, salesmen, etc., 18 years of age and over	11	5
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	18	5
Wage earners:		
18 years of age and over	21	73
Under 18 years of age		
Totals	21	73

Salary and wage payments—annual:	
Officers, superintendents and managers	$13,970
Clerks, stenographers, salesmen, etc.	14,511
Wage earners (including piece workers)	113,965
Total	$142,446

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5		1			1
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99		2			2
$14 to $15.99	1	8			9
$16 to $17.99	2	15			17
$18 to $19.99		18			18
$20 to $21.99	1	10			11
$22 to $24.99		8			8
$25 to $29.99	5	4			9
$30 to $34.99	3	4			7
$35 to $39.99	5	3			8
$40 and over	10	2			12
Totals	27	75			102

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	20	63	83
February	21	82	103
March	23	96	119
April	22	97	119
May	21	70	91
June	21	65	86
July	19	62	81
August	19	91	110
September	27	91	118
October	25	97	122
November	27	73	100
December	27	75	102

TABLE NO. 47. ICE, MANUFACTURED.

(51 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	73	
Clerks, stenographers, salesmen, etc., 18 years of age and over	109	15
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	182	15
Wage earners:		
18 years of age and over	894	
Under 18 years of age		
Totals	894	

Salary and wage payments—annual:	
Officers, superintendents and managers	$206,114
Clerks, stenographers, salesmen, etc	188,979
Wage earners (including piece workers)	1,582,892
Total	$1,977,985

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99		1			1
$6 to $6.99	1				1
$7 to $7.99	3				3
$8 to $9.99	18				18
$10 to $11.99	7				7
$12 to $13.99	8				8
$14 to $15.99	4				4
$16 to $17.99	1				1
$18 to $19.99	5				5
$20 to $21.99	12				12
$22 to $24.99	42	1			43
$25 to $29.99	238		9		247
$30 to $34.99	349				349
$35 to $39.99	121				121
$40 and over	93				93
Totals	902	2	9		913

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	917	2	919
February	820	2	822
March	948	2	950
April	1,019	1	1,020
May	1,094	2	1,096
June	1,108	2	1,110
July	1,105	3	1,108
August	1,130	4	1,134
September	1,107	4	1,111
October	1,041	4	1,045
November	940	2	942
December	830	2	832

TABLE NO. 48. IRON AND STEEL FORGINGS, BOLTS AND NUTS.

(14 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	49	
Clerks, stenographers, salesmen, etc., 18 years of age and over	60	15
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	109	15
Wage earners:		
18 years of age and over	1,092	1
Under 18 years of age		
Totals	1,092	1

Salary and wage payments—annual:	
Officers, superintendents and managers	$330,203
Clerks, stenographers, salesmen, etc.	175,695
Wage earners (including piece workers)	1,691,779
Total	$2,197,677

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99			1		1
$12 to $13.99	30				30
$14 to $15.99	110				110
$16 to $17.99	99				99
$18 to $19.99	88				88
$20 to $21.99	67				67
$22 to $24.99	181				181
$25 to $29.99	143				143
$30 to $34.99	116				116
$35 to $39.99	146				146
$40 and over	110				110
Totals	1,090		1		1,091

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,213	1	1,214
February	1,190	1	1,191
March	1,138	1	1,139
April	1,115	1	1,116
May	1,065	1	1,066
June	1,085	1	1,086
July	1,082	1	1,083
August	961	1	962
September	932	1	933
October	921	1	922
November	952	1	953
December	1,093	1	1,094

TABLE NO. 49. IRON AND STEEL, STRUCTURAL AND ORNAMENTAL.

(28 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	125	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	293	108
Clerks, stenographers, salesmen, etc., under 18 years of age	5	1
Totals	423	110
Wage earners:		
18 years of age and over	2,852	23
Under 18 years of age	12	
Totals	2,864	23

Salary and wage payments—annual:	
Officers, superintendents and managers	$679,895
Clerks, stenographers, salesmen, etc	600,987
Wage earners (including piece workers)	4,367,427
Total	$5,648,309

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	6				6
$5 to $5.99	5				5
$6 to $6.99	6				6
$7 to $7.99	3				3
$8 to $9.99					
$10 to $11.99	1				1
$12 to $13.99	4		1		5
$14 to $15.99	93	15	3		111
$16 to $17.99	30	6	3		39
$18 to $19.99	64		2		66
$20 to $21.99	285		1		286
$22 to $24.99	459	1			460
$25 to $29.99	697				697
$30 to $34.99	478				478
$35 to $39.99	409				409
$40 and over	293				293
Totals	2,833	22	10		2,865

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	3,084	12	3,096
February	2,872	12	2,884
March	3,155	14	3,169
April	3,102	15	3,117
May	2,860	14	2,874
June	3,059	18	3,077
July	3,092	24	3,116
August	2,897	25	2,922
September	2,834	24	2,858
October	2,922	26	2,948
November	2,610	24	2,634
December	2,806	22	2,828

TABLE NO. 50. JEWELRY.

(16 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	18	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	64	16
Clerks, stenographers, salesmen, etc., under 18 years of age	1	1
Totals	83	19
Wage earners:		
18 years of age and over	295	49
Under 18 years of age	2	10
Totals	297	59

Salary and wage payments—annual:	
Officers, superintendents and managers	$134,042
Clerks, stenographers, salesmen, etc.	129,224
Wage earners (including piece workers)	598,408
Total	$861,674

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99	1				1
$6 to $6.99		1	1		2
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	8	2			10
$12 to $13.99	6	2		12	20
$14 to $15.99	4	2	1	1	8
$16 to $17.99	6	21		2	29
$18 to $19.99	11	5			16
$20 to $21.99	8	8			16
$22 to $24.99	10	3			13
$25 to $29.99	20	1			21
$30 to $34.99	31	1			32
$35 to $39.99	53	1			54
$40 and over	138				138
Totals	296	47	2	15	360

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	296	71	367
February	291	60	351
March	293	59	352
April	287	56	343
May	288	54	342
June	284	58	342
July	284	57	341
August	290	59	349
September	290	60	350
October	294	63	357
November	293	66	359
December	301	64	365

TABLE NO. 51. KNIT GOODS.

(7 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	17	
Clerks, stenographers, salesmen, etc., 18 years of age and over	31	25
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	49	25
Wage earners:		
18 years of age and over	61	416
Under 18 years of age	1	1
Totals	62	417

Salary and wage payments—annual:	
Officers, superintendents and managers	$80,556
Clerks, stenographers, salesmen, etc.	129,508
Wage earners (including piece workers)	362,688
Total	$572,752

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99		1			1
$8 to $9.99					
$10 to $11.99					
$12 to $13.99		55	1		56
$14 to $15.99	1	23			24
$16 to $17.99	4	164	1		169
$18 to $19.99	4	86			90
$20 to $21.99	7	46			53
$22 to $24.99	1	19			20
$25 to $29.99	7	13			20
$30 to $34.99	16	9			25
$35 to $39.99	10	1			11
$40 and over	11				11
Totals	61	417	2		480

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	45	170	215
February	54	270	324
March	56	307	363
April	62	363	425
May	60	393	453
June	61	394	455
July	59	346	405
August	60	329	389
September	59	358	417
October	62	361	423
November	63	367	430
December	61	418	479

TABLE NO. 52. LAUNDRIES (STEAM).

(107 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	199	31
Clerks, stenographers, salesmen, etc., 18 years of age and over	941	439
Clerks, stenographers, salesmen, etc., under 18 years of age	10	8
Totals	1,150	478
Wage earners:		
18 years of age and over	1,573	4,488
Under 18 years of age	12	28
Totals	1,585	4,516

Salary and wage payments—annual:	
Officers, superintendents and managers	$720,850
Clerks, stenographers, salesmen, etc.	2,209,673
Wage earners (including piece workers)	6,076,294
Total	$9,006,817

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	1	1			2
$5 to $5.99				1	1
$6 to $6.99		1			1
$7 to $7.99					
$8 to $9.99	1	9		1	11
$10 to $11.99		35	1		36
$12 to $13.99	2	89	11	8	110
$14 to $15.99	19	241	1	4	265
$16 to $17.99	58	2,383	3	15	2,459
$18 to $19.99	94	870	3		967
$20 to $21.99	138	467	1		606
$22 to $24.99	207	226			433
$25 to $29.99	523	217		2	742
$30 to $34.99	285	28			313
$35 to $39.99	184	12			196
$40 and over	165	3			168
Totals	1,677	4,582	20	31	6,310

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,753	4,876	6,629
February	1,739	4,815	6,554
March	1,756	4,784	6,540
April	1,751	4,761	6,512
May	1,729	4,681	6,410
June	1,763	4,635	6,398
July	1,778	4,717	6,495
August	1,740	4,679	6,419
September	1,759	4,671	6,430
October	1,765	4,622	6,387
November	1,754	4,565	6,319
December	1,758	4,777	6,535

TABLE NO. 53. LEATHER GOODS.

(10 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	15	
Clerks, stenographers, salesmen, etc., 18 years of age and over	69	19
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	84	19
Wage earners:		
18 years of age and over	117	34
Under 18 years of age		
Totals	117	34

Salary and wage payments—annual:	
Officers, superintendents and managers	$88,011
Clerks, stenographers, salesmen, etc	143,392
Wage earners (including piece workers)	206,078
Total	$437,481

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	2	2			4
$14 to $15.99	3				3
$16 to $17.99	6	22			28
$18 to $19.99	3	6			9
$20 to $21.99	7	3			10
$22 to $24.99	8	1			9
$25 to $29.99	17				17
$30 to $34.99	24				24
$35 to $39.99	33				33
$40 and over	16				16
Totals	119	34			153

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	110	43	153
February	101	41	142
March	108	43	151
April	111	55	166
May	110	50	160
June	105	49	154
July	105	45	150
August	102	31	133
September	102	28	130
October	104	28	132
November	113	28	141
December	117	34	151

TABLE NO. 55. LIQUORS, MALT

(13 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	29	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	34	5
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	63	7
Wage earners:		
18 years of age and over	200	
Under 18 years of age		
Totals	200	

Salary and wage payments—annual:	
Officers, superintendents and managers	$123,139
Clerks, stenographers, salesmen, etc.	83,893
Wage earners (including piece workers)	416,702
Total	$623,734

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99	3				3
$6 to $6.99	5				5
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99					
$18 to $19.99	1				1
$20 to $21.99					
$22 to $24.99	8				8
$25 to $29.99	6				6
$30 to $34.99	20				20
$35 to $39.99	105				105
$40 and over	55				55
Totals	203				203

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	171		171
February	195		195
March	188		188
April	220		220
May	228		228
June	252		252
July	295		295
August	274		274
September	232		232
October	217		217
November	195		195
December	179		179

TABLE NO. 56. LIQUORS, VINOUS.

(8 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	15	3
Clerks, stenographers, salesmen, etc., 18 years of age and over	17	3
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	32	6
Wage earners:		
18 years of age and over	354	3
Under 18 years of age		
Totals	354	3

Salary and wage payments—annual:	
Officers, superintendents and managers	$81,800
Clerks, stenographers, salesmen, etc.	24,170
Wage earners (including piece workers)	253,723
Total	$359,693

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99			2		2
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99	181				181
$18 to $19.99	54				54
$20 to $21.99	39				39
$22 to $24.99	48				48
$25 to $29.99	19		1		20
$30 to $34.99	12				12
$35 to $39.99	4				4
$40 and over					
Totals	357		3		360

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	262	3	265
February	285	3	288
March	247	3	250
April	244	3	247
May	232	3	235
June	226	3	229
July	176	3	179
August	197	3	200
September	238	3	241
October	347	3	350
November	294	3	297
December	279	3	282

TABLE NO. 57. LUMBER INDUSTRY—PLANING MILLS.

(47 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	72	
Clerks, stenographers, salesmen, etc., 18 years of age and over	203	49
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	275	49
Wage earners:		
18 years of age and over	3,483	23
Under 18 years of age	5	
Totals	3,488	23

Salary and wage payments—annual:	
Officers, superintendents and managers	$294,934
Clerks, stenographers, salesmen, etc.	414,461
Wage earners (including piece workers)	4,336,107
Total	$5,045,502

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	5				5
$5 to $5.99	6				6
$6 to $6.99	9				9
$7 to $7.99	2				2
$8 to $9.99	4		1		5
$10 to $11.99	1		1		2
$12 to $13.99	10	1	2		13
$14 to $15.99	51	1	1		53
$16 to $17.99	52	6	6		64
$18 to $19.99	281	7	1		289
$20 to $21.99	494	2			496
$22 to $24.99	539	2	5		546
$25 to $29.99	523		3		526
$30 to $34.99	424	1	6		431
$35 to $39.99	461				461
$40 and over	590		9		599
Totals	3,452	20	35		3,507

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	2,186	59	2,245
February	2,372	75	2,447
March	2,589	76	2,665
April	2,723	71	2,794
May	2,644	70	2,714
June	3,260	57	3,317
July	3,198	44	3,242
August	3,171	28	3,199
September	3,323	30	3,353
October	3,187	25	3,212
November	2,946	23	2,969
December	2,925	25	2,950

TABLE NO. 58. LUMBER INDUSTRY—SASH AND DOOR MILLS AND HOUSE FINISH.

(40 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	119	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	472	138
Clerks, stenographers, salesmen, etc., under 18 years of age	4	1
Totals	595	141
Wage earners:		
18 years of age and over	4,202	44
Under 18 years of age	45	1
Totals	4,247	45

Salary and wage payments—annual:	
Officers, superintendents and managers	$596,310
Clerks, stenographers, salesmen, etc	1,155,196
Wage earners (including piece workers)	5,113,097
Total	$6,864,603

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	8	18			26
$12 to $13.99	41	11	16	1	69
$14 to $15.99	30	3	5		38
$16 to $17.99	73	11			84
$18 to $19.99	159	2	3		164
$20 to $21.99	422	3			425
$22 to $24.99	692	2	3		697
$25 to $29.99	697	2	1		700
$30 to $34.99	613	1			614
$35 to $39.99	713				713
$40 and over	570				570
Totals	4,018	53	28	1	4,100

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	3,072	23	3,095
February	3,023	23	3,046
March	3,116	20	3,136
April	3,349	21	3,370
May	3,303	20	3,323
June	3,163	17	3,180
July	3,052	16	3,068
August	3,428	16	3,444
September	3,644	17	3,661
October	3,760	20	3,780
November	4,101	24	4,125
December	4,258	26	4,284

TABLE NO. 59. LUMBER INDUSTRY—SAWMILLS AND LOGGING OPERATIONS.

(25 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	123	
Clerks, stenographers, salesmen, etc., 18 years of age and over	340	66
Clerks, stenographers, salesmen, etc., under 18 years of age	3	3
Totals	466	69
Wage earners:		
18 years of age and over	8,170	70
Under 18 years of age	48	
Totals	8,218	75

Salary and wage payments—annual:	
Officers, superintendents and managers	$55,178
Clerks, stenographers, salesmen, etc.	165,428
Wage earners (including piece workers)	8,317,314
Total	$8,537,920

Weekly Earnings of Wage Earners

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	22				22
$12 to $13.99	20		15		35
$14 to $15.99	56	14	14	5	89
$16 to $17.99	276	13	2		291
$18 to $19.99	697	15			712
$20 to $21.99	1,161	16	2		1,179
$22 to $24.99	1,488	8	3		1,499
$25 to $29.99	1,619	7	4		1,630
$30 to $34.99	1,317	1			1,318
$35 to $39.99	832				832
$40 and over	684				684
Totals	8,172	74	40	5	8,291

Number of Wage Earners, by Months

Month	Males	Females	Total
January	5,308	134	5,442
February	5,387	134	5,521
March	5,762	139	5,906
April	7,165	155	7,320
May	8,819	170	8,989
June	9,054	162	9,216
July	8,643	148	8,791
August	8,780	153	8,933
September	8,453	145	8,598
October	7,856	141	7,997
November	7,619	124	7,743
December	6,936	91	7,027

TABLE NO. 60. LUMBER INDUSTRY—SHINGLE MILLS.

(3 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	9	
Clerks, stenographers, salesmen, etc., 18 years of age and over	8	3
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	17	3
Wage earners:		
18 years of age and over	270	2
Under 18 years of age	1	
Totals	271	2

Salary and wage payments—annual:	
Officers, superintendents and managers	$33,152
Clerks, stenographers, salesmen, etc.	21,040
Wage earners (including piece workers)	298,776
Total	$352,968

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99			1		1
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99		1			1
$16 to $17.99					
$18 to $19.99	3				3
$20 to $21.99	31	1			32
$22 to $24.99	64				64
$25 to $29.99	83				83
$30 to $34.99	57				57
$35 to $39.99	20				20
$40 and over	12				12
Totals	270	2	1		273

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	137		137
February	126		126
March	179	1	180
April	239	2	241
May	272	2	274
June	270	2	272
July	265	2	267
August	269	2	271
September	276	2	278
October	246	2	248
November	207	2	209
December	191	2	193

TABLE NO. 61. MARBLE AND STONE WORK.

(3 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	8	
Clerks, stenographers, salesmen, etc., 18 years of age and over	14	5
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	22	5
Wage earners:		
18 years of age and over	181	
Under 18 years of age	1	
Totals	182	

Salary and wage payments—annual:	
Officers, superintendents and managers	$68,000
Clerks, stenographers, salesmen, etc.	45,160
Wage earners (including piece workers)	206,960
Total	$320,120

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99			1		1
$14 to $15.99					
$16 to $17.99	2				2
$18 to $19.99	3				3
$20 to $21.99					
$22 to $24.99	13				13
$25 to $29.99	15				15
$30 to $34.99	78				78
$35 to $39.99	44				44
$40 and over	26				26
Totals	181		1		182

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	195		195
February	187		187
March	173		173
April	52		52
May	44		44
June	46		46
July	76		76
August	82		82
September	131		131
October	165		165
November	169		169
December	182		182

TABLE NO. 62. MATTRESSES, PILLOWS AND BEDDING.

(17 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	35	7
Clerks, stenographers, salesmen, etc., 18 years of age and over	71	27
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	106	34
Wage earners:		
18 years of age and over	463	116
Under 18 years of age	19	2
Totals	482	118

Salary and wage payments—annual:	
Officers, superintendents and managers	$170,302
Clerks, stenographers, salesmen, etc.	138,096
Wage earners (including piece workers)	677,837
Total	$986,235

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99		1			1
$10 to $11.99	4		1		5
$12 to $13.99	5	5	3		13
$14 to $15.99	9	13	6	2	30
$16 to $17.99	14	39	9		62
$18 to $19.99	53	19			72
$20 to $21.99	41	15			56
$22 to $24.99	60	15			75
$25 to $29.99	128	4	1		133
$30 to $34.99	46	2			48
$35 to $39.99	31	1			32
$40 and over	63	1			64
Totals	454	115	20	2	591

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	289	82	371
February	371	91	462
March	421	100	521
April	431	108	539
May	425	107	532
June	398	106	504
July	277	112	389
August	410	106	516
September	444	119	563
October	474	131	605
November	495	140	635
December	459	129	588

TABLE NO. 63. METAL SIGNS, STENCILS AND RUBBER STAMPS.

(6 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	11	
Clerks, stenographers, salesmen, etc., 18 years of age and over	39	14
Clerks, stenographers, salesmen, etc., under 18 years of age		1
Totals	50	15
Wage earners:		
18 years of age and over	88	33
Under 18 years of age		
Totals	88	33

Salary and wage payments—annual:	
Officers, superintendents and managers	$58,983
Clerks, stenographers, salesmen, etc.	68,354
Wage earners (including piece workers)	145,115
Total	$272,452

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99		3			3
$16 to $17.99	15	18			33
$18 to $19.99	5	5			10
$20 to $21.99	7	3			10
$22 to $24.99	3	2			5
$25 to $29.99	25				25
$30 to $34.99	11	1			12
$35 to $39.99	10	1			11
$40 and over	12				12
Totals	88	33			121

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	86	25	111
February	82	27	109
March	75	31	106
April	89	41	130
May	97	42	139
June	100	44	144
July	94	38	132
August	80	35	115
September	77	32	109
October	75	24	99
November	88	41	129
December	86	44	130

TABLE NO. 64. MILLINERY.

(8 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	11	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	25	11
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	37	13
Wage earners:		
18 years of age and over	14	177
Under 18 years of age	1	4
Totals	15	181

Salary and wage payments—annual:	
Officers, superintendents and managers	$48,726
Clerks, stenographers, salesmen, etc.	65,494
Wage earners (including piece workers)	219,160
Total	$333,380

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99			1		1
$6 to $6.99					
$7 to $7.99					
$8 to $9.99		1	1	3	5
$10 to $11.99		4			4
$12 to $13.99		6			6
$14 to $15.99	1	11		1	13
$16 to $17.99		23			23
$18 to $19.99		55			55
$20 to $21.99		39			39
$22 to $24.99		19			19
$25 to $29.99	4	17			21
$30 to $34.99	2	4			6
$35 to $39.99	1	6			7
$40 and over	6	4			10
Totals	14	189	2	4	209

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	18	245	263
February	19	254	273
March	20	260	280
April	20	262	282
May	18	205	223
June	13	185	198
July	13	179	192
August	11	230	241
September	14	215	229
October	14	215	229
November	13	188	201
December	13	171	184

TABLE NO. 65. OIL STOVES AND OIL BURNING EQUIPMENT.

(3 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	3	
Clerks, stenographers, salesmen, etc., 18 years of age and over	3	1
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	6	1
Wage earners:		
18 years of age and over	20	
Under 18 years of age	2	
Totals	22	

Salary and wage payments—annual:	
Officers, superintendents and managers	$9,204
Clerks, stenographers, salesmen, etc.	6,964
Wage earners (including piece workers)	34,353
Total	$50,521

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99			1		1
$12 to $13.99					
$14 to $15.99			1		1
$16 to $17.99	3				3
$18 to $19.99	1				1
$20 to $21.99					
$22 to $24.99					
$25 to $29.99					
$30 to $34.99	2				2
$35 to $39.99	9				9
$40 and over	5				5
Totals	20		2		22

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	27	1	28
February	25	1	26
March	26	1	27
April	25	1	26
May	22	1	23
June	22	1	23
July	23	1	24
August	21	1	22
September	18	1	19
October	18	1	19
November	20	1	21
December	20	1	21

TABLE NO. 66. OIL WELL TOOLS AND SUPPLIES.

(12 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	59	
Clerks, stenographers, salesmen, etc., 18 years of age and over	201	48
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	260	48
Wage earners:		
18 years of age and over	1,119	2
Under 18 years of age	2	
Totals	1,121	2

Salary and wage payments—annual:	
Officers, superintendents and managers	$290,047
Clerks, stenographers, salesmen, etc.	541,148
Wage earners (including piece workers)	1,991,201
Total	$2,822,396

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99			1		1
$10 to $11.99					
$12 to $13.99					
$14 to $15.99	2		2		4
$16 to $17.99	1				1
$18 to $19.99	3				3
$20 to $21.99	187		1		188
$22 to $24.99	144				144
$25 to $29.99	282				282
$30 to $34.99	189				189
$35 to $39.99	204				204
$40 and over	127				127
Totals	1,139		4		1,143

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,451		1,451
February	1,459		1,459
March	1,400		1,400
April	1,378		1,378
May	1,381		1,381
June	1,397		1,397
July	1,233		1,233
August	1,073		1,073
September	1,049		1,049
October	815		815
November	860		860
December	1,143		1,143

TABLE NO. 67. PACKING AND PROCESSING OF DRIED FRUITS.

(45 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	52	
Clerks, stenographers, salesmen, etc., 18 years of age and over	42	41
Clerks, stenographers, salesmen, etc., under 18 years of age		1
Totals	94	42
Wage earners:		
18 years of age and over	1,472	1,781
Under 18 years of age	16	134
Totals	1,488	1,915

Salary and wage payments—annual:	
Officers, superintendents and managers	$136,663
Clerks, stenographers, salesmen, etc.	111,917
Wage earners (including piece workers)	1,274,610
Total	$1,523,190

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	46	107		15	168
$5 to $5.99	8	15		4	27
$6 to $6.99	14	20		2	36
$7 to $7.99	3	30		4	37
$8 to $9.99	19	63		8	90
$10 to $11.99	15	120	2	16	153
$12 to $13.99	21	198	1	21	241
$14 to $15.99	28	226	10	18	282
$16 to $17.99	62	327	3	17	409
$18 to $19.99	309	180		9	498
$20 to $21.99	176	151		3	330
$22 to $24.99	189	136			325
$25 to $29.99	249	118		1	368
$30 to $34.99	200	55			255
$35 to $39.99	94	25			119
$40 and over	47	45			92
Totals	1,480	1,816	16	118	3,430

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	281	47	328
February	404	136	540
March	383	467	850
April	408	112	520
May	453	164	617
June	526	379	905
July	1,010	1,479	2,489
August	1,402	1,892	3,294
September	1,388	1,157	2,545
October	1,583	926	2,509
November	1,041	551	1,592
December	686	382	1,068

TABLE NO. 68. PAINTS AND VARNISHES.

(15 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	45	
Clerks, stenographers, salesmen, etc., 18 years of age and over	293	88
Clerks, stenographers, salesmen, etc., under 18 years of age	1	1
Totals	339	89
Wage earners:		
18 years of age and over	775	89
Under 18 years of age	9	5
Totals	784	94

Salary and wage payments—annual:	
Officers, superintendents and managers	$186,573
Clerks, stenographers, salesmen, etc	626,952
Wage earners (including piece workers)	1,158,935
Total	$1,972,460

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99		5			5
$10 to $11.99	1				1
$12 to $13.99		1	2	1	4
$14 to $15.99	1	17	1	2	21
$16 to $17.99	5	17	1		23
$18 to $19.99	9	32	3	2	46
$20 to $21.99	96	3			99
$22 to $24.99	144	4	2		150
$25 to $29.99	311	2			313
$30 to $34.99	136				136
$35 to $39.99	40				40
$40 and over	24				24
Totals	767	81	9	5	862

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	749	92	841
February	725	96	821
March	732	91	823
April	748	90	838
May	741	95	836
June	733	96	829
July	742	92	834
August	730	97	827
September	720	90	810
October	780	103	883
November	803	90	893
December	797	86	883

TABLE NO. 69. PAPER AND PAPER GOODS (NOT ELSEWHERE SPECIFIED).

(17 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	27	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	60	52
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	87	53
Wage earners:		
18 years of age and over	510	276
Under 18 years of age	6	7
Totals	516	283

Salary and wage payments—annual:	
Officers, superintendents and managers	$172,094
Clerks, stenographers, salesmen, etc.	199,932
Wage earners (including piece workers)	905,969
Total	$1,277,995

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	16	26	1		43
$5 to $5.99	1				1
$6 to $6.99					
$7 to $7.99	1				1
$8 to $9.99	1				1
$10 to $11.99		1			1
$12 to $13.99	2	7		3	12
$14 to $15.99	9	10		1	20
$16 to $17.99	8	146	1	3	158
$18 to $19.99	19	41	1		61
$20 to $21.99	65	15			80
$22 to $24.99	131	18	3		152
$25 to $29.99	94	7			101
$30 to $34.99	68	2			70
$35 to $39.99	54				54
$40 and over	39				39
Totals	508	273	6	7	794

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	558	280	838
February	554	260	814
March	535	265	800
April	540	246	786
May	468	236	704
June	573	239	812
July	581	108	689
August	575	258	833
September	511	260	771
October	533	282	815
November	646	277	923
December	512	282	794

TABLE NO. 70. PATENT MEDICINES, COMPOUNDS AND DRUGGISTS' PREPARATIONS.

(11 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	24	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	42	25
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	66	27
Wage earners:		
18 years of age and over	158	146
Under 18 years of age	2	
Totals	160	146

Salary and wage payments—annual:	
Officers, superintendents and managers	$89,590
Clerks, stenographers, salesmen, etc	102,924
Wage earners (including piece workers)	417,613
Total	$610,127

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	1				1
$12 to $13.99		3	1		4
$14 to $15.99		7			7
$16 to $17.99	14	53			67
$18 to $19.99	1	27	1		29
$20 to $21.99	5	21			26
$22 to $24.99	12	13			25
$25 to $29.99	71	7			78
$30 to $34.99	24	5			29
$35 to $39.99	13				13
$40 and over	19				19
Totals	160	136	2		298

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	195	160	355
February	221	151	372
March	195	150	345
April	241	150	391
May	198	143	341
June	187	148	335
July	165	146	311
August	156	139	295
September	154	139	293
October	168	137	305
November	164	130	294
December	159	147	306

TABLE NO. 71. PETROLEUM REFINING.

(24 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	574	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	5,110	445
Clerks, stenographers, salesmen, etc., under 18 years of age	14	
Totals	5,698	446
Wage earners:		
18 years of age and over	10,203	122
Under 18 years of age	7	
Totals	10,210	122

Salary and wage payments—annual:	
Officers, superintendents and managers	$3,282,985
Clerks, stenographers, salesmen, etc	10,946,186
Wage earners (including piece workers)	23,028,581
Total	$37,257,752

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99		2	2		4
$12 to $13.99	30				30
$14 to $15.99	21				21
$16 to $17.99	32	1			33
$18 to $19.99	177	9	1		187
$20 to $21.99	133	3	1		137
$22 to $24.99	473	10	3		486
$25 to $29.99	661	63			724
$30 to $34.99	1,800	21			1,821
$35 to $39.99	3,425	7			3,432
$40 and over	3,451	3			3,454
Totals	10,203	119	7		10,329

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	11,804	168	11,972
February	11,587	166	11,753
March	11,993	166	12,159
April	11,890	168	12,058
May	11,505	181	11,686
June	11,183	187	11,370
July	10,792	174	10,966
August	10,130	160	10,290
September	9,777	138	9,915
October	9,933	128	10,061
November	10,131	134	10,265
December	10,148	122	10,270

TABLE NO. 72. PHOTO-ENGRAVING, ELECTROTYPING AND STEREOTYPING.

(24 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	35	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	48	28
Clerks, stenographers, salesmen, etc., under 18 years of age	8	
Totals	91	30
Wage earners:		
18 years of age and over	353	59
Under 18 years of age	1	
Totals	354	59

Salary and wage payments—annual:	
Officers, superintendents and managers	$205,192
Clerks, stenographers, salesmen, etc	145,670
Wage earners (including piece workers)	815,932
Total	$1,166,794

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	2				2
$12 to $13.99		1			1
$14 to $15.99	10	3			13
$16 to $17.99	9	24		1	34
$18 to $19.99	28	9			37
$20 to $21.99	18	5			23
$22 to $24.99	22	4			26
$25 to $29.99	20	10			30
$30 to $34.99	30	3			33
$35 to $39.99	25	4			29
$40 and over	190				190
Totals	354	63		1	418

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	345	54	399
February	339	55	394
March	336	54	390
April	349	49	398
May	342	52	394
June	341	52	393
July	340	46	386
August	353	50	403
September	361	56	417
October	367	56	423
November	366	59	425
December	358	64	422

TABLE NO. 73. PRINTING AND PUBLISHING.

(187 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	426	16
Clerks, stenographers, salesmen, etc., 18 years of age and over	3,713	960
Clerks, stenographers, salesmen, etc., under 18 years of age	697	44
Totals	4,836	1,020
Wage earners:		
18 years of age and over	4,450	890
Under 18 years of age	203	26
Totals	4,653	916

Salary and wage payments—annual:	
Officers, superintendents and managers	$2,055,742
Clerks, stenographers, salesmen, etc.	5,680,752
Wage earners (including piece workers)	9,856,572
Total	$17,593,066

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	14	5	44	1	64
$5 to $5.99	1	2	2		5
$6 to $6.99	4		2		6
$7 to $7.99	6	1	5		12
$8 to $9.99	13	1	6		20
$10 to $11.99	18	3	17		38
$12 to $13.99	30	23	25	8	86
$14 to $15.99	71	42	21	6	140
$16 to $17.99	103	107	19	5	234
$18 to $19.99	132	175	7	2	316
$20 to $21.99	69	207	3	1	280
$22 to $24.99	240	139	2	3	384
$25 to $29.99	347	70	4	1	422
$30 to $34.99	350	45	5	2	402
$35 to $39.99	304	10	32		346
$40 and over	2,593	31	1		2,625
Totals	4,295	861	195	29	5,380

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	4,396	961	5,357
February	4,301	950	5,251
March	4,354	971	5,325
April	4,322	935	5,257
May	4,321	891	5,212
June	4,355	902	5,257
July	4,355	892	5,247
August	4,337	900	5,237
September	4,386	898	5,284
October	4,459	926	5,385
November	4,566	931	5,497
December	4,648	969	5,617

TABLE NO. 74. ROCK QUARRYING AND CRUSHING.

(7 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	11	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	20	
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	31	1
Wage earners:		
18 years of age and over	392	2
Under 18 years of age		
Totals	392	2

Salary and wage payments—annual:	
Officers, superintendents and managers	$34,275
Clerks, stenographers, salesmen, etc	48,709
Wage earners (including piece workers)	577,166
Total	$660,150

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99	1				1
$18 to $19.99	1				1
$20 to $21.99	3				3
$22 to $24.99	171	2			173
$25 to $29.99	70				70
$30 to $34.99	62				62
$35 to $39.99	23				23
$40 and over	61				61
Totals	392	2			394

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	331	2	333
February	348	2	350
March	357	2	359
April	350	2	352
May	345	2	347
June	349	2	351
July	387	2	389
August	393	2	395
September	367	2	369
October	404	2	406
November	395	3	398
December	389	2	391

TABLE NO. 75. ROOFING MATERIALS AND BUILDING PAPER.

(3 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	2	
Clerks, stenographers, salesmen, etc., 18 years of age and over	19	6
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	22	6
Wage earners:		
18 years of age and over	219	14
Under 18 years of age	1	
Totals	220	14

Salary and wage payments—annual:	
Officers, superintendents and managers	$4,620
Clerks, stenographers, salesmen, etc.	24,978
Wage earners (including piece workers)	1,449,504
Total	$1,479,102

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99	4				4
$10 to $11.99	1				1
$12 to $13.99	9				9
$14 to $15.99	1				1
$16 to $17.99	2	12			14
$18 to $19.99	2	2	1		5
$20 to $21.99	37				37
$22 to $24.99	82				82
$25 to $29.99	45				45
$30 to $34.99	15				15
$35 to $39.99	2				2
$40 and over	5				5
Totals	205	14	1		220

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	140	16	156
February	93	12	105
March	121	16	137
April	141	15	156
May	121	11	132
June	128	10	138
July	122	12	134
August	127	12	139
September	164	16	180
October	234	23	257
November	241	24	265
December	220	14	234

TABLE NO. 76. RUBBER GOODS—MECHANICAL AND RUBBER SPECIALTIES.

(8 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	39	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	174	59
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	213	60
Wage earners:		
18 years of age and over	465	48
Under 18 years of age		
Totals	465	48

Salary and wage payments—annual:	
Officers, superintendents and managers	$133,337
Clerks, stenographers, salesmen, etc	373,902
Wage earners (including piece workers)	512,281
Total	$1,019,520

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	2	8			10
$14 to $15.99		4		1	5
$16 to $17.99	96	30			126
$18 to $19.99	70	3			73
$20 to $21.99	60	2			62
$22 to $24.99	45	1			46
$25 to $29.99	69				69
$30 to $34.99	88				88
$35 to $39.99	27				27
$40 and over	8				8
Totals	465	48		1	514

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	306	39	345
February	329	40	369
March	332	37	369
April	370	41	411
May	427	46	473
June	432	45	477
July	438	43	481
August	387	43	430
September	375	36	411
October	270	28	298
November	304	35	339
December	311	37	348

TABLE NO. 77. SALT.

(10 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	25	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	17	5
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	42	6
Wage earners:		
18 years of age and over	324	30
Under 18 years of age	1	5
Totals	325	35

Salary and wage payments—annual:	
Officers, superintendents and managers	$84,020
Clerks, stenographers, salesmen, etc.	34,240
Wage earners (including piece workers)	392,574
Total	$510,834

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	7	11		2	20
$14 to $15.99		2	1	2	5
$16 to $17.99	6	15			21
$18 to $19.99	39	1			40
$20 to $21.99	109				109
$22 to $24.99	63	1			64
$25 to $29.99	10				10
$30 to $34.99	17				17
$35 to $39.99	12				12
$40 and over	40				40
Totals	303	30	1	4	338

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	246	24	270
February	237	24	261
March	231	26	257
April	232	29	261
May	218	30	248
June	222	29	251
July	235	28	263
August	280	27	307
September	311	30	341
October	311	36	347
November	314	36	350
December	310	35	345

TABLE NO. 78. SHEET METAL PRODUCTS (NOT INCLUDING TIN CANS).

(48 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	95	5
Clerks, stenographers, salesmen, etc., 18 years of age and over	190	53
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	285	58
Wage earners:		
18 years of age and over	1,495	15
Under 18 years of age	13	
Totals	1,508	15

Salary and wage payments—annual:	
Officers, superintendents and managers	$469,878
Clerks, stenographers, salesmen, etc	656,165
Wage earners (including piece workers)	2,244,483
Total	$3,370,526

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	16				16
$5 to $5.99	18				18
$6 to $6.99	14				14
$7 to $7.99	7				7
$8 to $9.99					
$10 to $11.99	4		6		10
$12 to $13.99	8		4		12
$14 to $15.99	13	2	1		16
$16 to $17.99	11	9	4		24
$18 to $19.99	40	2			42
$20 to $21.99	120				120
$22 to $24.99	271				271
$25 to $29.99	263				263
$30 to $34.99	236				236
$35 to $39.99	178				178
$40 and over	319				319
Totals	1,518	13	15		1,546

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,431	12	1,443
February	1,421	9	1,430
March	1,509	14	1,523
April	1,532	20	1,552
May	1,616	15	1,631
June	1,468	15	1,483
July	1,431	14	1,445
August	1,413	10	1,423
September	1,456	11	1,467
October	1,428	14	1,442
November	1,473	14	1,487
December	1,555	12	1,567

TABLE NO. 79. SHIP BUILDING (INCLUDING BOAT BUILDING).

(15 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	112	
Clerks, stenographers, salesmen, etc., 18 years of age and over	454	174
Clerks, stenographers, salesmen, etc., under 18 years of age	7	
Totals	573	174
Wage earners:		
18 years of age and over	5,477	2
Under 18 years of age	38	
Totals	5,515	2

Salary and wage payments—annual:	
Officers, superintendents and managers	$746,342
Clerks, stenographers, salesmen, etc.	1,849,964
Wage earners (including piece workers)	12,882,468
Total	$15,478,774

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	25				25
$5 to $5.99	82				82
$6 to $6.99	17				17
$7 to $7.99	11				11
$8 to $9.99	22				22
$10 to $11.99	107		27		134
$12 to $13.99	50		8		58
$14 to $15.99	80				80
$16 to $17.99	182	1			183
$18 to $19.99	258				258
$20 to $21.99	645				645
$22 to $24.99	441				441
$25 to $29.99	1,324				1,324
$30 to $34.99	1,262	1			1,263
$35 to $39.99	796				796
$40 and over	396				396
Totals	5,698	2	35		5,735

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	26,037	8	26,045
February	26,235	8	26,243
March	25,175	7	25,182
April	22,830	6	22,836
May	19,644	4	19,648
June	14,786	3	14,789
July	10,492	2	10,494
August	9,105	2	9,107
September	8,117	2	8,119
October	5,845	2	5,847
November	4,078	2	4,080
December	3,909	2	3,911

TABLE NO. 80. SLAUGHTERING AND MEAT PACKING.

(34 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	104	3
Clerks, stenographers, salesmen, etc., 18 years of age and over	635	106
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	739	109
Wage earners:		
18 years of age and over	2,548	169
Under 18 years of age		
Totals	2,548	169

Salary and wage payments—annual:	
Officers, superintendents and managers	$615,185
Clerks, stenographers, salesmen, etc	1,443,498
Wage earners (including piece workers)	3,238,708
Total	$5,297,391

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	21	1			22
$5 to $5.99	14	1			15
$6 to $6.99	13				13
$7 to $7.99	13				13
$8 to $9.99	2				2
$10 to $11.99	2				2
$12 to $13.99	11	23			34
$14 to $15.99	69	37	1		107
$16 to $17.99	256	98			354
$18 to $19.99	284	10			294
$20 to $21.99	289	4			293
$22 to $24.99	312	2			314
$25 to $29.99	452	1			453
$30 to $34.99	359				359
$35 to $39.99	160				160
$40 and over	258				258
Totals	2,515	177	1		2,693

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	2,298	142	2,440
February	2,415	162	2,577
March	2,284	161	2,445
April	2,260	164	2,424
May	2,157	150	2,307
June	2,180	170	2,350
July	2,174	184	2,358
August	2,169	195	2,364
September	2,265	163	2,428
October	2,273	156	2,429
November	2,427	163	2,590
December	2,478	180	2,658

TABLE NO. 81. SMELTING AND REFINING.

(6 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	21	7
Clerks, stenographers, salesmen, etc., 18 years of age and over	63	5
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	85	12
Wage earners:		
18 years of age and over	415	1
Under 18 years of age	2	
Totals	417	1

Salary and wage payments—annual:	
Officers, superintendents and managers	$95,642
Clerks, stenographers, salesmen, etc	137,565
Wage earners (including piece workers)	614,171
Total	$847,378

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99			1		1
$14 to $15.99		1			1
$16 to $17.99					
$18 to $19.99	20				20
$20 to $21.99	13				13
$22 to $24.99	13				13
$25 to $29.99	55	1			56
$30 to $34.99	298	1			299
$35 to $39.99	12				12
$40 and over	6				6
Totals	417	3	1		421

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	420		420
February	399		399
March	464		464
April	450		450
May	446		446
June	413		413
July	352		352
August	418		418
September	418		418
October	430		430
November	438		438
December	408		408

TABLE NO. 82. SOAP, WASHING POWDER, ETC.

(10 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	22	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	94	43
Clerks, stenographers, salesmen, etc., under 18 years of age	6	
Totals	122	44
Wage earners:		
18 years of age and over	244	68
Under 18 years of age		4
Totals	244	72

Salary and wage payments—annual:	
Officers, superintendents and managers	$68,863
Clerks, stenographers, salesmen, etc.	203,644
Wage earners (including piece workers)	319,225
Total	$591,732

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age.		Total
	Males	Females	Males	Females	
Under $5	1	4			5
$5 to $5.99	10				10
$6 to $6.99	1	1			2
$7 to $7.99	1				1
$8 to $9.99					
$10 to $11.99		8	1		9
$12 to $13.99		6	1		7
$14 to $15.99	1	36	2		39
$16 to $17.99	29	8			37
$18 to $19.99	37	4			41
$20 to $21.99	63				63
$22 to $24.99	28	1			29
$25 to $29.99	41				41
$30 to $34.99	13				13
$35 to $39.99	14				14
$40 and over	5				5
Totals	244	68	4		316

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	237	73	310
February	224	75	299
March	241	101	342
April	229	88	317
May	225	71	296
June	228	69	297
July	227	61	288
August	228	59	287
September	227	61	288
October	232	69	301
November	226	62	288
December	211	48	259

TABLE NO. 83. STOVES AND FURNACES (NOT INCLUDING OIL STOVES).

(8 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	16	
Clerks, stenographers, salesmen, etc., 18 years of age and over	34	9
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	50	9
Wage earners:		
18 years of age and over	256	
Under 18 years of age	1	
Totals	257	

Salary and wage payments—annual:	
Officers, superintendents and managers	$69,812
Clerks, stenographers, salesmen, etc.	87,128
Wage earners (including piece workers)	434,355
Total	$591,295

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	3				3
$5 to $5.99	15				15
$6 to $6.99	15				15
$7 to $7.99	3				3
$8 to $9.99	8				8
$10 to $11.99	2				2
$12 to $13.99	2				2
$14 to $15.99					
$16 to $17.99	4				4
$18 to $19.99	7		1		8
$20 to $21.99	1				1
$22 to $24.99	18				18
$25 to $29.99	31				31
$30 to $34.99	30				30
$35 to $39.99	53				53
$40 and over	64				64
Totals	256		1		257

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	202		202
February	192		192
March	199		199
April	207		207
May	193		193
June	178		178
July	176		176
August	178		178
September	206		206
October	230		230
November	221		221
December	227		227

TABLE NO. 84. SUGAR REFINING.

(12 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	132	
Clerks, stenographers, salesmen, etc., 18 years of age and over	406	147
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	538	147
Wage earners:		
18 years of age and over	5,082	209
Under 18 years of age	4	4
Totals	5,086	213

Salary and wage payments—annual:	
Officers, superintendents and managers	$751,471
Clerks, stenographers, salesmen, etc.	764,547
Wage earners (including piece workers)	5,045,114
Total	6,561,132

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	2		5	4	11
$14 to $15.99	14		4		18
$16 to $17.99	8	4	69		81
$18 to $19.99	13	42	21		76
$20 to $21.99	293	61	1		355
$22 to $24.99	888	4	4		896
$25 to $29.99	1,688		1		1,689
$30 to $34.99	1,015				1,015
$35 to $39.99	582	1			583
$40 and over	383				383
Totals	4,886	112	105	4	5,107

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	2,822	163	2,985
February	2,454	153	2,607
March	2,430	203	2,633
April	2,673	232	2,905
May	2,459	184	2,643
June	2,330	198	2,528
July	2,631	193	2,824
August	4,467	200	4,667
September	4,588	203	4,791
October	4,971	217	5,188
November	3,451	216	3,667
December	1,893	129	2,022

TABLE NO. 85. TANNING.

(18 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	61	4
Clerks, stenographers, salesmen, etc., 18 years of age and over	52	23
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	113	27
Wage earners:		
18 years of age and over	1,113	34
Under 18 years of age	5	2
Totals	1,118	36

Salary and wage payments—annual:	
Officers, superintendents and managers	$274,145
Clerks, stenographers, salesmen, etc.	131,949
Wage earners (including piece workers)	1,299,349
Total	$1,705,443

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	45	1		1	47
$5 to $5.99	26				26
$6 to $6.99	4				4
$7 to $7.99	1				1
$8 to $9.99	1				1
$10 to $11.99	2				2
$12 to $13.99	2		1		3
$14 to $15.99	8	1			9
$16 to $17.99	8	2	3		13
$18 to $19.99	52	29		1	82
$20 to $21.99	79				79
$22 to $24.99	379		1		380
$25 to $29.99	267				267
$30 to $34.99	166				166
$35 to $39.99	36				36
$40 and over	36				36
Totals	1,112	33	5	2	1,152

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	750	5	755
February	821	5	826
March	832	12	844
April	847	17	864
May	878	15	893
June	931	15	946
July	982	16	998
August	1,018	17	1,035
September	1,028	30	1,058
October	1,063	33	1,096
November	1,078	36	1,114
December	1,117	37	1,154

TABLE NO. 86. TOBACCO MANUFACTURERS.

(16 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	24	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	156	20
Clerks, stenographers, salesmen, etc., under 18 years of age		2
Totals	180	23
Wage earners:		
18 years of age and over	523	762
Under 18 years of age	2	11
Totals	526	773

Salary and wage payments—annual:	
Officers, superintendents and managers	$120,166
Clerks, stenographers, salesmen, etc.	311,644
Wage earners (including piece workers)	1,031,104
Total	$1,462,914

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5		1			1
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	16		1		17
$12 to $13.99	9	83		1	93
$14 to $15.99	35	63	1	5	104
$16 to $17.99	83	376	1	5	465
$18 to $19.99	66	100		1	167
$20 to $21.99	81	57			138
$22 to $24.99	45	46			91
$25 to $29.99	97	31			128
$30 to $34.99	37	4			41
$35 to $39.99	24				24
$40 and over	29				29
Totals	522	761	3	12	1,298

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	512	618	1,130
February	491	602	1,093
March	511	589	1,100
April	503	638	1,141
May	510	581	1,091
June	521	603	1,124
July	526	572	1,098
August	494	609	1,103
September	473	589	1,062
October	466	698	1,164
November	493	777	1,270
December	517	774	1,291

TABLE NO. 87. TRUNKS, VALISES, ETC.

(10 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	14	
Clerks, stenographers, salesmen, etc., 18 years of age and over	19	4
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	33	4
Wage earners:		
18 years of age and over	153	18
Under 18 years of age		
Totals	153	18

Salary and wage payments—annual:	
Officers, superintendents and managers	$48,736
Clerks, stenographers, salesmen, etc.	37,198
Wage earners (including piece workers)	230,649
Total	$316,583

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	1				1
$14 to $15.99	1				1
$16 to $17.99	6	3			9
$18 to $19.99	15	9			24
$20 to $21.99	11	1			12
$22 to $24.99	13	5			18
$25 to $29.99	31				31
$30 to $34.99	29				29
$35 to $39.99	32				32
$40 and over	14				14
Totals	153	18			171

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	177	27	204
February	171	30	201
March	176	29	205
April	191	32	223
May	185	31	216
June	196	32	228
July	183	31	214
August	181	32	213
September	184	32	216
October	179	30	209
November	162	23	185
December	154	19	173

TABLE NO. 89. WIRE WORK (INCLUDING WIRE ROPE, NETTING, ETC.).

(12 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	23	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	58	15
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	82	16
Wage earners:		
18 years of age and over	412	3
Under 18 years of age	14	
Totals	426	3

Salary and wage payments—annual:	
Officers, superintendents and managers	$103,098
Clerks, stenographers, salesmen, etc	120,507
Wage earners (including piece workers)	533,376
Total	$756,981

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	2	1			3
$12 to $13.99		2			2
$14 to $15.99	2	1	2		5
$16 to $17.99	22		9		31
$18 to $19.99	45		1		46
$20 to $21.99	41				41
$22 to $24.99	95				95
$25 to $29.99	83				83
$30 to $34.99	40				40
$35 to $39.99	32				32
$40 and over	50				50
Totals	412	4	12		428

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	399	10	409
February	382	7	389
March	396	9	405
April	394	9	403
May	390	10	400
June	354	10	364
July	345	12	357
August	334	9	343
September	353	3	356
October	369	1	370
November	391	8	399
December	418	9	427

TABLE NO. 90. ALL OTHER INDUSTRIES.

(154 establishments reporting.)

The State.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	376	11
Clerks, stenographers, salesmen, etc., 18 years of age and over	943	343
Clerks, stenographers, salesmen, etc., under 18 years of age	7	1
Totals	1,326	355
Wage earners:		
18 years of age and over	4,953	1,729
Under 18 years of age	61	69
Totals	5,014	1,798

Salary and wage payments—annual:	
Officers, superintendents and managers	$1,663,889
Clerks, stenographers, salesmen, etc.	1,788,329
Wage earners (including piece workers)	8,656,072
Total	$12,108,290

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	16	15	1		32
$5 to $5.99	56	9		10	75
$6 to $6.99	50	1	2		53
$7 to $7.99	26	5	2		33
$8 to $9.99	45	7			52
$10 to $11.99	21	30	3	4	58
$12 to $13.99	32	83	17	32	164
$14 to $15.99	76	374	14	8	472
$16 to $17.99	133	744	8	12	897
$18 to $19.99	239	249	3	2	493
$20 to $21.99	364	151	4		519
$22 to $24.99	934	114		2	1,050
$25 to $29.99	1,259	73	15		1,347
$30 to $34.99	717	224	3		944
$35 to $39.99	557	14			571
$40 and over	697	7			704
Totals	5,222	2,100	72	70	7,464

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	5,008	1,819	6,827
February	5,118	2,066	7,184
March	5,188	1,940	7,128
April	4,728	1,766	6,494
May	4,830	1,808	6,638
June	4,981	1,887	6,868
July	4,942	1,824	6,766
August	4,986	1,940	6,926
September	4,187	1,827	6,014
October	5,253	1,863	7,116
November	5,184	1,764	6,948
December	5,085	1,708	6,793

TABLE NO. 1. ALL INDUSTRIES.

(764 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	1,730	128
Clerks, stenographers, salesmen, etc., 18 years of age and over	4,988	1,799
Clerks, stenographers, salesmen, etc., under 18 years of age	252	45
Totals	6,970	1,972
Wage earners:		
18 years of age and over	22,440	8,922
Under 18 years of age	221	150
Totals	22,661	9,072

Salary and wage payments—annual:	
Officers, superintendents and managers	$7,562,154
Clerks, stenographers, salesmen, etc.	11,778,598
Wage earners (including piece workers)	43,902,844
Total	$63,243,596

Weekly Wage Rates of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	182	88	10	3	283
$5 to $5.99	252	22	3	11	288
$6 to $6.99	161	17	2	1	181
$7 to $7.99	120	35	3		158
$8 to $9.99	84	69	2	3	158
$10 to $11.99	84	89	30	5	208
$12 to $13.99	165	518	52	47	782
$14 to $15.99	440	637	105	24	1,206
$16 to $17.99	748	3,483	62	68	4,361
$18 to $19.99	1,125	1,438	9	14	2,586
$20 to $21.99	1,485	919	6	4	2,414
$22 to $24.99	2,709	740	8	5	3,462
$25 to $29.99	4,058	598	6	3	4,665
$30 to $34.99	3,810	255	5	2	4,072
$35 to $39.99	2,778	76	33		2,887
$40 and over	4,450	72	1		4,523
Totals	22,651	9,056	337	190	32,234

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	28,179	7,342	35,521
February	27,133	7,500	34,633
March	27,369	7,803	35,172
April	25,899	8,159	34,058
May	23,516	7,854	31,370
June	21,182	7,970	29,152
July	20,487	7,999	28,486
August	20,887	8,800	29,687
September	22,029	8,713	30,742
October	22,553	8,935	31,488
November	22,386	8,623	31,009
December	21,829	8,552	30,381

TABLE NO. 4. AUTOMOBILES (INCLUDING BODIES AND PARTS).

(27 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	95	7
Clerks, stenographers, salesmen, etc., 18 years of age and over	113	42
Clerks, stenographers, salesmen, etc., under 18 years of age	18	8
Totals	226	57
Wage earners:		
18 years of age and over	758	10
Under 18 years of age	38	
Totals	796	10

Salary and wage payments—annual:	
Officers, superintendents and managers	$249,220
Clerks, stenographers, salesmen, etc.	304,778
Wage earners (including piece workers)	1,307,031
Total	$1,861,029

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	11		4		15
$5 to $5.99	10		2		12
$6 to $6.99	16				16
$7 to $7.99	16				16
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	1		1		2
$14 to $15.99			2		2
$16 to $17.99	1	1	1		3
$18 to $19.99	6	1			7
$20 to $21.99	8		1		9
$22 to $24.99	20	3			23
$25 to $29.99	36	4			40
$30 to $34.99	61	2			63
$35 to $39.99	230				230
$40 and over	285	2			287
Totals	701	13	11		725

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	735	17	752
February	749	18	767
March	752	16	768
April	726	16	742
May	753	15	768
June	748	15	763
July	726	14	740
August	727	13	740
September	729	13	742
October	730	13	743
November	732	12	744
December	716	12	728

TABLE NO. 5. AWNINGS, TENTS AND SAILS.

(4 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	5	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	3	1
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	8	2
Wage earners:		
18 years of age and over	23	28
Under 18 years of age		
Totals	23	28

Salary and wage payments—annual:	
Officers, superintendents and managers	$16,000
Clerks, stenographers, salesmen, etc	9,530
Wage earners (including piece workers)	75,640
Total	$101,170

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99	4				4
$10 to $11.99					
$12 to $13.99					
$14 to $15.99		5			5
$16 to $17.99		10			10
$18 to $19.99		8			8
$20 to $21.99	2	1			3
$22 to $24.99	2	3			5
$25 to $29.99	5	1			6
$30 to $34.99	5	1			6
$35 to $39.99	1				1
$40 and over	6				6
Totals	25	29			54

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	31	15	46
February	27	21	48
March	25	25	50
April	29	25	54
May	26	35	61
June	34	37	71
July	31	45	76
August	26	27	53
September	28	20	48
October	27	24	51
November	27	21	48
December	24	20	44

TABLE NO. 7. BAGS, OTHER THAN PAPER.

(4 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	14	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	40	20
Clerks, stenographers, salesmen, etc., under 18 years of age	2	
Totals	56	21
Wage earners:		
18 years of age and over	144	192
Under 18 years of age	2	10
Totals	146	202

Salary and wage payments—annual:	
Officers, superintendents and managers	$94,738
Clerks, stenographers, salesmen, etc	114,250
Wage earners (including piece workers)	429,191
Total	$638,179

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99				1	1
$12 to $13.99		7		5	12
$14 to $15.99	5	12		1	18
$16 to $17.99	10	88	1	3	102
$18 to $19.99		32			32
$20 to $21.99	5	19			24
$22 to $24.99	17	29	1		47
$25 to $29.99	25	3			28
$30 to $34.99	29	1			30
$35 to $39.99	35	1			36
$40 and over	18				18
Totals	144	192	2	10	348

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	156	205	361
February	181	243	424
March	164	226	390
April	162	222	384
May	165	251	416
June	170	230	400
July	166	228	394
August	169	259	428
September	166	236	402
October	157	227	384
November	147	202	349
December	136	165	301

TABLE NO. 8. BAKERY PRODUCTS.

(34 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	68	3
Clerks, stenographers, salesmen, etc., 18 years of age and over	326	88
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	394	91
Wage earners:		
18 years of age and over	734	412
Under 18 years of age	2	20
Totals	736	432

Salary and wage payments—annual:	
Officers, superintendents and managers	$276,659
Clerks, stenographers, salesmen, etc.	879,147
Wage earners (including piece workers)	1,664,605
Total	$2,820,411

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	2	6			8
$5 to $5.99	1				1
$6 to $6.99	14				14
$7 to $7.99	4				4
$8 to $9.99	2	3			5
$10 to $11.99	2				2
$12 to $13.99	1	21		1	23
$14 to $15.99	11	43		1	55
$16 to $17.99	1	214		12	227
$18 to $19.99	20	105	1	6	132
$20 to $21.99	31	13			44
$22 to $24.99	39	6			45
$25 to $29.99	69	1			70
$30 to $34.99	137	9			146
$35 to $39.99	113				113
$40 and over	301				301
Totals	748	421	1	20	1,190

Number of Wage Earners, by Months

Month	Males	Females	Total
January	752	451	1,203
February	758	460	1,218
March	771	464	1,235
April	774	467	1,241
May	773	456	1,229
June	768	453	1,221
July	769	449	1,218
August	762	447	1,209
September	756	453	1,209
October	744	455	1,199
November	745	448	1,193
December	755	557	1,312

TABLE NO. 9. BAKING POWDER AND YEAST.

(3 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	5	
Clerks, stenographers, salesmen, etc., 18 years of age and over	29	8
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	34	8
Wage earners:		
18 years of age and over	96	3
Under 18 years of age		
Totals	96	3

Salary and wage payments—annual:	
Officers, superintendents and managers	$38,750
Clerks, stenographers, salesmen, etc.	84,914
Wage earners (including piece workers)	204,019
Total	$327,683

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99		1			1
$18 to $19.99		2			2
$20 to $21.99					
$22 to $24.99					
$25 to $29.99					
$30 to $34.99	18				18
$35 to $39.99	63				63
$40 and over	15				15
Totals	96	3			99

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	119	3	122
February	126	3	129
March	121	3	124
April	113	3	116
May	115	3	118
June	118	3	121
July	120	3	123
August	98	3	101
September	95	3	98
October	97	3	100
November	94	3	97
December	96	3	99

TABLE NO. 11. BOILERS AND TANKS.

(7 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	21	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	29	4
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	50	5
Wage earners:		
18 years of age and over	114	
Under 18 years of age		
Totals	114	

Salary and wage payments—annual:	
Officers, superintendents and managers	$104,570
Clerks, stenographers, salesmen, etc	21,115
Wage earners (including piece workers)	357,153
Total	$482,838

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	1				1
$12 to $13.99					
$14 to $15.99	1				1
$16 to $17.99	2				2
$18 to $19.99	2				2
$20 to $21.99	6				6
$22 to $24.99	28				28
$25 to $29.99	24				24
$30 to $34.99	26				26
$35 to $39.99	29				29
$40 and over	18				18
Totals	137				137

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	213		213
February	230		230
March	142		142
April	167		167
May	170		170
June	191		191
July	148		148
August	120		120
September	155		155
October	166		166
November	175		175
December	266		266

TABLE NO. 13. BOXES, BAGS, CARTONS, ETC., PAPER.

(8 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	24	
Clerks, stenographers, salesmen, etc., 18 years of age and over	30	14
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	55	14
Wage earners:		
18 years of age and over	161	196
Under 18 years of age	4	8
Totals	165	204

Salary and wage payments—annual:	
Officers, superintendents and managers	$117,508
Clerks, stenographers, salesmen, etc.	66,781
Wage earners (including piece workers)	340,796
Total	$525,085

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	14	28			42
$5 to $5.99	5				5
$6 to $6.99	2				2
$7 to $7.99	2				2
$8 to $9.99					
$10 to $11.99		1			1
$12 to $13.99		20	1		21
$14 to $15.99	3	20		3	26
$16 to $17.99	1	76	1	3	81
$18 to $19.99	11	43		3	57
$20 to $21.99	11	13			24
$22 to $24.99	22	3	1		26
$25 to $29.99	23				23
$30 to $34.99	19	1			20
$35 to $39.99	17				17
$40 and over	20				20
Totals	150	205	3	9	367

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	105	186	291
February	108	184	292
March	107	170	277
April	112	178	290
May	118	190	308
June	114	170	284
July	111	162	273
August	124	177	301
September	125	184	309
October	138	187	325
November	147	211	358
December	153	213	366

TABLE NO. 14. BOXES, WOOD.

(7 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	17	
Clerks, stenographers, salesmen, etc., 18 years of age and over	17	8
Clerks, stenographers, salesmen, etc., under 18 years of age		1
Totals	34	9
Wage earners:		
18 years of age and over	329	28
Under 18 years of age		
Totals	329	28

Salary and wage payments—annual:	
Officers, superintendents and managers	$70,080
Clerks, stenographers, salesmen, etc	41,263
Wage earners (including piece workers)	342,868
Total	$454,211

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99		1			1
$7 to $7.99	1				1
$8 to $9.99					
$10 to $11.99		1			1
$12 to $13.99	5	4			9
$14 to $15.99	23	8			31
$16 to $17.99	12	8			20
$18 to $19.99	19	3			22
$20 to $21.99	9	7			16
$22 to $24.99	121	9			130
$25 to $29.99	68	4			72
$30 to $34.99	13				13
$35 to $39.99	37				37
$40 and over	4				4
Totals	312	45			357

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	274	31	305
February	283	30	313
March	303	35	338
April	313	37	350
May	309	29	338
June	309	31	340
July	296	29	325
August	299	29	328
September	330	29	359
October	42	34	376
November	320	36	356
December	324	33	357

TABLE NO. 15. BRASS, BRONZE AND COPPER PRODUCTS.

(10 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	17	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	22	5
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	39	6
Wage earners:		
18 years of age and over	155	4
Under 18 years of age	2	
Totals	157	4

Salary and wage payments—annual:	
Officers, superintendents and managers	$56,758
Clerks, stenographers, salesmen, etc.	46,542
Wage earners (including piece workers)	290,147
Total	$393,447

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99		1			1
$10 to $11.99	1				1
$12 to $13.99	3				3
$14 to $15.99		1			1
$16 to $17.99		4			4
$18 to $19.99	6				6
$20 to $21.99	1				1
$22 to $24.99	2	7			9
$25 to $29.99	12	9			21
$30 to $34.99	7	7			14
$35 to $39.99	29	24			53
$40 and over	25	20			45
Totals	86	73			159

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	193	4	197
February	172	5	177
March	172	5	177
April	170	6	176
May	171	6	177
June	155	4	159
July	143	5	148
August	127	5	132
September	152	5	157
October	156	7	163
November	162	4	166
December	162	4	166

TABLE NO. 18. BUTTER, CHEESE AND CONDENSED MILK.

(4 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	21	
Clerks, stenographers, salesmen, etc., 18 years of age and over	139	59
Clerks, stenographers, salesmen, etc., under 18 years of age		1
Totals	160	60
Wage earners:		
18 years of age and over	119	34
Under 18 years of age		1
Totals	119	35

Salary and wage payments—annual:	
Officers, superintendents and managers	$59,817
Clerks, stenographers, salesmen, etc	226,797
Wage earners (including piece workers)	133,690
Total	$420,304

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	3				3
$5 to $5.99	42				42
$6 to $6.99	6				6
$7 to $7.99	5				5
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99		14	1		15
$18 to $19.99		12			12
$20 to $21.99	1	5			6
$22 to $24.99	4	3			7
$25 to $29.99	10				10
$30 to $34.99	24				24
$35 to $39.99	13				13
$40 and over	11				11
Totals	119	34	1		154

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	130	43	173
February	135	40	175
March	155	45	200
April	167	55	222
May	154	53	207
June	135	47	182
July	134	41	175
August	119	38	157
September	124	39	163
October	128	35	163
November	121	33	154
December	117	34	151

TABLE NO. 19. CANS, TIN.

(9 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	17	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	49	11
Clerks, stenographers, salesmen, etc., under 18 years of age	2	
Totals	68	12
Wage earners:		
18 years of age and over	1,106	433
Under 18 years of age	6	2
Totals	1,112	435

Salary and wage payments—annual:	
Officers, superintendents and managers	$13,470
Clerks, stenographers, salesmen, etc.	92,045
Wage earners (including piece workers)	1,431,379
Total	$1,536,894

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99		6			6
$14 to $15.99	15	3	5	1	24
$16 to $17.99	146	399	1	1	547
$18 to $19.99	156	18			174
$20 to $21.99	171	3			174
$22 to $24.99	214	2			216
$25 to $29.99	173	1			174
$30 to $34.99	61				61
$35 to $39.99	84	1			85
$40 and over	86				86
Totals	1,106	433	6	2	1,547

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,037	362	1,399
February	1,096	377	1,473
March	1,181	498	1,679
April	1,202	531	1,733
May	1,032	449	1,481
June	907	356	1,263
July	1,087	398	1,485
August	1,425	661	2,086
September	1,255	541	1,796
October	1,066	478	1,544
November	981	395	1,376
December	987	365	1,352

TABLE NO. 21. CANNING AND PRESERVING OF FRUITS AND VEGETABLES.

(8 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	25	
Clerks, stenographers, salesmen, etc., 18 years of age and over	67	22
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	93	22
Wage earners:		
18 years of age and over	447	548
Under 18 years of age	6	2
Totals	453	550

Salary and wage payments—annual:	
Officers, superintendents and managers	$74,953
Clerks, stenographers, salesmen, etc.	107,233
Wage earners (including piece workers)	471,656
Total	$653,842

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5		4			4
$5 to $5.99		8			8
$6 to $6.99		8			8
$7 to $7.99		4			4
$8 to $9.99	2	10			12
$10 to $11.99		7			7
$12 to $13.99	5	24	1		30
$14 to $15.99	4	51			55
$16 to $17.99	17	138	1	17	173
$18 to $19.99	22	67		2	91
$20 to $21.99	55	60			115
$22 to $24.99	77	57	1		135
$25 to $29.99	147	53			200
$30 to $34.99	73	26			99
$35 to $39.99	60	2			62
$40 and over	26	2			28
Totals	488	521	3	19	1,031

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	283	144	427
February	257	96	353
March	225	100	325
April	230	86	316
May	245	132	377
June	363	299	662
July	381	493	874
August	397	505	902
September	463	321	784
October	500	248	748
November	308	131	439
December	255	157	412

TABLE NO. 22. CARBONATED BEVERAGES.

(3 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	5	
Clerks, stenographers, salesmen, etc., 18 years of age and over	3	2
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	8	2
Wage earners:		
18 years of age and over	27	
Under 18 years of age		
Totals	27	

Salary and wage payments—annual:	
Officers, superintendents and managers	$14,478
Clerks, stenographers, salesmen, etc.	8,887
Wage earners (including piece workers)	52,351
Total	$75,716

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99					
$18 to $19.99					
$20 to $21.99					
$22 to $24.99					
$25 to $29.99					
$30 to $34.99	13				13
$35 to $39.99	12				12
$40 and over	2				2
Totals	27				27

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	28		28
February	30		30
March	31		31
April	28		28
May	38		38
June	37		37
July	34		34
August	31		31
September	31		31
October	29		29
November	29		29
December	27		27

TABLE NO. 23. CARRIAGES, WAGONS AND MATERIALS.

(3 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	3	2
Clerks, stenographers, salesmen, etc., 18 years of age and over		
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	3	2
Wage earners:		
18 years of age and over	17	1
Under 18 years of age	1	
Totals	18	1

Salary and wage payments—annual:	
Officers, superintendents and managers	$8,550
Clerks, stenographers, salesmen, etc.	1,320
Wage earners (including piece workers)	31,015
Total	$40,885

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	1				1
$5 to $5.99					
$6 to $6.99	2				2
$7 to $7.99	1				1
$8 to $9.99	1				1
$10 to $11.99					
$12 to $13.99			1		1
$14 to $15.99					
$16 to $17.99					
$18 to $19.99	1				1
$20 to $21.99	1				1
$22 to $24.99	1				1
$25 to $29.99	1				1
$30 to $34.99	3				3
$35 to $39.99	1				1
$40 and over	4				4
Totals	17		1		18

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	18		18
February	15		15
March	18		18
April	18		18
May	17		17
June	15		15
July	16		16
August	19		19
September	20		20
October	21		21
November	17		17
December	16		16

TABLE NO. 24. CASKETS AND UNDERTAKERS' SUPPLIES.

(3 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	4	
Clerks, stenographers, salesmen, etc., 18 years of age and over	11	4
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	15	4
Wage earners:		
18 years of age and over	49	19
Under 18 years of age		
Totals	49	19

Salary and wage payments—annual:	
Officers, superintendents and managers	$35,420
Clerks, stenographers, salesmen, etc.	24,405
Wage earners (including piece workers)	96,427
Total	$156,252

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5		1			1
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99	1				1
$16 to $17.99					
$18 to $19.99	8	9			17
$20 to $21.99	3	5			8
$22 to $24.99	3				3
$25 to $29.99	2	3			5
$30 to $34.99	10				10
$35 to $39.99	19				19
$40 and over	3				3
Totals	49	18			67

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	47	19	66
February	49	18	67
March	50	19	69
April	52	18	70
May	49	18	67
June	51	14	65
July	48	13	61
August	48	16	64
September	48	17	65
October	54	17	71
November	52	17	69
December	49	17	66

TABLE NO. 26. CHEMICALS (INCLUDING CHEMICAL FERTILIZERS).

(10 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	30	
Clerks, stenographers, salesmen, etc., 18 years of age and over	33	13
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	63	13
Wage earners:		
18 years of age and over	142	10
Under 18 years of age		
Totals	142	10

Salary and wage payments—annual:	
Officers, superintendents and managers	$111,540
Clerks, stenographers, salesmen, etc.	50,428
Wage earners (including piece workers)	254,611
Total	$416,579

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99	1				1
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99		1			1
$14 to $15.99					
$16 to $17.99		3			3
$18 to $19.99		5			5
$20 to $21.99	7				7
$22 to $24.99	40				40
$25 to $29.99	25	1			26
$30 to $34.99	51				51
$35 to $39.99	8				8
$40 and over	9				9
Totals	141	10			151

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	224	7	231
February	246	7	253
March	249	7	256
April	236	8	244
May	148	8	156
June	147	9	156
July	144	9	153
August	130	8	138
September	146	8	154
October	149	10	159
November	136	11	147
December	143	10	153

TABLE NO. 27. CLOTHING, MEN'S.

(25 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	45	4
Clerks, stenographers, salesmen, etc., 18 years of age and over	126	42
Clerks, stenographers, salesmen, etc., under 18 years of age	42	4
Totals	213	50
Wage earners:		
18 years of age and over	301	1,077
Under 18 years of age		27
Totals	301	1,104

Salary and wage payments—annual:	
Officers, superintendents and managers	$255,711
Clerks, stenographers, salesmen, etc	293,115
Wage earners (including piece workers)	1,358,276
Total	$1,907,102

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	1	6		1	8
$5 to $5.99		5		1	6
$6 to $6.99		2		1	3
$7 to $7.99		8			8
$8 to $9.99		20			20
$10 to $11.99		19		2	21
$12 to $13.99	11	76		5	92
$14 to $15.99	11	83		6	100
$16 to $17.99	13	181		6	200
$18 to $19.99	16	106		1	123
$20 to $21.99	15	117		1	133
$22 to $24.99	15	138		2	155
$25 to $29.99	30	188		2	220
$30 to $34.99	28	108			136
$35 to $39.99	27	17			44
$40 and over	141	4			145
Totals	308	1,078		25	1,414

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	219	606	825
February	234	694	928
March	258	745	1,003
April	291	849	1,140
May	302	918	1,220
June	292	986	1,278
July	284	1,015	1,299
August	295	1,094	1,389
September	306	1,052	1,358
October	319	1,079	1,398
November	317	1,101	1,418
December	310	1,110	1,420

TABLE NO. 28. CLOTHING, WOMEN'S.

(34 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	44	5
Clerks, stenographers, salesmen, etc., 18 years of age and over	70	55
Clerks, stenographers, salesmen, etc., under 18 years of age	5	2
Totals	119	62
Wage earners:		
18 years of age and over	142	588
Under 18 years of age	2	3
Totals	144	591

Salary and wage payments—annual:	
Officers, superintendents and managers	$185,330
Clerks, stenographers, salesmen, etc	188,328
Wage earners (including piece workers)	937,396
Total	$1,311,054

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99		2			2
$6 to $6.99		1			1
$7 to $7.99		4			4
$8 to $9.99		10			10
$10 to $11.99		11			11
$12 to $13.99	12	34	1		47
$14 to $15.99	3	33		1	37
$16 to $17.99	10	166		2	178
$18 to $19.99	2	74	1		77
$20 to $21.99	2	66			68
$22 to $24.99	10	63			73
$25 to $29.99	6	52			58
$30 to $34.99	11	30			41
$35 to $39.99	10	8			18
$40 and over	79	15			94
Totals	145	569	2	3	719

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	132	581	713
February	139	665	804
March	129	592	721
April	135	683	818
May	148	669	817
June	160	672	832
July	139	690	829
August	147	691	838
September	155	674	829
October	149	699	848
November	144	652	796
December	144	566	710

TABLE NO. 29. COFFEE AND SPICE ROASTING AND GRINDING.

(11 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	39	4
Clerks, stenographers, salesmen, etc., 18 years of age and over	319	149
Clerks, stenographers, salesmen, etc., under 18 years of age	4	
Totals	362	153
Wage earners:		
18 years of age and over	333	206
Under 18 years of age	2	1
Totals	335	207

Salary and wage payments—annual:	
Officers, superintendents and managers	$263,978
Clerks, stenographers, salesmen, etc.	847,407
Wage earners (including piece workers)	608,270
Total	$1,719,655

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	1				1
$12 to $13.99					
$14 to $15.99	1	9			10
$16 to $17.99	4	124			128
$18 to $19.99	18	58			76
$20 to $21.99	16	15			31
$22 to $24.99	25	2			27
$25 to $29.99	93				93
$30 to $34.99	82				82
$35 to $39.99	66				66
$40 and over	25				25
Totals	331	208			539

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	261	201	462
February	260	205	465
March	263	201	464
April	273	209	482
May	283	207	490
June	289	216	505
July	281	218	499
August	296	229	525
September	296	240	536
October	306	223	529
November	303	201	504
December	332	204	536

TABLE NO. 30. CONFECTIONERY.

(45 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	103	9
Clerks, stenographers, salesmen, etc., 18 years of age and over	262	159
Clerks, stenographers, salesmen, etc., under 18 years of age	5	5
Totals	370	173
Wage earners:		
18 years of age and over	1,159	1,190
Under 18 years of age	16	11
Totals	1,175	1,201

Salary and wage payments—annual:	
Officers, superintendents and managers	$470,792
Clerks, stenographers, salesmen, etc	628,089
Wage earners (including piece workers)	2,132,595
Total	$3,231,476

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	2		1		3
$5 to $5.99					
$6 to $6.99	1				1
$7 to $7.99		13			13
$8 to $9.99	1	12			13
$10 to $11.99		9		1	10
$12 to $13.99	7	151	3	4	165
$14 to $15.99	27	144	8	1	180
$16 to $17.99	50	575	4	5	634
$18 to $19.99	83	153			236
$20 to $21.99	112	89			201
$22 to $24.99	151	45	1		197
$25 to $29.99	263	29	1		293
$30 to $34.99	179	5			184
$35 to $39.99	165	1			166
$40 and over	142				142
Totals	1,183	1,226	18	11	2,438

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	998	908	1,906
February	986	850	1,836
March	1,013	933	1,946
April	984	989	1,973
May	1,008	910	1,918
June	1,047	897	1,944
July	1,054	883	1,937
August	1,011	947	1,958
September	1,127	1,093	2,220
October	1,187	1,181	2,368
November	1,215	1,174	2,389
December	1,197	1,176	2,373

TABLE NO. 32. ELECTRIC MACHINERY, APPARATUS AND SUPPLIES.

(16 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	98	37
Clerks, stenographers, salesmen, etc., 18 years of age and over	57	27
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	155	64
Wage earners:		
18 years of age and over	453	111
Under 18 years of age	1	
Totals	451	111

Salary and wage payments—annual:	
Officers, superintendents and managers	$119,827
Clerks, stenographers, salesmen, etc.	372,216
Wage earners (including piece workers)	644,595
Total	$1,136,638

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	7		1		8
$5 to $5.99	9				9
$6 to $6.99	9				9
$7 to $7.99	13				13
$8 to $9.99	8				8
$10 to $11.99	2				2
$12 to $13.99	5				5
$14 to $15.99	37	12			49
$16 to $17.99	113	61			174
$18 to $19.99	96	11			107
$20 to $21.99	20	16			36
$22 to $24.99	32	8			40
$25 to $29.99	26	2			28
$30 to $34.99	27	1			28
$35 to $39.99	23				23
$40 and over	31				31
Totals	458	111	1		570

Number of Wage Earners, by Months.

Months	Males	Females	Total
January	404	101	505
February	386	105	491
March	411	99	510
April	406	97	503
May	418	101	519
June	405	87	492
July	430	84	514
August	434	99	533
September	496	124	620
October	517	136	653
November	476	118	594
December	455	111	566

TABLE NO. 34. ENGINES AND PUMPS—GAS, GASOLINE, ETC.

(6 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	14	
Clerks, stenographers, salesmen, etc., 18 years of age and over	18	4
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	32	4
Wage earners:		
18 years of age and over	141	
Under 18 years of age		
Totals	141	

Salary and wage payments—annual:	
Officers, superintendents and managers	$58,000
Clerks, stenographers, salesmen, etc.	50,674
Wage earners (including piece workers)	252,438
Total	$361,112

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	1				1
$14 to $15.99	4				4
$16 to $17.99	1				1
$18 to $19.99	6				6
$20 to $21.99	6				6
$22 to $24.99	30				30
$25 to $29.99	18				18
$30 to $34.99	4				4
$35 to $39.99	55				55
$40 and over	15				15
Totals	140				140

Number of Wage Earners, by Months.

Months	Males	Females	Total
January	286		286
February	267		267
March	251		251
April	185		185
May	156		156
June	92		92
July	121		121
August	95		95
September	90		90
October	113		113
November	123		123
December	141		141

TABLE NO. 37. FLOUR MILL AND GRIST MILL PRODUCTS.

(9 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	19	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	74	23
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	93	24
Wage earners:		
18 years of age and over	237	3
Under 18 years of age		
Totals	237	3

Salary and wage payments—annual:	
Officers, superintendents and managers	$100,374
Clerks, stenographers, salesmen, etc.	184,178
Wage earners (including piece workers)	267,070
Total	$551,622

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99	1				1
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	2				2
$12 to $13.99	2				2
$14 to $15.99	2				2
$16 to $17.99		3			3
$18 to $19.99	10				10
$20 to $21.99	7				7
$22 to $24.99	14				14
$25 to $29.99	101				101
$30 to $34.99	79				79
$35 to $39.99	12				12
$40 and over	11				11
Totals	241	3			244

Number of Wage Earners, by Months.

Months	Males	Females	Total
January	206	5	211
February	158		158
March	161	1	162
April	226	2	228
May	201	4	205
June	213	4	217
July	168		168
August	186	1	187
September	222	3	225
October	219	3	222
November	202	4	206
December	226	4	230

TABLE NO. 38. FOOD PREPARATIONS.

(13 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	32	
Clerks, stenographers, salesmen, etc., 18 years of age and over	45	23
Clerks, stenographers, salesmen, etc., under 18 years of age		1
Totals	77	24
Wage earners:		
18 years of age and over	156	91
Under 18 years of age	2	3
Totals	158	94

Salary and wage payments—annual:	
Officers, superintendents and managers	$112,040
Clerks, stenographers, salesmen, etc.	110,300
Wage earners (including piece workers)	374,211
Total	$596,551

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99	24				24
$6 to $6.99		2			2
$7 to $7.99					
$8 to $9.99		1			1
$10 to $11.99					
$12 to $13.99		3	2	3	8
$14 to $15.99					
$16 to $17.99		70	8		78
$18 to $19.99	6	2	2		10
$20 to $21.99	3	2			5
$22 to $24.99	10	1			11
$25 to $29.99	30				30
$30 to $34.99	43				43
$35 to $39.99	28				28
$40 and over	15				15
Totals	159	81	12	3	255

Number of Wage Earners, by Months.

Months	Males	Females	Total
January	166	81	247
February	166	81	247
March	162	89	251
April	152	83	235
May	140	71	211
June	149	70	219
July	146	65	211
August	146	68	214
September	154	100	254
October	162	92	254
November	165	95	260
December	167	94	261

TABLE NO. 39. FOUNDRY AND MACHINE SHOP PRODUCTS.

(47 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	87	
Clerks, stenographers, salesmen, etc., 18 years of age and over	205	54
Clerks, stenographers, salesmen, etc., under 18 years of age	3	
Totals	295	54
Wage earners:		
18 years of age and over	816	29
Under 18 years of age	14	
Totals	830	29

Salary and wage payments—annual:	
Officers, superintendents and managers	$518,332
Clerks, stenographers, salesmen, etc.	538,552
Wage earners (including piece workers)	1,840,447
Total	$2,897,331

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	18		2		20
$5 to $5.99	17				17
$6 to $6.99	26				26
$7 to $7.99	25				25
$8 to $9.99	5				5
$10 to $11.99	4		2		6
$12 to $13.99	13		4		17
$14 to $15.99	10		4		14
$16 to $17.99	15	20	4		39
$18 to $19.99	23				23
$20 to $21.99	25				25
$22 to $24.99	113	4			117
$25 to $29.99	148				148
$30 to $34.99	93				93
$35 to $39.99	308	1			309
$40 and over	185	1			186
Totals	1,028	26	16		1,070

Number of Wage Earners, by Months.

Months	Males	Females	Total
January	1,355	13	1,368
February	1,331	13	1,344
March	1,251	22	1,273
April	1,193	24	1,217
May	1,136	28	1,164
June	1,038	33	1,071
July	1,025	32	1,057
August	938	33	971
September	937	30	967
October	955	14	969
November	941	14	955
December	977	8	985

TABLE NO. 40. FURNITURE, BANK AND STORE FIXTURES, ETC.

(21 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	36	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	44	13
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	81	14
Wage earners:		
18 years of age and over	694	58
Under 18 years of age	6	
Totals	700	58

Salary and wage payments—annual:	
Officers, superintendents and managers	$128,643
Clerks, stenographers, salesmen, etc.	96,749
Wage earners (including piece workers)	1,009,687
Total	$1,235,079

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99	1				1
$8 to $9.99					
$10 to $11.99	14				14
$12 to $13.99	17	4	2		23
$14 to $15.99	12	7	2		21
$16 to $17.99	23	3	2		28
$18 to $19.99	41	12			53
$20 to $21.99	27	12			39
$22 to $24.99	77	4			81
$25 to $29.99	68	11			79
$30 to $34.99	92	2			94
$35 to $39.99	92	1			93
$40 and over	228	2			230
Totals	692	58	6		756

Number of Wage Earners, by Months.

Months	Males	Females	Total
January	576	42	618
February	508	46	554
March	563	52	615
April	579	56	635
May	561	50	611
June	485	50	535
July	498	46	544
August	512	39	551
September	656	45	701
October	702	57	759
November	694	59	753
December	693	59	752

TABLE NO. 43. GLASS CUTTING AND ORNAMENTING (INCLUDING MIRRORS).

(7 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	7	
Clerks, stenographers, salesmen, etc., 18 years of age and over	102	22
Clerks, stenographers, salesmen, etc., under 18 years of age	6	1
Totals	115	23
Wage earners:		
18 years of age and over	732	49
Under 18 years of age	1	
Totals	733	49

Salary and wage payments—annual:	
Officers, superintendents and managers	$77,950
Clerks, stenographers, salesmen, etc.	218,360
Wage earners (including piece workers)	1,592,800
Total	$1,889,110

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99			1		1
$10 to $11.99					
$12 to $13.99		1			1
$14 to $15.99					
$16 to $17.99	1	19			20
$18 to $19.99	4	10			14
$20 to $21.99	1	8			9
$22 to $24.99	169	10			179
$25 to $29.99	102	2			104
$30 to $34.99	211	1			212
$35 to $39.99	90		1		91
$40 and over	154				154
Totals	732	51	2		785

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	730	62	792
February	562	48	610
March	594	52	646
April	704	53	757
May	638	52	690
June	677	51	728
July	729	52	781
August	717	50	767
September	789	85	874
October	845	93	938
November	814	91	905
December	731	83	814

TABLE NO. 44. GLOVES, LEATHER.

(3 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	4	
Clerks, stenographers, salesmen, etc., 18 years of age and over	17	2
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	21	2
Wage earners:		
18 years of age and over	26	21
Under 18 years of age		
Totals	26	21

Salary and wage payments—annual:	
Officers, superintendents and managers	$10,700
Clerks, stenographers, salesmen, etc.	14,305
Wage earners (including piece workers)	40,274
Total	$65,279

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99		4			4
$16 to $17.99	1	9			10
$18 to $19.99		4			4
$20 to $21.99	6	1			7
$22 to $24.99	7	3			10
$25 to $29.99	3				3
$30 to $34.99	5				5
$35 to $39.99	2				2
$40 and over	1				1
Totals	25	21			46

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	9	8	17
February	15	11	26
March	17	18	35
April	16	23	39
May	20	22	42
June	21	19	40
July	22	17	39
August	22	18	41
September	24	21	45
October	25	20	45
November	26	21	47
December	25	20	45

TABLE NO. 45. GLUE AND TALLOW.

(3 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	5	
Clerks, stenographers, salesmen, etc., 18 years of age and over	6	4
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	11	4
Wage earners:		
18 years of age and over	75	5
Under 18 years of age		
Totals	75	5

Salary and wage payments—annual:	
Officers, superintendents and managers	$13,520
Clerks, stenographers, salesmen, etc	16,495
Wage earners (including piece workers)	91,075
Total	$121,090

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99	9				9
$6 to $6.99					
$7 to $7.99	3				3
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99	1	6			7
$18 to $19.99	27				27
$20 to $21.99	7				7
$22 to $24.99	2				2
$25 to $29.99	13				13
$30 to $34.99	5				5
$35 to $39.99	4				4
$40 and over	2				2
Totals	73	6			79

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	83	6	89
February	72	6	78
March	72	6	78
April	50		50
May	74	6	80
June	72	6	78
July	71	5	76
August	70	5	75
September	54		54
October	72	5	77
November	73	6	79
December	75	5	80

TABLE NO. 46. HATS AND CAPS, MEN'S.

(4 establishments reporting).

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	6	
Clerks, stenographers, salesmen, etc., 18 years of age and over	11	5
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	18	5
Wage earners:		
18 years of age and over	21	73
Under 18 years of age		
Totals	21	73

Salary and wage payments—annual:	
Officers, superintendents and managers	$13,970
Clerks, stenographers, salesmen, etc.	14,511
Wage earners (including piece workers)	113,965
Total	$142,446

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5		1			1
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99		2			2
$14 to $15.99	1	8			9
$16 to $17.99	2	15			17
$18 to $19.99		18			18
$20 to $21.99	1	10			11
$22 to $24.99		8			8
$25 to $29.99	5	4			9
$30 to $34.99	3	4			7
$35 to $39.99	5	3			8
$40 and over	10	2			12
Totals	27	75			102

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	20	63	83
February	21	82	103
March	23	96	119
April	22	97	119
May	21	70	91
June	21	65	86
July	19	62	81
August	19	91	110
September	27	91	118
October	25	97	122
November	27	73	100
December	27	75	102

TABLE NO. 47. ICE, MANUFACTURED.

(4 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	6	
Clerks, stenographers, salesmen, etc., 18 years of age and over	37	3
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	43	3
Wage earners:		
18 years of age and over	163	
Under 18 years of age		
Totals	163	

Salary and wage payments—annual:	
Officers, superintendents and managers	$30,021
Clerks, stenographers, salesmen, etc.	69,313
Wage earners (including piece workers)	299,711
Total	$399,045

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99					
$18 to $19.99					
$20 to $21.99					
$22 to $24.99					
$25 to $29.99	23				23
$30 to $34.99	87				87
$35 to $39.99	20				20
$40 and over	33				33
Totals	163				163

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	176	1	177
February	178	1	179
March	191	1	192
April	185	1	186
May	194	1	195
June	194	1	195
July	182	1	183
August	220	1	221
September	246	1	247
October	221	1	222
November	201	1	202
December	193	1	194

TABLE NO. 48. IRON AND STEEL FORGINGS, BOLTS AND NUTS.

(6 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	15	
Clerks, stenographers, salesmen, etc., 18 years of age and over	7	2
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	22	2
Wage earners:		
18 years of age and over	97	
Under 18 years of age		
Totals	97	

Salary and wage payments—annual:	
Officers, superintendents and managers	$88,504
Clerks, stenographers, salesmen, etc	13,750
Wage earners (including piece workers)	152,674
Total	$254,928

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99	17				17
$18 to $19.99	2				2
$20 to $21.99	15				15
$22 to $24.99	20				20
$25 to $29.99	8				8
$30 to $34.99	10				10
$35 to $39.99	18				18
$40 and over	7				7
Totals	97				97

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	109		109
February	117		117
March	110		110
April	107		107
May	96		96
June	98		98
July	95		95
August	96		96
September	92		92
October	88		88
November	88		88
December	97		97

TABLE NO. 49. IRON AND STEEL, STRUCTURAL AND ORNAMENTAL.

(16 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	51	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	69	40
Clerks, stenographers, salesmen, etc., under 18 years of age		1
Totals	120	42
Wage earners:		
18 years of age and over	1,081	22
Under 18 years of age	4	
Totals	1,085	22

Salary and wage payments—annual:	
Officers, superintendents and managers	$229,648
Clerks, stenographers, salesmen, etc.	179,720
Wage earners (including piece workers)	1,323,473
Total	$1,732,841

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	6				6
$5 to $5.99	5				5
$6 to $6.99	6				6
$7 to $7.99	3				3
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	1		1		2
$14 to $15.99	89				89
$16 to $17.99	22	14	2		38
$18 to $19.99	35	6			41
$20 to $21.99	116				116
$22 to $24.99	94	1			95
$25 to $29.99	342				342
$30 to $34.99	133				133
$35 to $39.99	88				88
$40 and over	121				121
Totals	1,061	21	3		1,085

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	957	11	968
February	817	11	828
March	998	13	1,011
April	862	14	876
May	789	13	802
June	901	17	918
July	969	23	992
August	729	24	753
September	872	23	895
October	1,086	25	1,111
November	962	23	985
December	1,024	21	1,045

TABLE NO. 50. JEWELRY.

(7 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	7	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	13	5
Clerks, stenographers, salesmen, etc., under 18 years of age		1
Totals	20	7
Wage earners:		
18 years of age and over	175	32
Under 18 years of age	1	10
Totals	176	42

Salary and wage payments—annual:	
Officers, superintendents and managers	$75,620
Clerks, stenographers, salesmen, etc	23,238
Wage earners (including piece workers)	344,845
Total	$443,703

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99	1				1
$6 to $6.99		1			1
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	7				7
$12 to $13.99	6			12	18
$14 to $15.99	2	1	1	1	5
$16 to $17.99	5	16		2	23
$18 to $19.99	8	3			11
$20 to $21.99	4	3			7
$22 to $24.99	2	2			4
$25 to $29.99	9				9
$30 to $34.99	23				23
$35 to $39.99	33	1			34
$40 and over	75				75
Totals	175	27	1	15	218

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	171	47	218
February	169	42	211
March	170	39	209
April	168	37	205
May	173	37	210
June	171	41	212
July	170	40	210
August	177	40	217
September	177	40	217
October	179	43	222
November	174	47	221
December	176	45	221

TABLE NO. 52. LAUNDRIES (STEAM).

(22 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	51	17
Clerks, stenographers, salesmen, etc., 18 years of age and over	201	61
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	252	78
Wage earners:		
18 years of age and over	410	922
Under 18 years of age	2	
Totals	412	922

Salary and wage payments—annual:	
Officers, superintendents and managers	$201,107
Clerks, stenographers, salesmen, etc.	449,771
Wage earners (including piece workers)	1,505,781
Total	$2,156,659

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99		3	1		4
$12 to $13.99		1			1
$14 to $15.99	8	2			10
$16 to $17.99	17	364			381
$18 to $19.99	12	244			256
$20 to $21.99	13	129	1		143
$22 to $24.99	47	82			129
$25 to $29.99	185	90			275
$30 to $34.99	57	3			60
$35 to $39.99	41	2			43
$40 and over	54				54
Totals	434	920	2		1,356

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	412	984	1,396
February	400	948	1,348
March	409	938	1,347
April	405	944	1,349
May	399	913	1,312
June	412	887	1,299
July	395	898	1,293
August	404	905	1,309
September	406	906	1,312
October	405	886	1,291
November	405	923	1,328
December	406	919	1,325

TABLE NO. 53. LEATHER GOODS.

(5 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	7	
Clerks, stenographers, salesmen, etc., 18 years of age and over	42	10
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	49	10
Wage earners:		
18 years of age and over	50	5
Under 18 years of age		
Totals	50	5

Salary and wage payments—annual:	
Officers, superintendents and managers	$54,211
Clerks, stenographers, salesmen, etc.	78,489
Wage earners (including piece workers)	91,071
Total	$223,771

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99	2				2
$16 to $17.99	1				1
$18 to $19.99		2			2
$20 to $21.99	2	2			4
$22 to $24.99	2	1			3
$25 to $29.99	4				4
$30 to $34.99	11				11
$35 to $39.99	21				21
$40 and over	7				7
Totals	50	5			55

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	57	6	63
February	51	6	57
March	52	5	57
April	49	6	55
May	51	6	57
June	51	4	55
July	50	4	54
August	50	3	53
September	50	3	53
October	50	4	54
November	51	4	55
December	51	5	56

TABLE NO. 55. LIQUORS, MALT.

(4 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	8	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	9	2
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	17	3
Wage earners:		
18 years of age and over	94	
Under 18 years of age		
Totals	94	

Salary and wage payments—annual:	
Officers, superintendents and managers	$39,600
Clerks, stenographers, salesmen, etc.	20,991
Wage earners (including piece workers)	227,038
Total	$287,629

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99	4				4
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99					
$18 to $19.99	1				1
$20 to $21.99					
$22 to $24.99					
$25 to $29.99					
$30 to $34.99					
$35 to $39.99	62				62
$40 and over	27				27
Totals	94				94

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	91		91
February	99		99
March	101		101
April	112		112
May	103		103
June	119		119
July	145		145
August	130		130
September	104		104
October	106		106
November	99		99
December	94		94

TABLE NO. 57. LUMBER INDUSTRY—PLANING MILLS.

(13 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	16	
Clerks, stenographers, salesmen, etc., 18 years of age and over	18	6
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	34	6
Wage earners:		
18 years of age and over	394	
Under 18 years of age	1	
Totals	395	

Salary and wage payments—annual:	
Officers, superintendents and managers	$76,803
Clerks, stenographers, salesmen, etc	55,828
Wage earners (including piece workers)	553,746
Total	$686,377

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	2		1		3
$14 to $15.99	1				1
$16 to $17.99	4		2		6
$18 to $19.99	12				12
$20 to $21.99	18				18
$22 to $24.99	45				45
$25 to $29.99	34				34
$30 to $34.99	54	1			55
$35 to $39.99	58				58
$40 and over	162				162
Totals	390	1	3		394

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	314	1	315
February	315	1	316
March	331	1	332
April	359	1	360
May	367	1	368
June	265	1	266
July	217	1	218
August	225	1	226
September	359	1	360
October	382	1	383
November	382	1	383
December	384	1	385

TABLE NO. 58. LUMBER INDUSTRY—SASH AND DOOR MILLS AND HOUSE FINISH.

(6 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	7	
Clerks, stenographers, salesmen, etc., 18 years of age and over	16	2
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	23	2
Wage earners:		
18 years of age and over	209	6
Under 18 years of age	2	
Totals	211	6

Salary and wage payments—annual:	
Officers, superintendents and managers	$29,058
Clerks, stenographers, salesmen, etc.	44,171
Wage earners (including piece workers)	29,490
Total	$368,130

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99			2		2
$14 to $15.99	2				2
$16 to $17.99	6				6
$18 to $19.99	5				5
$20 to $21.99	1				1
$22 to $24.99	15				15
$25 to $29.99	15				15
$30 to $34.99	17				17
$35 to $39.99	32				32
$40 and over	59				59
Totals	152		2		154

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	163	7	170
February	153	7	160
March	170	7	177
April	168	7	175
May	171	7	178
June	154	4	158
July	79	2	81
August	119	3	122
September	175	3	178
October	189	4	193
November	212	7	219
December	212	5	217

TABLE NO. 61. MARBLE AND STONE WORK.

(3 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	8	
Clerks, stenographers, salesmen, etc., 18 years of age and over	14	5
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	22	5
Wage earners:		
18 years of age and over	181	
Under 18 years of age	1	
Totals	182	

Salary and wage payments—annual:	
Officers, superintendents and managers	$68,000
Clerks, stenographers, salesmen, etc.	45,160
Wage earners (including piece workers)	206,960
Total	$320,120

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99			1		1
$14 to $15.99					
$16 to $17.99	2				2
$18 to $19.99	3				3
$20 to $21.99					
$22 to $24.99	13				13
$25 to $29.99	15				15
$30 to $34.99	78				78
$35 to $39.99	44				44
$40 and over	26				26
Totals	181		1		182

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	195		195
February	187		187
March	173		173
April	52		52
May	44		44
June	46		46
July	76		76
August	82		82
September	131		131
October	165		165
November	169		169
December	182		182

TABLE NO. 62. MATTRESSES, PILLOWS AND BEDDING.

(10 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	18	4
Clerks, stenographers, salesmen, etc., 18 years of age and over	40	17
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	58	21
Wage earners:		
18 years of age and over	284	58
Under 18 years of age	11	
Totals	295	58

Salary and wage payments—annual:	
Officers, superintendents and managers	$97,008
Clerks, stenographers, salesmen, etc.	77,194
Wage earners (including piece workers)	381,843
Total	$556,045

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	4		1		5
$12 to $13.99	5		3		8
$14 to $15.99	7	9	6		22
$16 to $17.99	13	18	1		32
$18 to $19.99	24	1			25
$20 to $21.99	31	11			42
$22 to $24.99	35	9			44
$25 to $29.99	77	4	1		82
$30 to $34.99	23	1			24
$35 to $39.99	22	1			23
$40 and over	29				30
Totals	270	55	12		337

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	117	35	152
February	195	45	240
March	227	52	279
April	247	58	305
May	243	56	299
June	226	54	280
July	99	57	156
August	232	50	282
September	245	56	301
October	276	67	343
November	299	75	374
December	267	67	334

TABLE NO. 63. METAL SIGNS, STENCILS AND RUBBER STAMPS.

(3 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	5	
Clerks, stenographers, salesmen, etc., 18 years of age and over	28	10
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	33	10
Wage earners:		
18 years of age and over	38	7
Under 18 years of age		
Totals	38	7

Salary and wage payments—annual:	
Officers, superintendents and managers	$23,283
Clerks, stenographers, salesmen, etc	53,736
Wage earners (including piece workers)	66,080
Total	$143,099

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99	15	2			17
$18 to $19.99					
$20 to $21.99		1			1
$22 to $24.99	2	2			4
$25 to $29.99	4				4
$30 to $34.99	7	1			8
$35 to $39.99	3	1			4
$40 and over	7				7
Totals	38	7			45

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	42	7	49
February	37	7	44
March	33	7	40
April	36	10	46
May	37	10	47
June	38	10	48
July	38	7	45
August	26	5	31
September	24	5	29
October	30	5	35
November	43	21	64
December	35	16	51

TABLE NO. 64. MILLINERY.

(8 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	11	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	25	11
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	37	13
Wage earners:		
18 years of age and over	14	177
Under 18 years of age	1	4
Totals	15	181

Salary and wage payments—annual:	
Officers, superintendents and managers	$48,726
Clerks, stenographers, salesmen, etc.	65,494
Wage earners (including piece workers)	219,160
Total	$333,380

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99			1		1
$6 to $6.99					
$7 to $7.99					
$8 to $9.99		1	1	3	5
$10 to $11.99		4			4
$12 to $13.99		6			6
$14 to $15.99	1	11		1	13
$16 to $17.99		23			23
$18 to $19.99		55			55
$20 to $21.99		39			39
$22 to $24.99		19			19
$25 to $29.99	4	17			21
$30 to $34.99	2	4			6
$35 to $39.99	1	6			7
$40 and over	6	4			10
Totals	14	189	2	4	209

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	18	245	263
February	19	254	273
March	20	260	280
April	20	262	282
May	18	205	223
June	13	185	198
July	13	179	192
August	11	230	241
September	14	215	229
October	14	215	229
November	13	188	201
December	13	171	184

TABLE NO. 67. PACKING AND PROCESSING OF DRIED FRUIT.

(3 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	3	
Clerks, stenographers, salesmen, etc., 18 years of age and over	2	1
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	5	1
Wage earners:		
18 years of age and over	41	67
Under 18 years of age		
Totals	41	67
Salary and wage payments—annual:		
Officers, superintendents and managers		$10,800
Clerks, stenographers, salesmen, etc		1,370
Wage earners (including piece workers)		28,363
Total		$40,533

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5		3			3
$5 to $5.99					
$6 to $6.99		2			2
$7 to $7.99		2			2
$8 to $9.99		5			5
$10 to $11.99	1	11			12
$12 to $13.99	3	5			8
$14 to $15.99	4	4			8
$16 to $17.99	9	26			35
$18 to $19.99	7	7			14
$20 to $21.99		2			2
$22 to $24.99	5				5
$25 to $29.99	2				2
$30 to $34.99	6				6
$35 to $39.99	1				1
$40 and over	3				3
Totals	41	67			108

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	5	6	11
February	5	5	10
March	7	6	13
April	6	10	16
May	4	10	14
June	5	10	15
July	4	12	16
August	4	6	10
September	6	14	20
October	42	61	103
November	24	23	47
December	34	54	88

TABLE NO. 68. PAINTS AND VARNISHES.

(6 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	17	
Clerks, stenographers, salesmen, etc., 18 years of age and over	48	18
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	65	18
Wage earners:		
18 years of age and over	66	7
Under 18 years of age	2	1
Totals	68	8

Salary and wage payments—annual:	
Officers, superintendents and managers	$67,072
Clerks, stenographers, salesmen, etc.	122,411
Wage earners (including piece workers)	88,008
Total	$277,491

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99		1		1	2
$14 to $15.99		2	1		3
$16 to $17.99	1				1
$18 to $19.99		2			2
$20 to $21.99	8				8
$22 to $24.99	18	1	1		20
$25 to $29.99	21	1			22
$30 to $34.99	12				12
$35 to $39.99	5				5
$40 and over	1				1
Totals	66	7	2	1	76

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	62	7	69
February	58	5	63
March	60	6	66
April	57	7	64
May	60	6	66
June	61	6	67
July	63	5	68
August	64	6	70
September	58	5	63
October	64	5	69
November	70	6	76
December	68	7	75

TABLE NO. 69. PAPER AND PAPER GOODS (NOT ELSEWHERE SPECIFIED).

(8 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	14	
Clerks, stenographers, salesmen, etc., 18 years of age and over	37	45
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	51	45
Wage earners:		
18 years of age and over	189	235
Under 18 years of age	3	6
Totals	192	241

Salary and wage payments—annual:	
Officers, superintendents and managers	$75,075
Clerks, stenographers, salesmen, etc.	132,811
Wage earners (including piece workers)	439,561
Total	$647,447

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	16	26	1		43
$5 to $5.99	1				1
$6 to $6.99					
$7 to $7.99					
$8 to $9.99	1				1
$10 to $11.99					
$12 to $13.99		7		3	10
$14 to $15.99	1	9		1	11
$16 to $17.99		115		2	117
$18 to $19.99	14	36			50
$20 to $21.99	18	13			31
$22 to $24.99	24	18	1		43
$25 to $29.99	37	7			44
$30 to $34.99	28	2			30
$35 to $39.99	28				28
$40 and over	22				22
Totals	190	233	2	6	431

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	229	244	473
February	223	228	451
March	219	230	449
April	208	205	413
May	209	196	405
June	210	195	405
July	212	68	280
August	222	215	437
September	189	215	404
October	199	235	434
November	303	233	536
December	193	241	434

TABLE NO. 70. PATENT MEDICINES, COMPOUNDS AND DRUGGISTS' PREPARATIONS.

(7 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	14	
Clerks, stenographers, salesmen, etc., 18 years of age and over	17	15
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	31	15
Wage earners:		
18 years of age and over	120	112
Under 18 years of age		
Totals	120	112

Salary and wage payments—annual:	
Officers, superintendents and managers	$45,285
Clerks, stenographers, salesmen, etc.	52,987
Wage earners (including piece workers)	331,010
Total	$429,282

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	1				1
$12 to $13.99		2			2
$14 to $15.99		7			7
$16 to $17.99	5	47			52
$18 to $19.99		24			24
$20 to $21.99	3	18			21
$22 to $24.99	3	4			7
$25 to $29.99	61	7			68
$30 to $34.99	22	3			25
$35 to $39.99	12				12
$40 and over	13				13
Totals	120	112			232

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	155	120	275
February	181	113	294
March	157	112	269
April	201	112	313
May	157	108	265
June	147	112	259
July	126	111	237
August	117	105	222
September	114	107	221
October	128	105	233
November	124	98	222
December	119	113	232

TABLE 72. PHOTO-ENGRAVING, ELECTROTYPING AND STEREOTYPING.

(18 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	27	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	36	21
Clerks, stenographers, salesmen, etc., under 18 years of age	2	
Totals	65	23
Wage earners:		
18 years of age and over	285	59
Under 18 years of age	1	
Totals	286	59

Salary and wage payments—annual:	
Officers, superintendents and managers	$160,267
Clerks, stenographers, salesmen, etc	115,948
Wage earners (including piece workers)	674,853
Total	$951,068

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	2				2
$12 to $13.99		1			1
$14 to $15.99	8	3			11
$16 to $17.99	9	24		1	34
$18 to $19.99	25	9			34
$20 to $21.99	16	5			21
$22 to $24.99	16	4			20
$25 to $29.99	15	10			25
$30 to $34.99	26	3			29
$35 to $39.99	20	4			24
$40 and over	148				148
Totals	285	63		1	349

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	272	52	324
February	268	53	321
March	269	54	323
April	280	49	329
May	275	52	327
June	274	52	326
July	278	46	324
August	290	50	340
September	296	56	352
October	300	56	356
November	300	59	359
December	290	64	354

TABLE NO. 73. PRINTING AND PUBLISHING.

(82 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	170	8
Clerks, stenographers, salesmen, etc., 18 years of age and over	1,205	365
Clerks, stenographers, salesmen, etc., under 18 years of age	140	18
Totals	1,515	391
Wage earners:		
18 years of age and over	2,061	403
Under 18 years of age	44	12
Totals	2,105	415

Salary and wage payments—annual:	
Officers, superintendents and managers	$887,719
Clerks, stenographers, salesmen, etc	2,346,997
Wage earners (including piece workers)	4,848,589
Total	$8,083,305

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	9			1	10
$5 to $5.99	1				1
$6 to $6.99	3				3
$7 to $7.99			1		1
$8 to $9.99	8				8
$10 to $11.99	9	1	8		18
$12 to $13.99	17	12	13	3	45
$14 to $15.99	32	14	5	3	54
$16 to $17.99	35	44	8	2	89
$18 to $19.99	80	43	3	1	127
$20 to $21.99	5	105	1	1	112
$22 to $24.99	163	83	1	3	250
$25 to $29.99	138	40	4	1	183
$30 to $34.99	160	24	5	2	191
$35 to $39.99	88	1	32		121
$40 and over	1,144	15	1		1,160
Totals	1,892	382	82	17	2,373

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	2,003	434	2,437
February	1,976	422	2,398
March	2,010	448	2,458
April	1,974	431	2,405
May	1,937	407	2,344
June	1,968	420	2,388
July	1,977	408	2,385
August	1,984	419	2,403
September	2,002	413	2,415
October	2,029	443	2,472
November	2,084	439	2,523
December	2,102	450	2,552

TABLE NO. 76. RUBBER GOODS—MECHANICAL AND RUBBER SPECIALTIES.

(3 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	12	
Clerks, stenographers, salesmen, etc., 18 years of age and over	16	4
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	28	4
Wage earners:		
18 years of age and over	77	10
Under 18 years of age		
Totals	77	10

Salary and wage payments—annual:	
Officers, superintendents and managers	$43,885
Clerks, stenographers, salesmen, etc.	26,443
Wage earners (including piece workers)	101,346
Total	$171,674

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99		2			2
$14 to $15.99		2			2
$16 to $17.99		1			1
$18 to $19.99		2			2
$20 to $21.99	5	2			7
$22 to $24.99	10	1			11
$25 to $29.99	12				12
$30 to $34.99	46				46
$35 to $39.99	2				2
$40 and over	2				2
Totals	77	10			87

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	75	12	87
February	80	12	92
March	77	12	89
April	81	11	92
May	78	11	89
June	72	11	83
July	74	12	86
August	74	12	86
September	75	11	86
October	75	11	86
November	76	11	87
December	76	11	87

TABLE NO. 78. SHEET METAL PRODUCTS (NOT INCLUDING TIN CANS).

(19 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	35	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	49	15
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	84	17
Wage earners:		
18 years of age and over	293	4
Under 18 years of age	3	
Totals	296	4

Salary and wage payments—annual:	
Officers, superintendents and managers	$164,059
Clerks, stenographers, salesmen, etc.	140,541
Wage earners (including piece workers)	544,144
Total	$848,744

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	14				14
$5 to $5.99	16				16
$6 to $6.99	4				4
$7 to $7.99	5				5
$8 to $9.99					
$10 to $11.99	2		2		4
$12 to $13.99	6				6
$14 to $15.99	2	1			3
$16 to $17.99	4	3	1		8
$18 to $19.99	4	1			5
$20 to $21.99	11				11
$22 to $24.99	20				20
$25 to $29.99	31				31
$30 to $34.99	24				24
$35 to $39.99	23				23
$40 and over	126				126
Totals	292	5	3		300

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	329		329
February	342		342
March	337		337
April	335	1	336
May	334	1	335
June	181	1	182
July	229	1	230
August	240	1	241
September	321	1	322
October	327	1	328
November	335	1	336
December	314	1	315

TABLE NO. 79. SHIPBUILDING (INCLUDING BOAT BUILDING).

(5 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	43	
Clerks, stenographers, salesmen, etc., 18 years of age and over	148	57
Clerks, stenographers, salesmen, etc., under 18 years of age	4	
Totals	195	57
Wage earners:		
18 years of age and over	2,045	2
Under 18 years of age	19	
Totals	2,064	2

Salary and wage payments—annual:	
Officers, superintendents and managers	$157,477
Clerks, stenographers, salesmen, etc	658,716
Wage earners (including piece workers)	5,877,532
Total	$6,693,725

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99			11		11
$12 to $13.99	13		8		21
$14 to $15.99	50				50
$16 to $17.99	3	1			4
$18 to $19.99	152				152
$20 to $21.99	412				412
$22 to $24.99	91				91
$25 to $29.99	456				456
$30 to $34.99	718	1			719
$35 to $39.99	121				121
$40 and over	29				29
Totals	2,045	2	19		2,066

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	8,570	8	8,578
February	8,047	8	8,055
March	7,882	7	7,889
April	6,410	6	6,416
May	4,769	4	4,773
June	2,791	3	2,794
July	1,968	2	1,970
August	1,717	2	1,719
September	1,762	2	1,764
October	1,644	2	1,646
November	1,856	2	1,858
December	2,065	2	2,067

TABLE NO. 80. SLAUGHTERING AND MEAT PACKING.

(14 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	32	
Clerks, stenographers, salesmen, etc., 18 years of age and over	49	7
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	81	7
Wage earners:		
18 years of age and over	257	3
Under 18 years of age		
Totals	257	3

Salary and wage payments—annual:	
Officers, superintendents and managers	$130,460
Clerks, stenographers, salesmen, etc.	116,743
Wage earners (including piece workers)	440,068
Total	$687,271

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	21	1			22
$5 to $5.99	14	1			15
$6 to $6.99	13				13
$7 to $7.99	13				13
$8 to $9.99	2				2
$10 to $11.99	2				2
$12 to $13.99	2				2
$14 to $15.99	1				1
$16 to $17.99					
$18 to $19.99	4				4
$20 to $21.99	1	1			2
$22 to $24.99	3				3
$25 to $29.99	31				31
$30 to $34.99	31				31
$35 to $39.99	20				20
$40 and over	102				102
Totals	260	3			263

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	248	2	250
February	252	2	254
March	251	2	253
April	253	2	255
May	248	3	251
June	260	3	263
July	255	3	258
August	259	3	262
September	262	3	265
October	266	3	269
November	265	3	268
December	263	3	266

TABLE NO. 81. SMELTING AND REFINING.

(6 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	21	7
Clerks, stenographers, salesmen, etc., 18 years of age and over	63	5
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	85	12
Wage earners:		
18 years of age and over	415	1
Under 18 years of age	2	
Totals	417	1

Salary and wage payments—annual:	
Officers, superintendents and managers	$95,642
Clerks, stenographers, salesmen, etc.	137,565
Wage earners (including piece workers)	614,171
Total	$847,378

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99			1		1
$14 to $15.99		1			1
$16 to $17.99					
$18 to $19.99	20				20
$20 to $21.99	13				13
$22 to $24.99	13				13
$25 to $29.99	55	1			56
$30 to $34.99	298	1			299
$35 to $39.99	12				12
$40 and over	6				6
Totals	417	3	1		421

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	420		420
February	399		399
March	464		464
April	450		450
May	446		446
June	413		413
July	352		352
August	418		418
September	418		418
October	430		430
November	438		438
December	408		408

TABLE NO. 82. SOAP, WASHING POWDER, ETC.

(5 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	12	
Clerks, stenographers, salesmen, etc., 18 years of age and over	10	2
Clerks, stenographers, salesmen, etc., under 18 years of age	6	
Totals	28	2
Wage earners:		
18 years of age and over	37	9
Under 18 years of age		
Totals	37	9

Salary and wage payments—annual:	
Officers, superintendents and managers	$37,438
Clerks, stenographers, salesmen, etc.	29,273
Wage earners (including piece workers)	46,598
Total	$113,309

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5		4			4
$5 to $5.99	10				10
$6 to $6.99	1				1
$7 to $7.99	1				1
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99		3			3
$18 to $19.99	7	2			9
$20 to $21.99	2				2
$22 to $24.99	3				3
$25 to $29.99	6				6
$30 to $34.99	3				3
$35 to $39.99	3				3
$40 and over	1				1
Totals	37	9			46

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	30	7	37
February	30	7	37
March	31	19	50
April	29	18	47
May	29	8	37
June	30	8	38
July	30	8	38
August	30	9	39
September	32	9	41
October	32	9	41
November	33	8	41
December	33	9	42

TABLE NO. 83. STOVES AND FURNACES (NOT INCLUDING OIL STOVES).

(4 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	8	
Clerks, stenographers, salesmen, etc., 18 years of age and over	14	6
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	22	6
Wage earners:		
18 years of age and over	153	
Under 18 years of age		
Totals	153	

Salary and wage payments—annual:	
Officers, superintendents and managers	$36,750
Clerks, stenographers, salesmen, etc.	48,039
Wage earners (including piece workers)	255,864
Total	$340,653

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	1				1
$5 to $5.99	3				3
$6 to $6.99	2				2
$7 to $7.99	2				2
$8 to $9.99	7				7
$10 to $11.99	1				1
$12 to $13.99	1				1
$14 to $15.99					
$16 to $17.99	1				1
$18 to $19.99	5				5
$20 to $21.99					
$22 to $24.99	10				10
$25 to $29.99	22				22
$30 to $34.99	19				19
$35 to $39.99	30				30
$40 and over	49				49
Totals	153				153

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	136		136
February	132		132
March	132		132
April	138		138
May	140		140
June	124		124
July	125		125
August	122		122
September	139		139
October	149		149
November	152		152
December	153		153

TABLE NO. 84. SUGAR REFINING.

(3 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	37	
Clerks, stenographers, salesmen, etc., 18 years of age and over	100	42
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	137	42
Wage earners:		
18 years of age and over	1,321	101
Under 18 years of age		
Totals	1,321	101

Salary and wage payments—annual:	
Officers, superintendents and managers	$217,976
Clerks, stenographers, salesmen, etc.	117,733
Wage earners (including piece workers)	1,461,059
Total	$1,796,768

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	2		1		3
$14 to $15.99	3		4		7
$16 to $17.99	1		69		70
$18 to $19.99			21		21
$20 to $21.99	18		1		19
$22 to $24.99	373		4		377
$25 to $29.99	562		1		563
$30 to $34.99	148				148
$35 to $39.99	99				99
$40 and over	115				115
Totals	1,321		101		1,422

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	961	81	1,042
February	776	45	821
March	774	83	857
April	925	90	1,015
May	706	47	753
June	673	78	751
July	901	86	987
August	1,331	84	1,415
September	1,449	90	1,539
October	1,447	105	1,552
November	1,355	101	1,456
December	665	23	688

TABLE NO. 85. TANNING.

(7 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	19	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	14	9
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	33	10
Wage earners:		
18 years of age and over	498	32
Under 18 years of age	1	2
Totals	499	34

Salary and wage payments—annual:	
Officers, superintendents and managers	$94,855
Clerks, stenographers, salesmen, etc.	36,843
Wage earners (including piece workers)	600,537
Total	$732,235

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	45	1	1		47
$5 to $5.99	25				25
$6 to $6.99	4				4
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	1				1
$12 to $13.99					
$14 to $15.99					
$16 to $17.99		2			2
$18 to $19.99	10	29		1	40
$20 to $21.99	35				35
$22 to $24.99	186		1		187
$25 to $29.99	80				80
$30 to $34.99	70				70
$35 to $39.99	20				20
$40 and over	22				22
Totals	498	32	1	2	533

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	312	2	314
February	358	3	361
March	382	9	391
April	379	15	394
May	386	12	398
June	414	12	426
July	423	13	436
August	431	14	445
September	449	27	476
October	472	30	502
November	480	33	513
December	501	34	535

TABLE NO. 86. TOBACCO MANUFACTURES.

(12 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	22	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	153	20
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	175	22
Wage earners:		
18 years of age and over	464	679
Under 18 years of age	3	11
Totals	467	690

Salary and wage payments—annual:	
Officers, superintendents and managers	$114,030
Clerks, stenographers, salesmen, etc	291,758
Wage earners (including piece workers)	913,921
Total	$1,319,709

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5		1			1
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	16		1		17
$12 to $13.99	7	83		1	91
$14 to $15.99	33	63	1	4	101
$16 to $17.99	79	343	1	5	428
$18 to $19.99	51	93			144
$20 to $21.99	69	47		1	117
$22 to $24.99	33	36			69
$25 to $29.99	87	23			110
$30 to $34.99	35	1			36
$35 to $39.99	24				24
$40 and over	29				29
Totals	463	690	3	11	1,167

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	470	553	1,023
February	450	539	989
March	468	521	989
April	460	569	1,029
May	458	499	957
June	460	520	980
July	466	484	950
August	433	522	955
September	426	556	982
October	398	631	1,029
November	429	695	1,124
December	457	691	1,148

TABLE NO. 87. TRUNKS, VALISES, ETC.

(7 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	9	
Clerks, stenographers, salesmen, etc., 18 years of age and over	15	3
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	24	3
Wage earners:		
18 years of age and over	101	13
Under 18 years of age		
Totals	101	13

Salary and wage payments—annual:	
Officers, superintendents and managers	$31,680
Clerks, stenographers, salesmen, etc.	28,444
Wage earners (including piece workers)	132,532
Total	$192,656

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	1				1
$14 to $15.99	1				1
$16 to $17.99	5				5
$18 to $19.99	13	9			22
$20 to $21.99	10	1			11
$22 to $24.99	11	3			14
$25 to $29.99	22				22
$30 to $34.99	25				25
$35 to $39.99	9				9
$40 and over	7				7
Totals	104	13			117

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	129	20	149
February	116	20	136
March	117	22	139
April	125	24	149
May	122	23	145
June	121	19	140
July	107	19	126
August	108	20	128
September	112	21	133
October	116	21	137
November	106	16	122
December	104	14	118

TABLE NO. 89. WIRE WORK (INCLUDING WIRE ROPE, NETTING, ETC).

(5 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	9	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	32	4
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	41	5
Wage earners:		
18 years of age and over	184	
Under 18 years of age		
Totals	184	

Salary and wage payments—annual:	
Officers, superintendents and managers	$28,751
Clerks, stenographers, salesmen, etc	56,426
Wage earners (including piece workers)	282,035
Total	$367,212

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	2				2
$12 to $13.99					
$14 to $15.99	1				1
$16 to $17.99	22				22
$18 to $19.99	8				8
$20 to $21.99	21				21
$22 to $24.99	40				40
$25 to $29.99	19				19
$30 to $34.99	21				21
$35 to $39.99	12				12
$40 and over	38				38
Totals	184				184

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	189		189
February	182		182
March	184		184
April	183		183
May	163		163
June	157		157
July	157		157
August	135		135
September	159		159
October	160		160
November	177		177
December	182		182

TABLE NO. 90. ALL OTHER INDUSTRIES.

(55 establishments reporting.)

San Francisco.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	106	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	194	103
Clerks, stenographers, salesmen, etc., under 18 years of age	7	1
Totals	307	106
Wage earners:		
18 years of age and over	936	537
Under 18 years of age	15	16
Totals	951	553

Salary and wage payments—annual:	
Officers, superintendents and managers	$429,666
Clerks, stenographers, salesmen, etc.	487,981
Wage earners (including piece workers)	1,809,692
Total	$2,727,339

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	11	6	1		18
$5 to $5.99	55	6		10	71
$6 to $6.99	49		2		51
$7 to $7.99	25	4	2		31
$8 to $9.99	44	6			50
$10 to $11.99	10	22	3	1	36
$12 to $13.99	16	44	2	9	71
$14 to $15.99	21	65	1		87
$16 to $17.99	48	229	3	6	286
$18 to $19.99	40	117			157
$20 to $21.99	79	78			157
$22 to $24.99	167	66			233
$25 to $29.99	155	30			185
$30 to $34.99	204	12			216
$35 to $39.99	168	1			169
$40 and over	108	4			112
Totals	1,200	690	14	26	1,930

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	972	286	1,258
February	954	408	1,362
March	929	430	1,359
April	920	452	1,372
May	921	465	1,386
June	910	492	1,402
July	871	451	1,322
August	897	517	1,414
September	909	503	1,412
October	984	529	1,513
November	968	472	1,440
December	942	479	1,421

TABLE NO. 1. ALL INDUSTRIES—Continued.

(429 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	1,065	44
Clerks, stenographers, salesmen, etc., 18 years of age and over	3,771	1,190
Clerks, stenographers, salesmen, etc., under 18 years of age	52	32
Totals	4,888	1,266
Wage earners:		
18 years of age and over	18,168	6,541
Under 18 years of age	114	161
Totals	18,282	6,702

Salary and wage payments—annual:	
Officers, superintendents and managers	$5,692,049
Clerks, stenographers, salesmen, etc.	8,299,901
Wage earners (including piece workers)	32,212,155
Total	$46,204,105

Weekly Wage Rates of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	119	45		11	175
$5 to $5.99	34	34		2	70
$6 to $6.99	46	50	2		98
$7 to $7.99	21	70	1		92
$8 to $9.99	5	107	4	5	121
$10 to $11.99	24	206	7	20	257
$12 to $13.99	155	540	19	61	775
$14 to $15.99	304	683	24	26	1,037
$16 to $17.99	548	2,535	29	35	3,147
$18 to $19.99	1,009	948	19	8	1,984
$20 to $21.99	1,504	544	4	3	2,055
$22 to $24.99	2,897	385	6		3,288
$25 to $29.99	3,659	269	21		3,949
$30 to $34.99	2,863	306	13		3,182
$35 to $39.99	2,232	35			2,267
$40 and over	2,565	18	9		2,592
Totals	17,985	6,775	158	171	25,089

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	20,056	5,263	25,319
February	19,685	5,491	25,176
March	19,644	5,484	25,128
April	19,212	5,099	24,311
May	18,970	5,339	24,309
June	17,717	5,142	22,859
July	18,875	5,564	24,439
August	19,012	5,246	24,258
September	17,884	5,427	23,311
October	17,863	5,366	23,229
November	17,883	5,846	23,729
December	18,361	6,139	24,500

TABLE NO. 3. ARTIFICIAL STONE, CLAY AND CONCRETE PRODUCTS.

(6 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	13	
Clerks, stenographers, salesmen, etc., 18 years of age and over	7	4
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	20	4
Wage earners:		
18 years of age and over	111	15
Under 18 years of age		
Totals	111	15

Salary and wage payments—annual:	
Officers, superintendents and managers	$66,871
Clerks, stenographers, salesmen, etc.	71,754
Wage earners (including piece workers)	155,212
Total	$293,837

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99		3			3
$18 to $19.99	19				19
$20 to $21.99	15	2			17
$22 to $24.99	15	6			21
$25 to $29.99	29	4			33
$30 to $34.99	18				18
$35 to $39.99	1				1
$40 and over	14				14
Totals	111	15			126

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	120	15	135
February	131	15	146
March	101	13	114
April	112	14	126
May	101	13	114
June	114	13	127
July	113	15	128
August	101	15	116
September	95	12	107
October	103	13	116
November	110	14	124
December	114	15	129

TABLE NO. 4. AUTOMOBILES (INCLUDING BODIES AND PARTS).

(20 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	45	
Clerks, stenographers, salesmen, etc., 18 years of age and over	93	42
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	138	42
Wage earners:		
18 years of age and over	458	4
Under 18 years of age		
Totals	458	4

Salary and wage payments—annual:	
Officers, superintendents and managers	$179,330
Clerks, stenographers, salesmen, etc.	249,059
Wage earners (including piece workers)	769,104
Total	$1,197,493

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	10				10
$5 to $5.99	10				10
$6 to $6.99	7				7
$7 to $7.99	7				7
$8 to $9.99	1				1
$10 to $11.99	5				5
$12 to $13.99	12				12
$14 to $15.99	9				9
$16 to $17.99	4				4
$18 to $19.99	10				10
$20 to $21.99	53	1			54
$22 to $24.99	61	2			63
$25 to $29.99	74	1			75
$30 to $34.99	65				65
$35 to $39.99	68				68
$40 and over	69	1			70
Totals	465	5			470

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	481	13	494
February	455	13	468
March	504	11	515
April	547	13	560
May	466	12	478
June	416	11	427
July	437	11	448
August	446	11	457
September	439	11	450
October	452	9	461
November	437	16	453
December	468	5	473

TABLE NO. 8. BAKERY PRODUCTS.

(17 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	57	
Clerks, stenographers, salesmen, etc., 18 years of age and over	398	66
Clerks, stenographers, salesmen, etc., under 18 years of age	3	
Totals	458	66
Wage earners:		
18 years of age and over	863	359
Under 18 years of age	1	10
Totals	864	369

Salary and wage payments—annual:	
Officers, superintendents and managers	$272,679
Clerks, stenographers, salesmen, etc.	754,147
Wage earners (including piece workers)	1,304,270
Total	$2,331,096

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	1	3			4
$5 to $5.99	1	4			5
$6 to $6.99					
$7 to $7.99	1	1			2
$8 to $9.99	1	1			2
$10 to $11.99	4	6		4	14
$12 to $13.99	3	40		3	46
$14 to $15.99	4	46			50
$16 to $17.99	18	147	1	2	168
$18 to $19.99	40	62		1	103
$20 to $21.99	89	25			114
$22 to $24.99	135	18			153
$25 to $29.99	192	13			205
$30 to $34.99	165	1			166
$35 to $39.99	122				122
$40 and over	87				87
Totals	863	367	1	10	1,241

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	758	322	1,080
February	775	338	1,113
March	759	272	1,031
April	757	264	1,021
May	779	256	1,035
June	800	293	1,093
July	800	274	1,074
August	796	240	1,036
September	844	332	1,176
October	857	348	1,205
November	859	378	1,237
December	876	376	1,252

TABLE NO. 13. BOXES, BAGS, CARTONS, ETC., PAPER.

(9 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	25	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	28	20
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	54	22
Wage earners:		
18 years of age and over	471	281
Under 18 years of age	3	17
Totals	474	298

Salary and wage payments—annual:	
Officers, superintendents and managers	$123,710
Clerks, stenographers, salesmen, etc.	71,978
Wage earners (including piece workers)	714,911
Total	$910,599

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99		25			25
$12 to $13.99	39	43	2	13	97
$14 to $15.99	11	74			85
$16 to $17.99	14	83	1	4	102
$18 to $19.99	25	34			59
$20 to $21.99	81	12			93
$22 to $24.99	99	2			101
$25 to $29.99	80	1			81
$30 to $34.99	62	2			64
$35 to $39.99	20				20
$40 and over	38				38
Totals	469	276	3	17	765

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	402	188	590
February	394	196	590
March	393	210	603
April	388	211	599
May	383	209	592
June	369	238	607
July	367	246	613
August	375	212	587
September	395	265	660
October	406	288	694
November	427	323	750
December	474	301	775

TABLE NO. 14. BOXES, WOOD.

(4 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	16	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	8	5
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	24	7
Wage earners:		
18 years of age and over	277	45
Under 18 years of age		
Totals	277	45

Salary and wage payments—annual:	
Officers, superintendents and managers	$63,298
Clerks, stenographers, salesmen, etc.	25,435
Wage earners (including piece workers)	279,883
Total	$368,616

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	12	6			18
$14 to $15.99	11	3			14
$16 to $17.99	9	25			34
$18 to $19.99	14	6			20
$20 to $21.99	39	5			44
$22 to $24.99	104				104
$25 to $29.99	46				46
$30 to $34.99	23				23
$35 to $39.99	8				8
$40 and over	11				11
Totals	277	45			322

Number of Wage Earners, by Months.

Months	Males	Females	Total
January	238	44	282
February	237	33	270
March	248	43	291
April	269	44	313
May	287	45	332
June	229	40	269
July	212	38	250
August	228	16	244
September	222	31	253
October	238	32	270
November	286	35	321
December	277	45	322

TABLE NO. 15. BRASS, BRONZE AND COPPER PRODUCTS.

(8 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	16	3
Clerks, stenographers, salesmen, etc., 18 years of age and over	28	9
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	44	12
Wage earners:		
18 years of age and over	238	6
Under 18 years of age	20	
Totals	258	6

Salary and wage payments—annual:	
Officers, superintendents and managers	$81,475
Clerks, stenographers, salesmen, etc.	78,886
Wage earners (including piece workers)	327,450
Total	$487,811

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	65				65
$5 to $5.99	6				6
$6 to $6.99					
$7 to $7.99	1				1
$8 to $9.99	1				1
$10 to $11.99					
$12 to $13.99					
$14 to $15.99	3				3
$16 to $17.99	3	4	2		9
$18 to $19.99	6		3		9
$20 to $21.99	9	3			12
$22 to $24.99	34				34
$25 to $29.99	23	1			24
$30 to $34.99	33				33
$35 to $39.99	33				33
$40 and over	41				41
Totals	258	8	5		271

Number of Wage Earners, by Months.

Months	Males	Females	Total
January	160	5	165
February	173	5	178
March	165	4	169
April	167	5	172
May	233	5	238
June	246	8	254
July	244	7	251
August	244	7	251
September	248	7	255
October	241	7	248
November	262	7	269
December	264	6	270

TABLE NO. 16. BRICK AND TILE.

(8 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	19	
Clerks, stenographers, salesmen, etc., 18 years of age and over	39	4
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	59	4
Wage earners:		
18 years of age and over	651	74
Under 18 years of age	4	7
Totals	655	81

Salary and wage payments—annual:	
Officers, superintendents and managers	$65,212
Clerks, stenographers, salesmen, etc	59,619
Wage earners (including piece workers)	809,291
Total	$934,122

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	27				27
$5 to $5.99					
$6 to $6.99	7				7
$7 to $7.99	5				5
$8 to $9.99					
$10 to $11.99					
$12 to $13.99		23			23
$14 to $15.99	3	9		3	15
$16 to $17.99		32	2	4	38
$18 to $19.99	69	7	1		77
$20 to $21.99	83	1	1		85
$22 to $24.99	182				182
$25 to $29.99	129	2			131
$30 to $34.99	76				76
$35 to $39.99	47				47
$40 and over	35				35
Totals	663	74	4	7	748

Number of Wage Earners, by Months.

Months	Males	Females	Total
January	626	59	685
February	581	61	642
March	584	62	646
April	607	65	672
May	626	61	687
June	628	60	688
July	619	61	680
August	664	62	726
September	671	64	735
October	641	63	704
November	627	71	698
December	660	81	741

TABLE NO. 17. BROOMS AND BRUSHES.

(5 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	9	
Clerks, stenographers, salesmen, etc., 18 years of age and over	15	1
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	25	1
Wage earners:		
18 years of age and over	55	1
Under 18 years of age	1	
Totals	56	1

Salary and wage payments—annual:	
Officers, superintendents and managers	$33,250
Clerks, stenographers, salesmen, etc.	16,965
Wage earners (including piece workers)	77,686
Total	$127,901

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99			1		1
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99			1		1
$14 to $15.99					
$16 to $17.99					
$18 to $19.99	5				5
$20 to $21.99	3				3
$22 to $24.99	5				5
$25 to $29.99	7				7
$30 to $34.99	18				18
$35 to $39.99	16				16
$40 and over					
Totals	54		2		56

Number of Wage Earners, by Months.

Months	Males	Females	Total
January	51		51
February	52		52
March	51		51
April	55		55
May	43		43
June	43		43
July	52		52
August	54		54
September	54		54
October	55		55
November	56		56
December	57		57

TABLE NO. 21. CANNING AND PRESERVING OF FRUITS AND VEGETABLES.

(4 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	8	
Clerks, stenographers, salesmen, etc., 18 years of age and over	6	5
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	14	5
Wage earners:		
18 years of age and over	200	541
Under 18 years of age	8	63
Totals	208	704

Salary and wage payments—annual:	
Officers, superintendents and managers	$37,915
Clerks, stenographers, salesmen, etc	11,766
Wage earners (including piece workers)	91,530
Total	$141,211

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5		11			11
$5 to $5.99		6			6
$6 to $6.99		20			20
$7 to $7.99		36			36
$8 to $9.99		47		5	52
$10 to $11.99		46		14	60
$12 to $13.99	1	147	5	28	181
$14 to $15.99		84	1	11	96
$16 to $17.99	22	119	2	12	155
$18 to $19.99	13	60		1	74
$20 to $21.99	19	31		2	52
$22 to $24.99	58	24			82
$25 to $29.99	33	13			46
$30 to $34.99	35	6			41
$35 to $39.99	10				10
$40 and over	9				9
Totals	200	680	8	73	931

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	15	5	20
February	16	2	18
March	18	5	23
April	21	9	30
May	69	297	366
June	21	11	32
July	137	427	564
August	108	212	320
September	107	220	327
October	20	8	28
November	16	5	21
December	17	7	24

TABLE NO. 26. CHEMICALS (INCLUDING CHEMICAL FERTILIZERS).

(5 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	11	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	14	6
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	25	7
Wage earners:		
18 years of age and over	62	1
Under 18 years of age	1	
Totals	63	1

Salary and wage payments—annual:	
Officers, superintendents and managers	$39,760
Clerks, stenographers, salesmen, etc.	40,503
Wage earners (including piece workers)	82,398
Total	$162,661

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99		1			1
$18 to $19.99			1		1
$20 to $21.99	29				29
$22 to $24.99	8				8
$25 to $29.99	4				4
$30 to $34.99	10				10
$35 to $39.99	10				10
$40 and over	1				1
Totals	62	1	1		64

Number of Wage Earners, by Months.

Months	Males	Females	Total
January	60	2	62
February	56	1	57
March	59	2	61
April	54	1	55
May	51	1	52
June	50	2	52
July	50	2	52
August	51	1	52
September	72	1	73
October	57	2	59
November	56	1	57
December	63	1	64

TABLE NO. 27. CLOTHING, MEN'S.

(9 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	30	3
Clerks, stenographers, salesmen, etc., 18 years of age and over	53	24
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	83	27
Wage earners:		
18 years of age and over	72	765
Under 18 years of age	5	7
Totals	77	772

Salary and wage payments—annual:	
Officers, superintendents and managers	$194,782
Clerks, stenographers, salesmen, etc.	126,287
Wage earners (including piece workers)	713,684
Total	$1,034,753

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5		6		1	7
$5 to $5.99		5			5
$6 to $6.99		8			8
$7 to $7.99		5			5
$8 to $9.99		14			14
$10 to $11.99	1	28		1	30
$12 to $13.99	1	39	1		41
$14 to $15.99	2	72	3	2	79
$16 to $17.99	5	124	1	1	131
$18 to $19.99	2	80		1	83
$20 to $21.99	2	66			68
$22 to $24.99	3	53			56
$25 to $29.99	13	74	1		88
$30 to $34.99	16	25			41
$35 to $39.99	4	6			10
$40 and over	11	5			16
Totals	60	610	6	6	682

Number of Wage Earners, by Months.

Months	Males	Females	Total
January	70	573	643
February	71	616	687
March	71	654	725
April	79	753	832
May	80	765	845
June	73	745	818
July	77	707	784
August	78	698	776
September	79	720	799
October	77	768	845
November	77	755	832
December	73	702	775

TABLE NO. 28. CLOTHING, WOMEN'S.

(15 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	24	6
Clerks, stenographers, salesmen, etc., 18 years of age and over	18	6
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	42	12
Wage earners:		
18 years of age and over	51	284
Under 18 years of age	3	1
Totals	54	285

Salary and wage payments—annual:	
Officers, superintendents and managers	$118,910
Clerks, stenographers, salesmen, etc.	70,656
Wage earners (including piece workers)	376,134
Total	$565,700

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99			1		1
$7 to $7.99					
$8 to $9.99		1			1
$10 to $11.99		4	1	1	6
$12 to $13.99	3	18	1		22
$14 to $15.99	1	16			17
$16 to $17.99	8	120			128
$18 to $19.99	9	40			49
$20 to $21.99	6	42			48
$22 to $24.99	3	27			30
$25 to $29.99	9	17			26
$30 to $34.99	5	11			16
$35 to $39.99	5	6			11
$40 and over	26	3			29
Totals	75	305	3	1	384

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	48	215	263
February	51	262	313
March	53	300	353
April	47	338	385
May	54	331	385
June	50	341	391
July	55	311	366
August	56	320	376
September	54	341	395
October	56	357	413
November	50	337	387
December	49	310	359

TABLE NO. 30. CONFECTIONERY.

(12 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	30	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	72	30
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	102	32
Wage earners:		
18 years of age and over	248	286
Under 18 years of age		5
Totals	248	291

Salary and wage payments—annual:	
Officers, superintendents and managers	$146,308
Clerks, stenographers, salesmen, etc.	18,424
Wage earners (including piece workers)	529,926
Total	$694,658

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	2	3			5
$5 to $5.99					
$6 to $6.99		1			1
$7 to $7.99					
$8 to $9.99		5			5
$10 to $11.99		7			7
$12 to $13.99		22	3		25
$14 to $15.99	1	32			33
$16 to $17.99	2	121			123
$18 to $19.99	2	32			34
$20 to $21.99	18	15			33
$22 to $24.99	37	24			61
$25 to $29.99	60	22			82
$30 to $34.99	38				38
$35 to $39.99	47				47
$40 and over	43				43
Totals	250	284	3		537

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	213	216	429
February	219	206	425
March	232	221	453
April	222	204	426
May	247	206	453
June	248	204	452
July	244	190	434
August	240	193	433
September	248	223	471
October	256	271	537
November	255	276	531
December	253	316	569

TABLE NO. 32. ELECTRIC MACHINERY, APPARATUS AND SUPPLIES.

(5 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	15	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	19	13
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	34	14
Wage earners:		
18 years of age and over	123	15
Under 18 years of age	2	
Totals	125	15

Salary and wage payments—annual:	
Officers, superintendents and managers	$18,385
Clerks, stenographers, salesmen, etc.	35,785
Wage earners (including piece workers)	195,592
Total	$249,762

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	1				1
$12 to $13.99	2			2	4
$14 to $15.99					
$16 to $17.99		4		2	6
$18 to $19.99	4	8		2	14
$20 to $21.99	1	8	1	1	11
$22 to $24.99	4	6	1		11
$25 to $29.99	13	14	2		29
$30 to $34.99	8	10	4		22
$35 to $39.99	11	4			15
$40 and over	14	5			19
Totals	58	59	8	7	132

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	126	27	153
February	119	28	147
March	118	28	146
April	117	24	141
May	121	16	137
June	118	25	143
July	114	23	137
August	111	21	132
September	118	20	138
October	127	21	148
November	110	14	124
December	117	15	132

TABLE NO. 34. ENGINES AND PUMPS—GAS, GASOLINE, ETC.

(4 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	20	
Clerks, stenographers, salesmen, etc., 18 years of age and over	65	19
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	85	19
Wage earners:		
18 years of age and over	266	
Under 18 years of age	1	
Totals	267	

Salary and wage payments—annual:	
Officers, superintendents and managers	$150,992
Clerks, stenographers, salesmen, etc	208,760
Wage earners (including piece workers)	468,150
Total	$827,902

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	1				1
$12 to $13.99	1				1
$14 to $15.99	4		1		5
$16 to $17.99	1				1
$18 to $19.99	5				5
$20 to $21.99	10				10
$22 to $24.99	31				31
$25 to $29.99	65				65
$30 to $34.99	73				73
$35 to $39.99	51				51
$40 and over	24				24
Totals	266		1		267

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	398		398
February	386		386
March	390		390
April	388		388
May	347		347
June	308		308
July	314		314
August	312		312
September	215		215
October	215		215
November	223		223
December	263	1	264

TABLE NO. 37. FLOUR MILL AND GRIST MILL PRODUCTS.

(4 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	15	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	95	26
Clerks, stenographers, salesmen, etc., under 18 years of age		1
Totals	110	28
Wage earners:		
18 years of age and over	211	11
Under 18 years of age		
Totals	211	11

Salary and wage payments—annual:	
Officers, superintendents and managers	$73,661
Clerks, stenographers, salesmen, etc.	172,533
Wage earners (including piece workers)	336,911
Total	$583,105

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99	2				2
$16 to $17.99	2	4			6
$18 to $19.99	6	4			10
$20 to $21.99	2	1			3
$22 to $24.99	25				25
$25 to $29.99	34				34
$30 to $34.99	120				120
$35 to $39.99	19				19
$40 and over	3				3
Totals	213	9			222

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	184	10	194
February	180	10	190
March	186	10	196
April	176	10	186
May	175	9	184
June	172	10	182
July	191	9	200
August	187	10	197
September	195	9	204
October	197	9	206
November	211	9	220
December	213	9	222

TABLE NO. 38. FOOD PREPARATIONS.

(7 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	13	
Clerks, stenographers, salesmen, etc., 18 years of age and over	17	13
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	30	13
Wage earners:		
18 years of age and over	47	642
Under 18 years of age	2	15
Totals	49	657

Salary and wage payments—annual:	
Officers, superintendents and managers	$47,568
Clerks, stenographers, salesmen, etc.	39,192
Wage earners (including piece workers)	221,206
Total	$307,966

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5		12		10	22
$5 to $5.99		15		2	17
$6 to $6.99		20			20
$7 to $7.99		26			26
$8 to $9.99		30			30
$10 to $11.99		57			57
$12 to $13.99		54		3	57
$14 to $15.99	2	91			93
$16 to $17.99	1	134	1		136
$18 to $19.99	1	81	2		84
$20 to $21.99	4	61			65
$22 to $24.99	8	55			63
$25 to $29.99	22	5			27
$30 to $34.99	3				3
$35 to $39.99	5				5
$40 and over	1				1
Totals	47	641	3	15	706

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	50	656	706
February	50	650	700
March	46	645	691
April	50	39	89
May	46	35	81
June	47	35	82
July	48	63	111
August	35	32	67
September	38	43	81
October	42	54	96
November	49	545	594
December	58	660	718

TABLE NO. 39. FOUNDRY AND MACHINE SHOP PRODUCTS.

(34 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	75	4
Clerks, stenographers, salesmen, etc., 18 years of age and over	125	36
Clerks, stenographers, salesmen, etc., under 18 years of age	2	
Totals	202	40
Wage earners:		
18 years of age and over	1,112	11
Under 18 years of age	4	
Totals	1 116	11

Salary and wage payments—annual:	
Officers, superintendents and managers	$297,093
Clerks, stenographers, salesmen, etc.	250,669
Wage earners (including piece workers)	1,740,570
Total	$2,288,332

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99		3	3		6
$10 to $11.99	2				2
$12 to $13.99	5				5
$14 to $15.99	5				5
$16 to $17.99	28	3	1		32
$18 to $19.99	34	2			36
$20 to $21.99	92	4			96
$22 to $24.99	93				93
$25 to $29.99	195	1			196
$30 to $34.99	236				236
$35 to $39.99	188				188
$40 and over	187				187
Totals	1,065	13	4		1,082

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,192	2	1,194
February	1,059	1	1,060
March	1,089	1	1,090
April	1,145	2	1,147
May	1,145	2	1,147
June	1,113	2	1,115
July	1,139	2	1,141
August	1,120	1	1,121
September	1,080	1	1,081
October	1,060	2	1,062
November	1,098	2	1,100
December	1,121	2	1,123

TABLE NO. 40. FURNITURE, BANK AND STORE FIXTURES.

(18 establishments reporting).

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	4	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	89	39
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	93	40
Wage earners:		
18 years of age and over	889	73
Under 18 years of age	9	1
Totals	898	74

Salary and wage payments—annual:	
Officers, superintendents and managers	$221,590
Clerks, stenographers, salesmen, etc	225,219
Wage earners (including piece workers)	1,309,985
Total	$1,756,794

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99	3				3
$8 to $9.99	1				1
$10 to $11.99	1		4		5
$12 to $13.99	18				18
$14 to $15.99	13		1		14
$16 to $17.99	13	40	4		57
$18 to $19.99	61	14			75
$20 to $21.99	60	9			69
$22 to $24.99	150	3			153
$25 to $29.99	127	5			132
$30 to $34.99	88	2			90
$35 to $39.99	220				220
$40 and over	156				156
Totals	911	73	9		993

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	612	44	656
February	649	66	715
March	696	65	761
April	719	75	794
May	696	70	766
June	714	74	788
July	768	79	847
August	793	81	874
September	850	82	932
October	879	79	958
November	896	78	974
December	901	72	973

TABLE NO. 41. GAS (IN CONTAINERS).

(3 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	4	
Clerks, stenographers, salesmen, etc., 18 years of age and over	13	7
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	17	7
Wage earners:		
18 years of age and over	47	
Under 18 years of age		
Totals	47	

Salary and wage payments—annual:	
Officers, superintendents and managers	$11,278
Clerks, stenographers, salesmen, etc.	29,688
Wage earners (including piece workers)	79,191
Total	$120,154

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99					
$18 to $19.99	1				1
$20 to $21.99					
$22 to $24.99	5				5
$25 to $29.99	5				5
$30 to $34.99	16				16
$35 to $39.99	15				15
$40 and over	5				5
Totals	47				47

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	59		59
February	56		56
March	55		55
April	51		51
May	51		51
June	48		48
July	46		46
August	45		45
September	44		44
October	44		44
November	43		43
December	43		43

TABLE NO. 42. GAS AND ELECTRIC FIXTURES.

(5 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	15	
Clerks, stenographers, salesmen, etc., 18 years of age and over	29	7
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	44	7
Wage earners:		
18 years of age and over	82	15
Under 18 years of age		
Totals	82	15

Salary and wage payments—annual:	
Officers, superintendents and managers	$108,562
Clerks, stenographers, salesmen, etc.	80,230
Wage earners (including piece workers)	145,190
Total	$333,982

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99		1			1
$12 to $13.99	4	2			6
$14 to $15.99	4	1			5
$16 to $17.99	3	4			7
$18 to $19.99	4	2			6
$20 to $21.99	8				8
$22 to $24.99	6				6
$25 to $29.99	7	4			11
$30 to $34.99	11				11
$35 to $39.99	20				20
$40 and over	15	1			16
Totals	82	15			97

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	100	16	116
February	100	15	115
March	93	14	107
April	89	15	104
May	85	15	100
June	77	16	93
July	75	15	90
August	74	14	88
September	72	14	86
October	73	14	87
November	78	15	93
December	82	15	97

TABLE NO. 43. GLASS, CUTTING AND ORNAMENTING (INCLUDING MIRRORS).

(3 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	3	
Clerks, stenographers, salesmen, etc., 18 years of age and over	3	
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	6	
Wage earners:		
18 years of age and over	39	
Under 18 years of age		
Totals	39	

Salary and wage payments—annual:	
Officers, superintendents and managers	$17,473
Clerks, stenographers, salesmen, etc.	3,756
Wage earners (including piece workers)	63,602
Total	$84,831

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99					
$18 to $19.99	2				2
$20 to $21.99	1	1			2
$22 to $24.99	7				7
$25 to $29.99	3				3
$30 to $34.99	4				4
$35 to $39.99	4				4
$40 and over	18				18
Totals	39	1			40

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	17	2	19
February	31	2	33
March	31	2	33
April	20	2	22
May	32	2	34
June	32	2	34
July	31	2	33
August	35	2	37
September	36	2	38
October	37	2	39
November	40	2	42
December	39	1	40

TABLE NO. 47. ICE, MANUFACTURED.

(8 establishments reporting).

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	16	
Clerks, stenographers, salesmen, etc., 18 years of age and over	29	3
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	45	3
Wage earners:		
18 years of age and over	200	
Under 18 years of age		
Totals	200	

Salary and wage payments—annual:	
Officers, superintendents and managers	$51,611
Clerks, stenographers, salesmen, etc	50,268
Wage earners (including piece workers)	406,312
Total	$508,191

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99					
$18 to $19.99					
$20 to $21.99					
$22 to $24.99	2				2
$25 to $29.99	84				84
$30 to $34.99	76				76
$35 to $39.99	24				24
$40 and over	14				14
Totals	200				200

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	202		202
February	200		200
March	216		216
April	295		295
May	306		306
June	306		306
July	231		231
August	228		228
September	219		219
October	217		217
November	216		216
December	196		196

TABLE NO. 48. IRON AND STEEL FORGINGS, BOLTS AND NUTS.

(3 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	13	
Clerks, stenographers, salesmen, etc., 18 years of age and over	13	6
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	26	6
Wage earners:		
18 years of age and over	455	
Under 18 years of age		
Totals	455	

Salary and wage payments—annual:	
Officers, superintendents and managers	$111,400
Clerks, stenographers, salesmen, etc.	32,417
Wage earners (including piece workers)	617,083
Total	$760,900

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	30				30
$14 to $15.99	110				110
$16 to $17.99	28				28
$18 to $19.99	60				60
$20 to $21.99	25				25
$22 to $24.99	46				46
$25 to $29.99	62				62
$30 to $34.99	45				45
$35 to $39.99	27				27
$40 and over	22				22
Totals	455				455

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	445		445
February	423		423
March	417		417
April	402		402
May	381		381
June	334		334
July	362		362
August	362		362
September	357		357
October	349		349
November	386		386
December	455		455

TABLE NO. 49. IRON AND STEEL, STRUCTURAL AND ORNAMENTAL.

(5 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	41	
Clerks, stenographers, salesmen, etc., 18 years of age and over	124	41
Clerks, stenographers, salesmen, etc., under 18 years of age	5	
Totals	170	41
Wage earners:		
18 years of age and over	1,025	
Under 18 years of age	8	
Totals	1,033	

Salary and wage payments—annual:	
Officers, superintendents and managers	$270,334
Clerks, stenographers, salesmen, etc	177,437
Wage earners (including piece workers)	1,941,391
Total	$2,389,162

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	1				1
$14 to $15.99	3		3		6
$16 to $17.99	6		1		7
$18 to $19.99	27		2		29
$20 to $21.99	86				86
$22 to $24.99	182		1		183
$25 to $29.99	210				210
$30 to $34.99	196				196
$35 to $39.99	200				200
$40 and over	115				115
Totals	1,026		7		1,033

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,480		1,480
February	1,404		1,404
March	1,389		1,389
April	1,403		1,403
May	1,237		1,237
June	1,303		1,303
July	1,364		1,364
August	1,442		1,442
September	1,256		1,256
October	1,163		1,163
November	973		973
December	1,033		1,033

TABLE NO. 50. JEWELRY.

(5 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	8	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	50	9
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	59	10
Wage earners:		
18 years of age and over	91	6
Under 18 years of age		
Totals	91	6

Salary and wage payments—annual:	
Officers, superintendents and managers	$50,513
Clerks, stenographers, salesmen, etc.	99,515
Wage earners (including piece workers)	200,042
Total	$350,070

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99	1				1
$12 to $13.99		1			1
$14 to $15.99	1				1
$16 to $17.99		1			1
$18 to $19.99		2			2
$20 to $21.99	2	3			5
$22 to $24.99	7	1			8
$25 to $29.99	7	1			8
$30 to $34.99	4	1			5
$35 to $39.99	16				16
$40 and over	53				53
Totals	91	10			101

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	91	8	99
February	91	8	99
March	90	8	98
April	89	8	97
May	86	9	95
June	88	9	97
July	87	9	96
August	86	9	95
September	85	9	94
October	86	8	94
November	88	9	97
December	94	10	104

TABLE NO. 51. KNIT GOODS.

(4 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	11	
Clerks, stenographers, salesmen, etc., 18 years of age and over	22	18
Clerks, stenographers, salesmen, etc., under 18 years of age	1	
Totals	34	18
Wage earners:		
18 years of age and over	50	354
Under 18 years of age		1
Totals	50	355

Salary and wage payments—annual:	
Officers, superintendents and managers	$54,200
Clerks, stenographers, salesmen, etc	106,669
Wage earners (including piece workers)	292,888
Total	$453,757

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99		1			1
$8 to $9.99					
$10 to $11.99					
$12 to $13.99		53		1	54
$14 to $15.99	1	20			21
$16 to $17.99	3	122			125
$18 to $19.99	4	78			82
$20 to $21.99	7	40			47
$22 to $24.99		17			17
$25 to $29.99	7	13			20
$30 to $34.99	12	9			21
$35 to $39.99	6	1			7
$40 and over	10				10
Totals	50	354		1	405

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	33	110	143
February	41	198	239
March	43	224	267
April	48	277	325
May	47	303	350
June	51	311	362
July	49	281	330
August	50	272	322
September	48	300	348
October	52	301	353
November	52	301	353
December	50	354	404

TABLE NO. 52. LAUNDRIES (STEAM).

(15 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	40	4
Clerks, stenographers, salesmen, etc., 18 years of age and over	314	149
Clerks, stenographers, salesmen, etc., under 18 years of age	8	5
Totals	362	158
Wage earners:		
18 years of age and over	424	1,661
Under 18 years of age	2	13
Totals	426	1,674

Salary and wage payments—annual:	
Officers, superintendents and managers	$190,161
Clerks, stenographers, salesmen, etc	895,316
Wage earners (including piece workers)	1,824,447
Total	$2,909,924

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5		1			1
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99		5			5
$10 to $11.99		28			28
$12 to $13.99		44	1	6	51
$14 to $15.99	5	146		2	153
$16 to $17.99	32	1,091	1	4	1,128
$18 to $19.99	42	241			283
$20 to $21.99	71	87			158
$22 to $24.99	100	72			172
$25 to $29.99	141	36			177
$30 to $34.99	83	12			95
$35 to $39.99	24	2			26
$40 and over	23				23
Totals	521	1,765	2	12	2,300

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	595	1,819	2,414
February	600	1,784	2,384
March	606	1,794	2,400
April	604	1,779	2,383
May	596	1,735	2,331
June	603	1,740	2,343
July	618	1,799	2,417
August	585	1,778	2,363
September	583	1,777	2,360
October	593	1,759	2,352
November	595	1,712	2,307
December	589	1,883	2,472

TABLE NO. 53. LEATHER GOODS.

(5 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	8	
Clerks, stenographers, salesmen, etc., 18 years of age and over	27	9
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	35	9
Wage earners:		
18 years of age and over	67	29
Under 18 years of age		
Totals	67	29

Salary and wage payments—annual:	
Officers, superintendents and managers	$33,800
Clerks, stenographers, salesmen, etc.	64,903
Wage earners (including piece workers)	115,007
Total	$213,710

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	2	2			4
$14 to $15.99	1				1
$16 to $17.99	5	22			27
$18 to $19.99	3	4			7
$20 to $21.99	5	1			6
$22 to $24.99	6				6
$25 to $29.99	13				13
$30 to $34.99	13				13
$35 to $39.99	12				12
$40 and over	9				9
Totals	69	29			98

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	53	37	90
February	50	35	85
March	56	38	94
April	62	49	111
May	59	44	103
June	54	45	99
July	55	41	96
August	52	28	80
September	52	25	77
October	54	24	78
November	62	24	86
December	66	29	95

TABLE NO. 57. LUMBER INDUSTRY (PLANING MILLS).

(8 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	4	
Clerks, stenographers, salesmen, etc., 18 years of age and over	51	12
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	55	12
Wage earners:		
18 years of age and over	594	
Under 18 years of age		
Totals	594	

Salary and wage payments—annual:	
Officers, superintendents and managers	$16,400
Clerks, stenographers, salesmen, etc.	90,469
Wage earners (including piece workers)	712,127
Total	$818,996

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	5				5
$5 to $5.99	2				2
$6 to $6.99	8				8
$7 to $7.99					
$8 to $9.99					
$10 to $11.99			1		1
$12 to $13.99					
$14 to $15.99	8				8
$16 to $17.99	3		1		4
$18 to $19.99	73				73
$20 to $21.99	102				102
$22 to $24.99	96		3		99
$25 to $29.99	122		3		125
$30 to $34.99	44		6		50
$35 to $39.99	40				40
$40 and over	63		9		72
Totals	566		23		589

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	426	1	427
February	412	1	413
March	420	1	421
April	457	1	458
May	456	1	457
June	486	1	487
July	431	1	432
August	512	1	513
September	541	1	542
October	570	1	571
November	636	1	637
December	596	1	597

TABLE NO. 58. LUMBER INDUSTRY—SASH AND DOOR MILLS AND HOUSE FINISH.

(13 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	59	
Clerks, stenographers, salesmen, etc., 18 years of age and over	326	104
Clerks, stenographers, salesmen, etc., under 18 years of age	3	1
Totals	388	105
Wage earners:		
18 years of age and over	2,322	13
Under 18 years of age	1	
Totals	2,323	13

Salary and wage payments—annual:	
Officers, superintendents and managers	$340,969
Clerks, stenographers, salesmen, etc	743,717
Wage earners (including piece workers)	2,606,059
Total	$3,690,745

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99		1			1
$12 to $13.99	2				2
$14 to $15.99	2				2
$16 to $17.99	14	2			16
$18 to $19.99	35	1	2		38
$20 to $21.99	217	2			219
$22 to $24.99	509	1			510
$25 to $29.99	504	2			506
$30 to $34.99	307	1			308
$35 to $39.99	329				329
$40 and over	268				268
Totals	2,187	10	2		2,199

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,623	10	1,633
February	1,582	9	1,591
March	1,622	8	1,630
April	1,793	8	1,801
May	1,741	8	1,749
June	1,601	8	1,609
July	1,580	8	1,588
August	1,841	7	1,848
September	1,864	8	1,872
October	1,941	8	1,949
November	2,178	8	2,186
December	2,356	11	2,367

TABLE NO. 62. MATTRESSES, PILLOWS AND BEDDING.

(3 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	9	
Clerks, stenographers, salesmen, etc., 18 years of age and over	26	9
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	35	9
Wage earners:		
18 years of age and over	111	46
Under 18 years of age	1	2
Totals	112	48

Salary and wage payments—annual:	
Officers, superintendents and managers	$45,004
Clerks, stenographers, salesmen, etc.	51,182
Wage earners (including piece workers)	210,511
Total	$306,697

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99		5			5
$14 to $15.99	1	4		2	7
$16 to $17.99	1	15	1		17
$18 to $19.99	8	15			23
$20 to $21.99	5	1			6
$22 to $24.99	17	6			23
$25 to $29.99	34				34
$30 to $34.99	12				12
$35 to $39.99	8				8
$40 and over	25				25
Totals	111	46	1	2	160

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	111	32	143
February	110	32	142
March	124	34	158
April	111	36	147
May	111	38	149
June	105	38	143
July	107	41	148
August	106	39	145
September	115	48	163
October	110	49	159
November	114	50	164
December	112	48	160

TABLE NO. 63. METAL SIGNS, STENCILS AND RUBBER STAMPS.

(3 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	6	
Clerks, stenographers, salesmen, etc., 18 years of age and over	11	4
Clerks, stenographers, salesmen, etc., under 18 years of age		1
Totals	17	5
Wage earners:		
18 years of age and over	50	26
Under 18 years of age		
Totals	50	26

Salary and wage payments—annual:	
Officers, superintendents and managers	$35,700
Clerks, stenographers, salesmen, etc.	14,618
Wage earners (including piece workers)	79,035
Total	$129,353

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99		3			3
$16 to $17.99		16			16
$18 to $19.99	5	5			10
$20 to $21.99	7	2			9
$22 to $24.99	1				1
$25 to $29.99	21				21
$30 to $34.99	4				4
$35 to $39.99	7				7
$40 and over	5				5
Totals	50	26			76

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	44	18	62
February	45	20	65
March	42	24	66
April	53	31	84
May	60	32	92
June	62	34	96
July	56	31	87
August	54	30	84
September	53	27	80
October	45	19	64
November	45	20	65
December	51	28	79

TABLE NO. 65. OIL STOVES AND OIL BURNING EQUIPMENT.

(3 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	3	
Clerks, stenographers, salesmen, etc., 18 years of age and over	3	1
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	6	1
Wage earners:		
18 years of age and over	20	
Under 18 years of age	2	
Totals	22	

Salary and wage payments—annual:	
Officers, superintendents and managers	$9,204
Clerks, stenographers, salesmen, etc	6,964
Wage earners (including piece workers)	34,353
Total	$50,521

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99			1		1
$12 to $13.99					
$14 to $15.99			1		1
$16 to $17.99	3				3
$18 to $19.99	1				1
$20 to $21.99					
$22 to $24.99					
$25 to $29.99					
$30 to $34.99	2				2
$35 to $39.99	9				9
$40 and over	5				5
Totals	20		2		22

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	27	1	28
February	25	1	26
March	26	1	27
April	25	1	26
May	22	1	23
June	22	1	23
July	23	1	24
August	21	1	22
September	18	1	19
October	18	1	19
November	20	1	21
December	20	1	21

TABLE NO. 66. OIL WELL TOOLS AND SUPPLIES.

(6 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	17	
Clerks, stenographers, salesmen, etc., 18 years of age and over	33	12
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	50	12
Wage earners:		
18 years of age and over	219	
Under 18 years of age	1	
Totals	220	

Salary and wage payments—annual:	
Officers, superintendents and managers	$79,415
Clerks, stenographers, salesmen, etc	110,718
Wage earners (including piece workers)	474,827
Total	$564,960

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99			1		1
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99					
$18 to $19.99	2				2
$20 to $21.99	3				3
$22 to $24.99	9				9
$25 to $29.99	59				59
$30 to $34.99	76				76
$35 to $39.99	27				27
$40 and over	43				43
Totals	219		1		220

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	330		330
February	332		332
March	331		331
April	316		316
May	315		315
June	318		318
July	298		298
August	296		296
September	264		264
October	220		220
November	211		211
December	220		220

TABLE NO. 68. PAINTS AND VARNISHES.

(4 establishments reporting).

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	9	
Clerks, stenographers, salesmen, etc., 18 years of age and over	18	7
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	27	7
Wage earners:		
18 years of age and over	99	15
Under 18 years of age	2	
Totals	101	15

Salary and wage payments—annual:	
Officers, superintendents and managers	$26,960
Clerks, stenographers, salesmen, etc.	27,972
Wage earners (including piece workers)	138,010
Total	$192,942

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99	1				1
$16 to $17.99	2	3			5
$18 to $19.99	2		1		3
$20 to $21.99	2	1			3
$22 to $24.99	23	2	1		26
$25 to $29.99	39	1			40
$30 to $34.99	11				11
$35 to $39.99	6				6
$40 and over	5				5
Totals	91	7	2		100

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	110	10	120
February	87	10	97
March	84	10	94
April	87	10	97
May	86	10	96
June	86	10	96
July	90	10	100
August	94	10	104
September	90	10	100
October	103	12	115
November	103	12	115
December	105	12	117

TABLE NO. 69. PAPER AND PAPER GOODS (NOT ELSEWHERE SPECIFIED).

(4 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	8	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	10	3
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	18	4
Wage earners:		
18 years of age and over	152	8
Under 18 years of age	1	
Totals	153	8

Salary and wage payments—annual:	
Officers, superintendents and managers	$79,707
Clerks, stenographers, salesmen, etc.	34,792
Wage earners (including piece workers)	212,343
Total	$326,842

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	2				2
$14 to $15.99	8				8
$16 to $17.99	8	3	1		12
$18 to $19.99	3	4			7
$20 to $21.99	16	1			17
$22 to $24.99	33				33
$25 to $29.99	28				28
$30 to $34.99	19				19
$35 to $39.99	23				23
$40 and over	12				12
Totals	152	8	1		161

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	184	5	189
February	180	5	185
March	160	5	165
April	151	9	160
May	135	9	144
June	136	8	144
July	163	6	169
August	162	10	172
September	149	9	158
October	129	12	141
November	150	10	160
December	153	8	161

TABLE NO. 71. PETROLEUM REFINING.

(8 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	34	1
Clerks, stenographers, salesmen, etc., 18 years of age and over	112	20
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	146	21
Wage earners:		
18 years of age and over	898	
Under 18 years of age		
Totals	898	

Salary and wage payments—annual:	
Officers, superintendents and managers	$240,099
Clerks, stenographers, salesmen, etc.	$222,303
Wage earners (including piece workers)	1,025,427
Total	$1,487,829

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99					
$18 to $19.99	83				83
$20 to $21.99	49				49
$22 to $24.99	213				213
$25 to $29.99	108				108
$30 to $34.99	212				212
$35 to $39.99	122				122
$40 and over	120				120
Totals	907				907

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	762		762
February	705		705
March	690		690
April	635		635
May	676		676
June	777		777
July	896		896
August	880		880
September	880		880
October	879		879
November	930		930
December	868		868

TABLE NO. 72. PHOTO-ENGRAVING, ELECTROTYPING AND STEREOTYPING.

(6 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	8	
Clerks, stenographers, salesmen, etc., 18 years of age and over	12	7
Clerks, stenographers, salesmen, etc., under 18 years of age	6	
Totals	26	7
Wage earners:		
18 years of age and over	68	
Under 18 years of age		
Totals	68	

Salary and wage payments—annual:	
Officers, superintendents and managers	$44,925
Clerks, stenographers, salesmen, etc	29,722
Wage earners (including piece workers)	141,079
Total	$215,726

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99	2				2
$16 to $17.99					
$18 to $19.99	3				3
$20 to $21.99	2				2
$22 to $24.99	6				6
$25 to $29.99	5				5
$30 to $34.99	4				4
$35 to $39.99	5				5
$40 and over	42				42
Totals	69				69

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	73	2	75
February	71	2	73
March	67		67
April	69		69
May	67		67
June	67		67
July	62		62
August	63		63
September	65		65
October	67		67
November	66		66
December	68		68

TABLE NO. 73. PRINTING AND PUBLISHING.

(41 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	96	6
Clerks, stenographers, salesmen, etc., 18 years of age and over	454	163
Clerks, stenographers, salesmen, etc., under 18 years of age	20	23
Totals	570	192
Wage earners:		
18 years of age and over	1,099	337
Under 18 years of age	30	14
Totals	1,129	351

Salary and wage payments—annual:	
Officers, superintendents and managers	$470,447
Clerks, stenographers, salesmen, etc.	1,178,036
Wage earners (including piece workers)	2,225,132
Total	$3,873,615

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99		1			1
$6 to $6.99					
$7 to $7.99			1		1
$8 to $9.99					
$10 to $11.99	1	2			3
$12 to $13.99	5	8	5	5	23
$14 to $15.99	12	19	12	3	46
$16 to $17.99	24	53	8	3	88
$18 to $19.99	31	111	4	1	147
$20 to $21.99	40	82	2		124
$22 to $24.99	50	32			82
$25 to $29.99	133	16			149
$30 to $34.99	115	13			128
$35 to $39.99	106	5			111
$40 and over	562	1			563
Totals	1,079	343	32	12	1,466

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,073	338	1,411
February	1,021	331	1,352
March	1,031	328	1,359
April	1,006	308	1,314
May	1,030	300	1,330
June	1,055	304	1,359
July	1,047	320	1,367
August	1,039	312	1,351
September	1,047	320	1,367
October	1,067	319	1,386
November	1,089	328	1,417
December	1,130	350	1,480

TABLE NO. 78. SHEET METAL PRODUCTS (NOT INCLUDING TIN CANS).

(9 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	22	3
Clerks, stenographers, salesmen, etc., 18 years of age and over	24	8
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	46	11
Wage earners:		
18 years of age and over	219	8
Under 18 years of age		
Totals	219	8

Salary and wage payments—annual:	
Officers, superintendents and managers	$112,242
Clerks, stenographers, salesmen, etc	47,126
Wage earners (including piece workers)	297,823
Total	$457,191

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	2				2
$5 to $5.99	2				2
$6 to $6.99	10				10
$7 to $7.99	2				2
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	1				1
$14 to $15.99	1	1			2
$16 to $17.99	2	6			8
$18 to $19.99	8	1			9
$20 to $21.99	8				8
$22 to $24.99	55				55
$25 to $29.99	41				41
$30 to $34.99	44				44
$35 to $39.99	16				16
$40 and over	27				27
Totals	219	8			227

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	236	12	248
February	245	9	254
March	231	11	242
April	180	13	193
May	243	11	254
June	198	11	209
July	203	9	212
August	211	7	218
September	182	6	188
October	167	9	176
November	211	10	221
December	217	8	225

TABLE NO. 79. SHIP BUILDING (INCLUDING BOAT BUILDING).

(3 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	11	
Clerks, stenographers, salesmen, etc., 18 years of age and over	92	22
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	103	22
Wage earners:		
18 years of age and over	199	
Under 18 years of age		
Totals	199	

Salary and wage payments—annual:	
Officers, superintendents and managers	$203,283
Clerks, stenographers, salesmen, etc.	403,685
Wage earners (including piece workers)	2,889,262
Total	$3,496,230

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99					
$18 to $19.99					
$20 to $21.99	13				13
$22 to $24.99	20				20
$25 to $29.99	34				34
$30 to $34.99	78				78
$35 to $39.99	40				40
$40 and over	16				16
Totals	201				201

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	3,191		3,191
February	3,136		3,136
March	2,975		2,975
April	2,301		2,301
May	2,017		2,017
June	966		966
July	1,767		1,767
August	1,518		1,518
September	1,338		1,338
October	711		711
November	220		220
December	200		200

TABLE NO. 80. SLAUGHTERING AND MEAT PACKING.

(5 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	20	
Clerks, stenographers, salesmen, etc., 18 years of age and over	283	57
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	303	57
Wage earners:		
18 years of age and over	1,376	108
Under 18 years of age		
Totals	$1,376	108

Salary and wage payments—annual:	
Officers, superintendents and managers	$141,543
Clerks, stenographers, salesmen, etc.	615,370
Wage earners (including piece workers)	1,549,513
Total	$2,306,426

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	7	23			30
$14 to $15.99	60	35			95
$16 to $17.99	246	52			298
$18 to $19.99	224	4			228
$20 to $21.99	149				149
$22 to $24.99	165				165
$25 to $29.99	225				225
$30 to $34.99	147				147
$35 to $39.99	46				46
$40 and over	62				62
Totals	1,331	114			1,445

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,178	112	1,290
February	1,226	110	1,336
March	1,135	109	1,244
April	1,128	108	1,236
May	1,077	103	1,180
June	1,061	108	1,169
July	1,063	119	1,182
August	1,034	128	1,162
September	1,112	119	1,231
October	1,120	100	1,220
November	1,262	112	1,374
December	1,292	114	1,406

TABLE NO. 83. STOVES AND FURNACES (NOT INCLUDING OIL STOVES).

(4 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	8	
Clerks, stenographers, salesmen, etc., 18 years of age and over	20	3
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	28	3
Wage earners:		
18 years of age and over	103	
Under 18 years of age	1	
Totals	104	

Salary and wage payments—annual:	
Officers, superintendents and managers	$33,062
Clerks, stenographers, salesmen, etc.	39,089
Wage earners (including piece workers)	178,491
Total	$250,642

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	2				2
$5 to $5.99	12				12
$6 to $6.99	13				13
$7 to $7.99	1				1
$8 to $9.99	1				1
$10 to $11.99	1				1
$12 to $13.99	1				1
$14 to $15.99					
$16 to $17.99	3				3
$18 to $19.99	2		1		3
$20 to $21.99	1				1
$22 to $24.99	8				8
$25 to $29.99	9				9
$30 to $34.99	11				11
$35 to $39.99	23				23
$40 and over	15				15
Totals	103		1		104

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	66		66
February	60		60
March	67		67
April	69		69
May	53		53
June	54		54
July	51		51
August	56		56
September	67		67
October	81		81
November	69		69
December	74		74

TABLE NO. 86. TOBACCO MANUFACTURES.

(4 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	2	
Clerks, stenographers, salesmen, etc., 18 years of age and over	3	
Clerks, stenographers, salesmen, etc., under 18 years of age		1
Totals	5	1
Wage earners:		
18 years of age and over	59	83
Under 18 years of age		
Totals	59	83

Salary and wage payments—annual:	
Officers, superintendents and managers	$6,136
Clerks, stenographers, salesmen, etc.	19,886
Wage earners (including piece workers)	117,183
Total	$143,205

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99	2				2
$14 to $15.99	2			1	3
$16 to $17.99	4	33			37
$18 to $19.99	15	7			22
$20 to $21.99	12	10			22
$22 to $24.99	12	10			22
$25 to $29.99	10	8			18
$30 to $34.99	2	3			5
$35 to $39.99					
$40 and over					
Totals	59	71		1	131

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	42	65	107
February	41	63	104
March	43	68	111
April	43	69	112
May	52	82	134
June	61	83	144
July	60	88	148
August	61	87	148
September	47	33	80
October	68	67	135
November	64	82	146
December	60	83	143

TABLE NO. 87. TRUNKS, VALISES, ETC.

(3 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	5	
Clerks, stenographers, salesmen, etc., 18 years of age and over	4	1
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	9	1
Wage earners:		
18 years of age and over	52	5
Under 18 years of age		
Totals	52	5

Salary and wage payments—annual:	
Officers, superintendents and managers	$17,056
Clerks, stenographers, salesmen, etc	8,754
Wage earners (including piece workers)	98,117
Total	$123,927

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99					
$16 to $17.99	1	3			4
$18 to $19.99	2				2
$20 to $21.99	1				1
$22 to $24.99	2	2			4
$25 to $29.99	9				9
$30 to $34.99	4				4
$35 to $39.99	23				23
$40 and over	7				7
Totals	49	5			54

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	48	7	55
February	55	10	65
March	59	7	66
April	66	8	74
May	63	8	71
June	75	13	88
July	76	12	88
August	73	12	85
September	72	11	83
October	63	9	72
November	56	7	63
December	50	5	55

TABLE NO. 89. WIRE WORK (INCLUDING WIRE ROPE, NETTING, ETC.)

(3 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	2	
Clerks, stenographers, salesmen, etc., 18 years of age and over	6	1
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	8	1
Wage earners:		
18 years of age and over	51	3
Under 18 years of age		
Totals	51	3

Salary and wage payments—annual:	
Officers, superintendents and managers	$18,000
Clerks, stenographers, salesmen, etc.	11,823
Wage earners (including piece workers)	53,043
Total	$82,866

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5					
$5 to $5.99					
$6 to $6.99					
$7 to $7.99					
$8 to $9.99					
$10 to $11.99					
$12 to $13.99					
$14 to $15.99			2		2
$16 to $17.99			1		1
$18 to $19.99	6				6
$20 to $21.99	4				4
$22 to $24.99	10				10
$25 to $29.99	15				15
$30 to $34.99	7				7
$35 to $39.99	4				4
$40 and over	5				5
Totals	51		3		54

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	44		44
February	45		45
March	43		43
April	44		44
May	45		45
June	45		45
July	45		45
August	48		48
September	48		48
October	52		52
November	54		54
December	54		54

TABLE NO. 90. ALL OTHER INDUSTRIES.

(49 establishments reporting.)

Los Angeles.

Number of employees	Male	Female
Salaried:		
Officers, superintendents and managers	138	2
Clerks, stenographers, salesmen, etc., 18 years of age and over	470	139
Clerks, stenographers, salesmen, etc., under 18 years of age		
Totals	608	141
Wage earners:		
18 years of age and over	1,592	310
Under 18 years of age	1	5
Totals	1,593	315

Salary and wage payments—annual:	
Officers, superintendents and managers	$639,779
Clerks, stenographers, salesmen, etc.	575,839
Wage earners (including piece workers)	2,980,774
Total	$4,196,392

Weekly Earnings of Wage Earners.

Weekly wage rate	18 years of age and over		Under 18 years of age		Total
	Males	Females	Males	Females	
Under $5	5	9			14
$5 to $5.99	1	3			4
$6 to $6.99	1	1			2
$7 to $7.99	1	1			2
$8 to $9.99		1			1
$10 to $11.99	6	1			7
$12 to $13.99	1	10			11
$14 to $15.99	11	27		2	40
$16 to $17.99	30	145		3	178
$18 to $19.99	38	43	2	2	85
$20 to $21.99	53	27			80
$22 to $24.99	252	22			274
$25 to $29.99	569	15	15		599
$30 to $34.99	212	210	3		425
$35 to $39.99	165	11			176
$40 and over	229	2			231
Totals	1,574	528	20	7	2,129

Number of Wage Earners, by Months.

Month	Males	Females	Total
January	1,609	262	1,871
February	1,657	343	2,000
March	1,735	252	1,987
April	1,695	296	1,991
May	1,892	295	2,187
June	1,887	288	2,175
July	1,958	306	2,264
August	1,985	367	2,352
September	1,156	325	1,481
October	1,805	321	2,126
November	1,767	276	2,043
December	1,770	254	2,024

PART III.

REPORT OF THE
STATE DIRECTOR OF EMPLOYMENT.
1921-1922.

INTRODUCTION.

During the fiscal years 1920-1921 and 1921-1922, the public employment bureaus of the State of California filled 345,410 positions at a total cost of $186,705.48, making a unit cost of 54 cents per position. Beginning with May, 1922, the placements month by month were practically double those of the corresponding months of 1921 and will, to all present appearances, total at least 240,000 for the calendar year 1922. This will bring the cost of each position down to about 40 cents. The increased business of the bureaus can be attributed in part to the speeding up of industry and in part to the establishment of seasonal offices in localities where large numbers of men were needed to harvest the fruit and grape crops. These offices were managed by one man. Owing to the fact that the demand for labor was confined to one particular class of help, large numbers of workers were handled quickly at an exceptionally low overhead expense thereby reducing the unit cost per position.

I am presenting below some figures showing the requests for labor made during the last two fiscal years on these bureaus and the number of workers supplied. Figures with more elaborate data as to sex, locality and occupations are also shown in the following tables.

Labor Requested.

During the fiscal year ending June 30, 1921, employers called on the offices 123,872 times for a total of 220, 859 persons, and during the fiscal year ending June 30, 1922, employers made use of the offices 122,808 times for a total of 197,208 individuals.

Applicants Registered.

During the fiscal year 1920-1921, there were registered 108,221 individuals of which number 83,657 were males and 24,564 were females. For the fiscal year 1921-1922 there were registered 100,102 individuals divided between 74,488 males and 25,614 females. Theoretically, all public bureaus should register those out of employment, but we find that applicants are mostly concerned about getting work and prefer not to register unless they can be furnished jobs when registering. Most of the public employment bureaus throughout the eastern and middle western states register an applicant every time he applies for work but in the California and Massachusetts bureaus, they are registered but once each fiscal year.

Individuals Placed.

The reports of most public employment bureaus generally refer only to the number of positions filled. In addition to this information, our bureaus also tabulate the number of individuals who receive these positions. For the fiscal year ending June 30, 1921, 180,331 positions were given to 80,729 individuals and for the fiscal year ending June 30, 1922, the 165,079 positions were given to 65,325 individuals, making averages of 223 and 253 positions per 100 individuals for the respective years.

Placements by Industries.

Hotels and restaurants, including hospitals and other institutions absorbed 26,662 of our total placements during 1920-1921, followed by building construction with 25,324; private homes 23,871; agriculture 20,328; wholesale and retail trade 15,616; transportation and public utilities 15,137; and lumber and timber products with 10,023.

During the fiscal year ending June 30, 1922, building construction took the lead with 37,603 mainly due to the large number supplied by the Los Angeles office. Private homes accounted for 25,125 hotels and restaurants 21,095; agriculture 19,109; and wholesale and retail trade, 15,675.

Arrangement with the United States Employment Office.

Our state public employment bureaus continued their cooperating arrangement with the United States Employment Service, furnishing this service with information as to all demands made on us for labor and applications for positions, together with the number referred and placed according to the different localities in which we are operating. We also give this department at Washington a weekly summary of labor conditions throughout the state. In addition we answer inquiries concerning employment conditions in California received by the United States Employment Service from various parts of the United States and referred to us. In return we are granted the franking privilege and the use of some furniture and stationery.

It is interesting to note that of the 42 states operating under this arrangement with the United States Employment Service, California is first in the number of placements, the Los Angeles office leading all cities in the United States in the number of positions filled by their public bureaus.

Comparison with Licensed Fee Agencies.

In February, 1916, when the state bureaus were started there were 221 licensed fee agencies operating in the state, of which 134 were furnishing domestic, hotel and restaurant help and general industrial positions for men. In addition there were 16 commercial agencies, 9 being located in San Francisco and 7 in Los Angeles. Of the 134 fee agencies mentioned above, 27 were operating in San Francisco, 24 in Los Angeles, 9 in Oakland and 11 in Sacramento. In August, 1922, there were 234 licensed fee agencies, of which number 112 furnished domestic, hotel and restaurant help and general industrial positions for men, showing a decrease of 22 fee agencies in the lines the state bureaus were most actively competing. Of these 112 fee agencies, 22 were operating in San Francisco, 21 in Los Angeles, 4 in Oakland and 15 in Sacramento. During this time the state had increased its population approximately 900,000.

In these six and one-half years the commercial fee agencies had increased from 16 to 56, of which number 16 were in San Francisco and 23 in Los Angeles. During the same period the theatrical agencies had increased in number from 11 to 24 and the teachers' agencies from 7 to 15, while the Oriental agencies decreased from 47 to 24 and the nurses' agencies from 6 to 3.

Commercial Positions.

The only city in which we have been operating a department exclusively for clerks, salesmen and high class office help is in the city of Los Angeles. This department occupies two rooms, is operated by two clerks with sometimes a third clerk part of the day, and all morning the rooms are thronged with from fifty to seventy persons seeking employment.

During the last fiscal year ending June 30, 1922, 4454 positions were filled by the Los Angeles commercial office, 1189 being for males and 3265 for females as grouped below accordingly as they were one day, one week, or over eight day positions.

Occupation and sex	Number wanted	Number placed	Duration of positions in days		
			1 or less	2 to 7	8 and over
MALES.					
Bookkeepers, cashiers, office clerks, stenographers and typists	707	461	6	38	417
Hotel, stock clerks, etc.	526	264	42	18	204
All other	685	464	141	5	318
Total males	1,918	1,189	189	61	939
FEMALES.					
Bookkeepers, cashiers, office clerks, stenographers and typists	3,628	2,932	181	1,309	1,442
Saleswomen, phone operators, etc.	276	171	12	23	136
All other	332	162	26	37	99
Total females	4,236	3,265	219	1,369	1,677
Total males and females	6,154	4,454	408	1,430	2,616

The number of positions at the different salaries were tabulated and, figured on a basis of a fee charge of 25 per cent of the first month's salary, the Los Angeles commercial department saved applicants placed by them over $40,000 in that respect during the fiscal year ending June 30, 1922.

In the above figures no credit is taken for approximately 2,400 positions furnished applicants ranging from one day to three weeks' duration, during which time the applicants so placed earned over $45,000 in salaries.

Despite the large number of positions filled, there were 1,700 the filling of which were lost to the bureau. This is accounted for in part by the keen competition with the private fee agencies who doubtless had the same orders, and partly by the fact that the office force is inadequate to properly interview, classify and refer the immense number of applicants for commercial positions.

In both San Francisco and Oakland, the office arrangement and insufficiency of clerks prohibits us from properly handling this class of business. The San Francisco office placed, in commercial positions, about four applicants per day and the Oakland office three per day during the last fiscal year. Notwithstanding this comparatively poor showing, each applicant is saved at least from $15 to $25 on every position and the saving to applicants in fees around the bay region will amount to $15,000 each year.

Various civic bodies in San Francisco have interested themselves with the object of getting an appropriation sufficient to place the state bureaus in a position where they can handle the commercial and office help to

the satisfaction of the applicant and the employer and enable us to compete successfully with the private fee agencies as we are doing in other lines.

Offices Operated.

Nine offices were operated in the seven cities of Los Angeles, San Francisco, Oakland, Fresno, Sacramento, Stockton and San Jose for the entire biennial period, the two extra offices being for women which are located apart from the men's departments in Los Angeles and San Francisco. In addition, regular offices were maintained in Chico and Marsyville until July 31, 1921, but were discontinued on account of the dull year. However, in the spring of 1922 the chamber of commerce of Marysville and the growers of Sutter and Yuba counties, fearful that they would not be able to get labor to harvest their large crops, took the matter up with the Labor Commissioner with the result that a seasonal office was established there on May 13th and was successfully operated until October 11th. A second seasonal office was established at Modesto in response to the request of the board of trade of Stanislaus County. This office operated from May 24th to October 14th. The chamber of commerce of Chico and the growers of Butte County also asked for an office to help them out and the Chico office was opened on August 28th and closed October 26th. A fourth seasonal office was established in Lodi to help out the grape growers and was operated from September 18th to November 18th. Considerable difficulty was encountered in all of these places to get locations and we settled the matter in Lodi by operating a tent in the park near the center of the town and close to the railroad depot. In these four places the growers were well satisfied with the work as their letters to this effect testify.

One new permanent office was opened in Bakersfield on June 29, 1922, to meet the demand for labor in that district. This office is operated by one man and has already justified its establishment. No figures are given in this report from the Bakersfield office as it ran for two days only in that fiscal year.

During the hop picking season in the Sonoma Valley, the growers had a representative in our San Francisco office and large numbers of men were shipped from the bay region to help gather this commodity.

Unemployment.

Due to the depression throughout the United States in 1921, and with the idea of trying to get accurate data on the situation in California as to the increase of unemployment, these bureaus, in cooperation with the United States Department of Labor, started a survey of the manufacturing establishments throughout the state as of September 30th. As a result of this survey and taken in conjunction with a later one as of November 30th of the same year, it was estimated that there were from 100,000 to 125,000 persons out of employment in California in the middle of the winter.

In accordance with the act to provide for the extension of public works of the State of California during period of extraordinary unemployment, the State Board of Control was kept in close touch with the situation and the different state bureaus, boards and commissions were urged to increase

the opportunities for those needing employment by making contemplated improvements at this time. California was one of the first states to supply the National Unemployment Conference at Washington with full data as to the conditions existing in this state. These surveys have been kept up with the object of having comparative information on the different manufacturing industries from year to year as well as to obtain an index as to labor conditions.

In Los Angeles and San Francisco, these bureaus were made the clearing house for the mayor's unemployment committee and were strong factors in helping to relieve the situation. Both cities were saved the expense of starting employment offices and every effort was made to create work and stimulate employers to hurry along all contemplated work and give deserving persons the chance to earn enough to keep themselves alive until conditions again became normal. The plan worked so well that Los Angeles is preparing to meet any industrial depression by doing the same thing this year if the occasion should warrant, and San Francisco can be depended on to do likewise. Furthermore, from the experience gained during the last winter, we are prepared to take the matter up with the other cities where we maintain offices with the object of handling their local situation similarly.

According to the United States census of manufactures of 1919, there are approximately 37,000 more male wage earners employed in the manufacturing industry in California during the months of September and October than there are in the months of February and March, with January showing a few thousand less. To these can be added at least 3,000 male clerks making 40,000. The figures for shipbuilding have been excluded because they were very abnormal in 1919. Practically 10,000 of this number is furnished by the lumber and timber products, 8,000 by the canning and preserving industry and 3,000 by the beet sugar industry. Power construction and road building employ fewer men in winter and the same is true of agriculture. If these totals are added to the 40,000 in the manufacturing business it can be readily seen that there are at least 60,000 more men employed in the summer and fall than there are in the winter. The same census shows that there are 32,000 less women employed in February than in August, about 90 per cent of whom are attributable to the canning and preserving industry. As most of these women and girls live at home and do not follow any other occupation during the balance of the year, we can eliminate them from our unemployment estimate. In the winter months the men generally congregate in the larger cities and although the country districts have the use of these men in the summer and fall, the problem of looking out for them is up to the larger cities in winter. For the reason that we will practically have this problem with us all the time, we should be prepared to handle it each winter and to watch for any abnormal conditions which would swell the number of unemployed to the figures estimated for the winter of 1921-1922. To meet this emergency each large city should have a permanent unemployment committee, headed by some man of prominence in the community. This committee, by closely cooperating with our bureaus could reduce distress due to unemployment to the lowest possible minimum.

TABLE No. 1. Labor Requested by and Furnished to Employers, by Sex and by Offices, Year Ending June 30, 1921.

LABOR REQUESTED.

Office	Applications for help	Number of persons wanted				
		Male	Female	In town	Out of town	Total
Los Angeles	54,548	70,414	23,309	77,446	16,307	93,723
San Francisco	23,766	31,183	9,822	27,637	13,36	41,005
Oakland	19,221	20,611	10,149	25,838	4,922	30,760
Fresno	6,389	13,356	273	4,254	9,975	14,229
Sacramento	4,981	11,247	758	4,250	7,755	12,005
San Jose	7,656	10,435	1,135	5,380	6,190	11,570
Stockton	3,644	9,030	97	2,368	6,759	9,127
Chic	1,782	4,123	210	533	3,800	4,333
Marysville	1,885	4,050	57	517	3,590	4,107
Totals	123,872	175,049	45,810	148,193	72,666	220,859

LABOR SUPPLIED.

Office	Males	Females	In town	Out of town	Total
Los Angeles	59,942	16,069	62,792	13,219	76,011
San Francisco	26,345	6,818	22,921	10,142	33,063
Oakland	16,404	6,552	20,410	2,546	22,956
Fresno	13,235	237	3,941	9,531	13,472
Sacramento	9,459	361	3,717	6,103	9,820
San Jose	9,113	684	4,638	5,159	9,797
Stockton	8,609	63	2,250	6,422	8,672
Chico	3,137	113	381	2,869	3,250
Marysville	3,256	34	387	2,903	3,290
Totals	149,400	30,931	121,437	58,894	180,331

TABLE No. 2. Number of Applicants Registered and Number Referred to Positions by Sex and by Offices, Year Ending June 30, 1921.

Office	Males		Females		Total	
	Registered	Referred	Registered	Referred	Registered	Referred
Los Angeles	27,084	68,4 8	10,557	21,125	37,641	89,623
San Francisco	15,030	32,313	5,520	9,029	20,550	41,342
Oakland	11,330	21,845	6,829	9,476	18,159	31,321
Fresno	9,174	13,802	306	234	9,480	14,036
Sacramento	6,798	11,092	510	399	7,308	11,491
San Jose	4,855	10,612	605	1,194	5,460	11,806
Stockton	4,548	9,233	61	68	4,609	9,301
Chico	2,466	3,161	121	137	2,587	3,298
Marysville	2,372	3,610	55	55	2,427	3,665
Tota s	83,657	174,166	24,564	41,717	108,221	215,883

TABLE No. 3. Labor Requested by and Furnished to Employers, by Sex and by Offices, Year Ending June 30, 1922.

LABOR REQUESTED

Office	Applications for help	Number of persons wanted				
		Male	Female	In town	Out of town	Total
Los Angeles	58,873	65,590	23,152	77,117	11,625	88,742
San Francisco	22,109	24,491	11,276	28,435	7,332	35,767
Oakland	16,981	18,553	8,354	24,055	2,852	26,907
Fresno	6,347	14,325	142	3,761	10,706	14,467
Sacramento	4,759	8,748	573	4,185	5,136	9,321
San Jose	8,324	11,468	801	5,050	6,319	12,269
Stockton	4 111	6,841	136	2,679	4,298	6,977
Marysville	809	1,818	14	194	1,638	1,832
Modesto	360	653	8	64	597	661
Chico	135	249	16	34	231	265
Totals	122,808	152,736	44,472	146,474	50 734	19 ,208

LABOR SUPPLIED.

Office	Males	Females	In town	Out of town	Total
Los Angeles	58,096	15,759	64,552	9,303	73,855
San Francisco	21,003	8,259	24,342	4,920	29,262
Oakland	15,941	5,118	19,366	1,693	21,059
Fresno	13,767	120	3,757	10,130	13,887
Sacramento	7,520	266	3,709	4,077	7,786
San Jose	10,058	491	5.271	5,278	10,549
Stockton	6,307	69	2,535	3,841	6,376
Marysville	1,510	12	186	1,336	1,522
Modesto	554	4	56	502	558
Chico	215	10	27	198	225
Totals	134,971	30,108	123,801	41,278	165,079

TABLE No. 4. Number of Applicants Registered and Number Referred to Positions by Sex and by Offices, Year Ending June 30, 1922.

Office	Males		Females		Total	
	Registered	Referred	Registered	Referred	Registered	Referred
Los Angeles	24,691	66,293	11,188	21,483	35,879	87,776
San Francisco	14,801	25,543	6,708	11,389	21,509	36,932
Oakland	9,849	20,454	6,274	7,502	16,123	27,956
Fresno	9,404	14,534	172	127	9,576	14,661
Sacramento	4,955	7,729	533	304	5,488	8,033
San Jose	4,983	11,634	568	1,009	5,551	12,643
Stockton	3,950	6,660	100	76	4,050	6,736
Marysville	1,210	1,544	34	24	1,244	1,568
Modesto	440	609	20	9	460	618
Chico	205	220	17	15	222	235
Totals	74,488	155,220	25,614	41,938	100,102	197,158

TABLE No. 5. Showing Duration of Positions Filled by Offices, Year Ending June 30, 1921.

Office	Duration of positions offered in days						Total
	1 or less		2 to 7		8 and over		
	Number	Per cent	Number	Per cent	Number	Per cent	
Los Angeles	21,200	45 7	16,173	55 5	38,638	36 9	76,011
Per cent	27 8		21 3		50 9		
San Francisco	7,450	16 1	4,652	16 0	20,961	20 0	33,063
Per cent	22 5		14 1		63 4		
Oakland	7,448	16 0	3,001	10 3	12,537	12 0	22,956
Per cent	32 3		13 1		54 6		
Fresno	3,148	6 8	1,528	5 2	8,796	8 4	13,472
Per cent	23 4		11 3		65 3		
Sacramento	2,524	5 4	760	2 6	6,536	6 3	9,820
Per cent	25 7		7 7		66 6		
San Jose	3,064	6 6	1,052	3 6	5 681	5 3	9,797
Per cent	31 3		10 7		58 9		
Stockton	1,126	2 4	948	3 3	6,598	6 3	8,672
Per cent	13 0		10 9		76 1		
Chico	195	4	208	7	2,847	2 7	3,250
Per cent	6 0		6 4		87 6		
Marysville	284	.6	818	2 8	2,188	2 1	3,290
Per cent	8 6		24 9		66 5		
Totals	46,409	100 0	29,140	100 0	104,782	100 0	180,331
Per cent	25 7		16 2		58 1		

TABLE No. 6. Showing Duration of Positions Filled by Offices, Year Ending June 30, 1922.

Office	Duration of positions offered in days						Total
	1 or less		2 to 7		8 and over		
	Number	Per cent	Number	Per cent	Number	Per cent	
Los Angeles	20,342	44 03	19,619	53 79	33,894	41 13	73,855
Per cent	27 5		26 6		45 9		
San Francisco	6,803	14 72	5,446	14 93	17,013	20 65	29,262
Per cent	23 3		18 6		58 1		
Oakland	7,449	16 12	5,045	13 83	8,565	10 39	21,059
Per cent	35 4		24 0		40 6		
Fresno	3,620	7 83	1,846	5 06	8,421	10 22	13,887
Per cent	26 1		13 3		60 6		
Sacramento	2,661	5.77	1,248	3.42	3,877	4 71	7,786
Per cent	35 0		16 0		49 0		
San Jose	3,828	8 30	1,672	4 58	5,049	6 13	10,549
Per cent	36 3		15 8		47 9		
Stockton	1,374	3.00	1,201	3 29	3,801	4 64	6,376
Per cent	21 5		18 9		59 6		
Marysville	56	121	276	.76	1,190	1 44	1,522
Per cent	3 7		18 1		78 2		
Modesto	48	103	110	30	400	49	558
Per cent	8 6		19 7		71 7		
Chico	24	.009	13	01	188	23	225
Per cent	10 7		5 8		83 5		
Totals	46,205	100 00	36,476	100 00	82,398	100 00	165,079
Per cent	28 0		22 1		49 9		

TABLE No. 7. Showing Individuals Placed and Ratio of Positions Filled to Individuals Placed, Year Ending June 30, 1921.

Office	Individuals placed	Positions filled	Ratio, positions to individuals
Los Angeles	28,344	76,011	2.68
San Francisco	14,364	33,063	2.30
Oakland	10,189	22,956	2.25
Fresno	7,683	13,472	1.75
Sacramento	6,556	9,820	1.50
San Jose	4,529	9,797	2.16
Stockton	4,378	8,672	1.98
Chico	2,582	3,290	1.27
Marysville	2,104	3,250	1.54
Totals	80,729	180,331	2.23

TABLE No. 8. Showing Individuals Placed and Ratio of Positions Filled to Individuals Placed, Year Ending June 30, 1922.

Office	Individuals placed	Positions filled	Ratio, positions to individuals
Los Angeles	22,873	73,855	3.23
San Francisco	12,048	29,262	2.43
Oakland	8,689	21,059	2.42
Fresno	7,566	13,887	1.84
Sacramento	4,251	7,786	1.83
San Jose	4,508	10,549	2.34
Stockton	3,686	6,376	1.73
Marysville	1,079	1,522	1.41
Modesto	409	558	1.36
Chico	216	225	1.04
Totals	65,325	165,079	2.53

TABLE No. 9. Showing Positions Reported as Filled Monthly by Offices, Year Ending June 30, 1921.

	Los Angeles	San Francisco	Oakland	Fresno	Sacramento	San Jose	Stockton	Chico	Marysville	Total
1920										
July	8,392	4,890	2,451	1,455	1,679	1,017	1,136	355	366	21,741
August	9,393	4,465	3,133	1,889	2,147	1,277	1,143	475	801	24,723
September	10,704	6,008	2,989	1,775	1,714	1,463	969	404	446	26,472
October	9,977	3,692	2,760	1,629	1,068	1,068	831	458	238	21,721
November	6,587	2,521	1,961	968	537	625	656	206	192	14,253
December	4,577	1,566	1,268	811	307	463	475	110	79	9,656
1921										
January	3,539	1,112	1,052	759	383	431	469	59	56	7,840
February	3,197	1,170	1,065	804	208	415	424	104	106	7,493
March	4,079	1,723	1,544	1,159	308	726	636	157	177	10,509
April	5,188	1,956	1,614	724	433	643	729	415	256	11,958
May	4,829	1,908	1,536	635	435	779	654	283	436	11,585
June	3,549	1,962	1,583	864	601	890	550	244	137	12,380
Totals	76,011	33,063	22,956	13,472	9,820	9,797	8,672	3,250	3,290	180,331

TABLE No. 10. Showing Positions Reported as Filled Monthly by Offices, Year Ending June 30, 1922.

	Los Angeles	San Francisco	Oakland	Fresno	Sacramento	San Jose	Stockton	Marysville	Modesto	Chico	Total
1921											
July	4,761	1,641	1,423	601	574	717	340	257		225	10,539
August	5,105	2,030	1,548	955	776	1,208	305				11,927
September	6,056	1,950	1,587	1,699	709	1,515	433				14,009
October	6,416	1,877	1,631	1,016	695	1,118	601				13,354
November	5,439	1,666	1,364	857	524	659	548				11,057
December	4,451	1,623	1,352	855	288	494	419				9,482
1922											
January	4,484	1,730	1,319	998	312	515	234				9,592
February	4,331	1,761	1,210	950	222	416	199				9,089
March	6,024	2,580	1,863	1,293	393	731	387				13,271
April	6,538	2,758	2,352	1,338	566	812	525				14,889
May	9,272	4,008	2,752	1,734	1,258	1,135	1,208	712	104		22,183
June	10,978	5,638	2,658	1,591	1,469	1,229	1,117	553	454		25,087
Totals	73,855	29,262	21,059	13,887	7,786	10,549	6,376	1,522	558	225	165,079

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TABLE No. 11. Placements by Industries, Year Ending June 30, 1921.

Industry	Los Angeles	San Francisco	Oakland	Fresno	Sacramento	San Jose	Stockton	Marysville	Chico	Total	Per cent
Agriculture	2,455	824	399	5,681	1,757	3,645	1,414	2,332	1,821	20,328	11.3
Building construction	19,026	1,692	2,993	592	192	202	348	76	203	25,324	14.0
Clerical and professional	3,745	413	577	4	10	6	3	1		4,759	2.6
Factories, N. E. S.	2,265	2,923	1,968	46	36	173	138	35	3	7,587	4.2
Foods, beverages and tobacco	1,124	1,547	491	396	683	149	25	21	23	4,459	2.5
Hotels, restaurants, apartments, cafeterias, camps, clubs, hospitals and institutions	10,514	7,936	3,636	821	1,296	1,227	820	199	213	26,662	14.8
Lumber and timber products	4,337	1,395	551	905	1,365	334	351	184	601	10,023	5.6
Metals and machinery	5,607	2,774	2,406	252	126	158	119	5	9	11,456	6.4
Mining, quarrying, oil, smelting and dredging	2,358	360	195	631	508	67	1,809	23	11	5,962	3.3
Office buildings	546	197	84	13		47	14	8	11	920	.5
Private homes	12,334	3,096	4,654	400	688	2,186	327	49	137	23,871	13.2
Recreation and amusement	256	82	84	72	28	18				540	.3
Street and highway	142	171	344	351	742	343	403	71	97	2,664	1.5
Transportation and public utilities	3,417	5,677	898	1,861	1,392	191	1,586	55	60	15,137	8.3
Wholesale and retail trade	7,037	3,054	2,200	1,207	738	766	373	194	47	15,616	8.7
Miscellaneous	848	922	1,476	240	259	285	942	37	14	5,023	2.8
Totals	76,011	33,063	22,956	13,472	9,820	9,797	8,672	3,290	3,250	180,331	100.0

TABLE No. 12. Placements by Industries, Year Ending June 30, 1922.

Industry	Los Angeles	San Francisco	Oakland	Fresno	Sacramento	San Jose	Stockton	Marysville	Modesto	Chico	Total	Per cent
Agriculture	1,800	1,004	471	5,877	2,163	3,839	2,304	1,168	405	78	19,109	11.6
Building construction	25,774	3,819	6,042	752	358	356	444	38	5	15	37,603	22.8
Clerical and professional	3,575	448	377	7	12	1	1				4,419	2.7
Factories, N. E. S.	2,298	1,348	1,032	21	25	179	96	5	3		5,007	3.0
Foods, beverages and tobacco	1,054	1,439	372	165	336	329	91	1		5	3,791	2.3
Hotels, restaurants, apartments, cafeterias, camps, clubs, hospitals and institutions	9,001	6,248	2,572	739	656	1,263	536	34	22	24	21,095	12.8
Lumber and timber products	2,372	694	586	534	778	276	280	10	2	30	5,562	3.4
Metals and machinery	5,086	1,157	1 197	217	38	120	38	8	1	1	7,863	4.8
Mining, quarrying, oil, smelting and dredging	913	110	100	130	94	54	641	1		4	2,047	1.2
Office buildings	532	165	42	11	2	38	6	6			802	.5
Private homes	12,760	4,196	4,092	441	640	2,598	357	6	23	12	25,125	15.2
Recreation and amusement	194	250	122	61	26	51	1	2			707	.4
Street and highway	367	250	196	222	234	175	215	100		16	1,775	1.0
Transportation and public utilities	2,684	2,034	553	3,167	1,185	222	304	32	82	2	10,265	6.2
Wholesale and retail trade	4,655	5,306	2,116	1,417	1,054	810	266	53	10	8	15,675	9.5
Miscellaneous	793	794	1,189	126	205	238	756	58	5	30	4,294	2.6
Totals	73,855	29,262	21,055	13,887	7,786	10,549	6,376	1,522	558	225	165,079	100.0

TABLE No. 13. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

LOS ANGELES OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Auto mechanics	241	174	161	13	6	17	151
Auto mechanics helpers	15	13	13			2	11
Auto painters	6	6	6				6
Auto trimmers	5	3	3			1	2
Auto washers	84	69	69		3	6	60
Bakers	161	120	90	30	8	2	110
Bakers helpers	157	118	91	27	3		115
Barnmen	9	8	8				8
Bean hands	373	283		283		16	267
Bed makers	8	7		7		2	5
Beet hands	88	88		88			88
Blacksmiths	148	98	25	73		8	90
Blacksmiths' helpers	36	34	18	16		5	29
Boiler makers	32	23	3	20			23
Boiler makers' helpers	37	30	25	5			30
Boiters-up	116	66		66			66
Bookkeepers	160	91	74	17	1		90
Bottle washers	11	9	8	1		3	6
Boxmakers	29	16	15	1		1	15
Boys, apprentice	190	128	125	3		4	124
Boys, bell	8	7	7				7
Boys, bus	582	452	394	58	57	7	388
Boys, delivery	75	42	39	3	1		41
Boys, errand	116	55	55		5	6	44
Boys, messenger	36	19	19		1		18
Boys, office	122	71	71			1	70
Boys, supply	28	19	11	8		1	18
Boys, wheel	3	3	2	1			3
Bricklayers	198	171	148	23	19	72	80
Bricklayers' helpers	136	130	120	10	13	60	57
Butchers	11	9	8	1			9
Cabinetmakers	76	41	41		1	2	38
Calciminers	25	20	20		3	14	3
Cannery workers	80	41	17	24	4	4	33
Can washers	22	20	20		4	5	11
Carpenters	3,960	3,208	2,806	402	139	1,022	2,047
Carpenters' helpers	454	419	272	147	34	112	273
Carpet layers	15	9	9				9
Cement finishers	320	278	240	38	19	142	117
Chainmen	10	10	2	8		2	8
Chauffeurs	786	584	564	20	18	26	540
Chemists	6	4		4			4
Choremen	126	92	28	64	1		91
Chuck tenders	16	3		3			3
Cleaners	1,769	1,744	1,722	22	1,537	187	20
Clerks, commissary	14	10		10			10
Clerks, hotel	19	9	9				9
Clerks, office	529	287	256	31		9	273
Clerks, order	21	12	12				12
Clerks, sales	267	154	149	5	3	28	123
Clerks, shipping	32	25	25		2		23
Clerks, stock	176	118	113	5		2	116
Clerks, yard	4	4	4				4
Collectors	14	6	6				6
Compositors	24	16	10	6		2	14
Confectionery workers	37	31	31		1		30
Cooks	1,490	1,069	563	506	13	17	1,039
Cooks' helpers	71	49	26	23			49
Coopers	28	11	11				11
Corn huskers	9	9		9			9
Cotton gin operators	3	2		2			2
Cotton pickers	505	461		461			461
Couples (males)	119	69	29	40			69
Creamery workers	165	143	133	10	32	16	95
Dairy hands	19	17	2	15			17
Deliverymen	8	7	6	1			7
Dishwashers	3,556	2,645	1,965	680	109	68	2,468
Distributors	258	219	219		71	139	9
Draftsmen	35	21	20	1			21
Drapery hangers	6	2	2				2
Drillers	13	8	1	7		1	7
Electricians	113	88	63	25	6	26	56
Electricians' helpers	34	27	25	2	1	1	25

TABLE No. 13. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921—Continued.

LOS ANGELES OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Elevator operators	307	183	183		1	16	166
Employment managers	6	5	2	3			5
Engineers	155	100	66	34		7	93
Farm hands (general)	671	511	5	506		25	486
Firemen	55	49	15	34		1	48
Floor scrapers	25	22	19	3		11	11
Flunkies	241	188		189		1	188
Foremen, track	17	12		12			12
Freight handlers	20	14	14				14
Fruit packers	12	8		8			8
Fruit packers, apples	11	7		7			7
Fruit pickers, apricots	40	40		40			40
Fruit pickers, grapes	18	15		15			15
Fruit pickers, lemons	74	69		69			69
Fruit pickers, tomatoes	7	4		4			4
Fruit pickers, oranges	30	26		26			26
Fruit pickers, peaches	7	7		7		7	
Fruit pickers, walnuts	16	14		14			14
Fumigators	16	11		11			11
Floor walkers	4	2	2				2
Furniture finishers	42	26	25	1		1	25
Furniture polishers	36	12	12				12
Furniture repairmen	47	27	27			5	22
Garagemen	58	51	51			1	50
Gardeners	158	137	95	42	4	27	106
Glassmen	26	17	16	1			17
Glaziers	14	8	8		1	3	4
Hay hands	306	233	14	219	1	24	208
Herders	12	7	7				7
Hod carriers	40	38	35	3	1	16	21
Hog men	11	8	3	5			8
Housemen	281	201	174	27	6	4	191
Ice pullers	31	23	22	1	3	3	17
Irrigators	32	15		15			15
Janitors	850	605	565	40	31	28	546
Kitchen helpers	750	556	356	200	23	19	514
Laborers, building construction	9,724	8,740	7,922	818	1,443	3,427	3,870
Laborers, concrete	3,798	3,536	3,336	200	573	2,000	963
Laborers, draying	533	516	512	4	412	58	46
Laborers, factory	1,312	1,188	1,140	48	289	181	718
Laborers, food, beverages	300	263	263		113	37	113
Laborers, foundry	155	131	131			2	129
Laborers, hotels, institutions	47	44	31	13	12	12	20
Laborers, lumber	4,371	4,031	3,116	915	775	1,771	1,485
Laborers, metals and machinery	4,835	4,581	4,402	179	2,679	1,397	505
Laborers, mining, quarry	1,866	1,677	30	1,647		40	1,637
Laborers, private homes	2,483	2,425	2,378	47	1,983	391	51
Laborers, public utility	722	621	172	449	2	11	608
Laborers, railroad	1,212	968	26	942		2	966
Laborers, street and highway	172	87	13	74	2	8	77
Laborers, warehouse	770	746	746		213	194	339
Laborers, wholesale and retail	5,706	5,525	5,437	88	3,294	1,606	622
Laborers, wrecking	227	201	182	19	17	108	76
Laboratory workers	9	3	3				3
Lathers	248	215	202	13	15	140	60
Laundry workers	200	151	150	1	3	5	143
Linemen	63	37	7	30		3	34
Linen-men	6	5	5				5
Machinists	215	159	45	114		10	149
Machinists' helpers	93	84	31	53		6	78
Meat cutters	6	3	2	1			3
Milkers	134	98	16	82			98
Millwrights	32	20	18	2			20
Miners	149	100	4	96		1	99
Mortar mixers	70	70	60	10	13	40	17
Molders	71	16	12	4			16
Movies	154	123	123		107	15	1
Muckers	279	236		236		2	234
Nurses (male)	67	49	18	31	1		48
Oilers	12	8	8				8
Orchard hands	46	36		36			36
Orderlies	59	49	21	28			49

TABLE No. 13. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921—Concluded.

LOS ANGELES OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Packers	150	100	100		32	11	57
Painters	886	743	655	88	56	282	405
Pantrymen	106	71	48	23			71
Paper hangers	150	123	122	1	26	66	31
Pin setters	137	107	107				107
Pipe coverers	11	10		10			10
Pipe fitters	116	89	23	66		8	81
Pipe fitters' helpers	118	106	58	48	2	16	88
Plasterers	369	268	238	30	18	111	139
Plasters' helpers	32	28	25	3	3	12	13
Platers, metal	4	4	4				4
Plumbers	176	143	132	11	10	68	65
Plumbers' helpers	63	57	54	3	12	29	16
Polishers, metal	18	16	16			1	15
Porters	920	700	580	120	65	51	584
Pot washers	279	211	137	74	9	8	194
Pressers	32	20	17	3		2	18
Press feeders	17	8	8				8
Printers	5	3	3				3
Pruners	15	9	2	7		4	5
Riggers	44	25	3	22	2	1	22
Riveters	16	14	5	9		2	12
Rivet heaters	7	5		5			5
Roofers	43	35	34	1	5	10	20
Roofers' helpers	131	126	121	5	32	36	58
Sack sewers	21	16	12	4		1	15
Salesmen, foods	21	12	11	1			12
Sample carriers	29	29	29		26	2	1
Sawmill hands	124	112	99	13	1	14	97
Seamen	10	7		7			7
Sheet metal workers	75	59	36	23	2	5	52
Sheet metal workers' helpers	22	21	21			1	20
Shinglers	166	140	132	8	26	79	35
Silvermen	80	57	46	11		1	56
Solicitors	165	70	69	1	1	4	65
Stablemen	34	30	17	13			30
Stenographers	157	90	74	16		5	85
Stone masons	4	4	3	1		1	3
Stone masons' helpers	2	2	1	1		1	1
Structural iron workers	21	17	15	2			17
Substation operators	10	4		4			4
Tailors	23	13	12	1		4	9
Tallymen	3	3	3				3
Teamsters, ranch	244	178	16	162		1	177
Teamsters, others	671	489	223	266	4	36	449
Tent pullers	7	7		7			7
Tent makers	4	4		4			4
Tile setters	33	22	18	4		9	12
Tile setters' helpers	21	20	13	7		1	19
Timbermen	28	22		22			22
Towermen	15	6		6			6
Trammers	37	33		33			33
Traymen	13	9	4	5			9
Trouble shooters	4	3	3				3
Typists	36	27	23	4			27
Upholsterers	17	12	12		2		10
Vegetable men	139	110	60	50	2	4	104
Vulcanizers	5	2	2			1	1
Waiters	700	517	405	112	42	14	461
Watchmen	94	74	60	14	2	9	63
Welders	36	31	20	11		6	25
Window cleaners	88	57	57			8	49
Window trimmers	7	7	7				7
Woodchoppers	41	33	18	15		2	31
Woodworkers	44	26	26				26
Yardmen	142	107	76	31		1	106
Miscellaneous occupations	149	91	45	46		3	88
Totals	70,414	59,942	47,464	12,475	14,518	14,639	30,785

TABLE No. 14. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

LOS ANGELES OFFICE—FEMALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Addressers	23	22	22			2	20
Agricultural workers	41	28	15	13			28
Attendants	20	10	10				10
Awning and tent workers	3	2	2				2
Binders and packers	109	88	88		2	1	85
Canvassers	206	85	85		19	14	52
Bookkeepers	286	176	175	1	2	4	171
Bottlewashers	10	10	10				10
Cannery hands	313	144	116	28		3	141
Cateresses	62	52	52		52		
Chambermaids	891	577	550	27	102	15	460
Cigar and tobacco workers	11	7	7				7
Cleaners and dyers	73	27	27			2	25
Clerks, general office	1,451	1,165	1,163	2	90	505	570
Companions	27	15	13	2	1	1	13
Confectionery workers	106	62	62			4	58
Cooks, family	549	195	128	67		2	193
Cooks, restaurant and hotel	584	261	185	76	1	2	258
Couples (females)	119	69	29	40			69
Day workers	6,338	6,108	6,066	42	5,945	163	
Decorators	3	3	3			3	
Demonstrators	24	10	10			6	4
Dishwashers	275	195	186	9	47	6	142
Distributors	4	3	3				3
Domestics	3,481	1,338	1,202	136	19	45	1,274
Dried fruit workers	5	5	5		1	2	2
Drug workers	8	2	2				2
Elevator operators	11	1	1				1
Errand girls	32	12	12		1		11
Folders (advertising)	85	77	77			30	47
Folders (garments)	28	26	26				26
Fruit packers	43	10		10			10
Fruit pickers	145	94	34	60		13	81
Fruit sorters	17	17	17				17
Garments workers	488	230	230			1	229
Housekeepers	19	13	10	3			13
Investigators	5	5	5				5
Janitresses	561	389	386	3	130	4	255
Kitchen helpers	738	510	494	16	63	21	426
Labelers	119	98	98			1	97
Laundresses	4	3	2	1			3
Laundry workers	158	97	95	2			97
Leather workers	13	10	10				10
Linen room workers	5	4	4				4
Maids, second	149	61	46	15			61
Matrons	45	25	4	21			25
Mechanical workers	192	155	155				155
Messenger girls	35	30	30		5	2	23
Millinery workers	39	12	12				12
Movies	27	25	25		25		
Nurses, children	183	87	82	5	25	3	59
Nurses, practical	190	112	102	10		10	102
Packers	105	75	75		22	32	21
Paper box workers	17	12	12				12
Paper factory workers	38	31	31		1		30
Paper machine workers	56	35	35				35
Power machine operators	96	29	29				29
Saleswomen	370	229	224	5	21	50	158
Seamstresses	74	48	47	1	24		24
Sewers (hand)	13	2	2				2
Sorters (seeds)	19	18	18			3	15
Stenographers	904	592	585	7	24	132	436
Stock girls	19	9	9			1	8
Tea and coffee workers	10	9	9			2	7
Technician	10	5	5				5
Telephone operators	91	69	54	15	1	6	62
Textile workers	111	89	89				89
Typists	1,094	1,006	1,006		40	412	554
Ushers	3	3	3				3
Waitresses	1,799	955	829	126	15	31	909
Woodworkers	28	17	17				17
Wreath makers	41	32	32		4		28
Miscellaneous workers	58	42	41	1		1	41
Totals	23,309	16,069	15,325	744	6,682	1 534	7,853

TABLE No. 15. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

LOS ANGELES OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Agents and solicitors	232	89	89		28	5	56
Attendants	5	5	3	2			5
Auto mechanics	316	247	231	16	16	46	185
Auto trimmers	31	6	6				6
Auto washers	117	107	106	1	7	12	88
Bakers	80	56	33	23	1	2	53
Bakers' helpers	82	72	62	10	5	4	63
Bean hands	80	79		79		15	64
Bed makers	21	16	7	9			16
Beet hands	307	291		291			291
Blacksmiths	125	80	41	39		10	70
Blacksmiths' helpers	27	25	17	8	1	4	20
Boilermakers	50	29	21	8			29
Boilermakers' helpers	64	52	41	11			52
Bookkeeper-cashiers	111	66	59	7		4	62
Bootblacks	21	12	12				12
Bottlers	6	4	4				4
Bottle washers	36	34	18	16		2	32
Box makers	54	47	42	5	1	5	41
Boys, apprentice	126	104	99	5	1	1	102
Boys, bell	4	3	3				3
Boys, bus	366	310	293	17	75	7	228
Boys, errand	33	26	26			1	25
Boys, factory	118	100	100		1	4	95
Boys, office	124	65	65				65
Boys, stock	28	19	18	1			19
Boys, wheel	153	91	91		4	2	85
Brick cleaners	54	55	55		3	28	24
Bricklayers	432	391	298	93	20	163	208
Bricklayers' helpers	149	142	131	11	11	71	60
Bushelmen	5	5	5			1	4
Butchers	22	13	9	4	1	1	11
Cabinetmakers	127	76	73	3		3	73
Calciminers	48	44	43	1	13	13	18
Carpenters	6,112	5,277	4,814	463	217	1,844	3,216
Carpenters' helpers	333	318	300	18	37	131	150
Carpet layers	18	10	10			3	7
Car repairers, railroad	37	32	7	25			32
Cement finishers	681	627	557	70	55	336	236
Chauffeurs	495	397	386	11	32	44	321
Chipper and caulkers	15	12	7	5			12
Choremen	131	113	26	87		3	110
Chuck tenders	22	11		11			11
Cigar rollers	20	9	9				9
Clerks, hotel	20	7	7				7
Clerks, office	316	206	188	18		18	188
Clerks, order	18	14	14				14
Clerks, sales	127	78	72	6	11	11	56
Clerks, shipping	27	15	15				15
Clerks, stock	65	39	37	2	3	2	34
Cleaners	2,123	2,065	2,056	9	1,786	241	38
Cobblers	8	5	3	2			5
Conductors	70	53	53				53
Cooks	1,182	773	454	319	11	24	738
Cooks' helpers	39	33	23	10		2	31
Coopers	13	7	6	1			7
Cotton pickers	191	159		159			159
Couples (male)	158	96	32	64			96
Creamery helpers	36	33	17	16	3	4	26
Dairy hands	51	23	5	18			23
Dishwashers	3,119	2,705	2,246	459	93	75	2,537
Distributors	265	249	249		122	117	10
Draftsmen	51	28	25	3	1	1	26
Drillers	25	23		23			23
Electricians	216	166	140	26	9	29	128
Electricians' helpers	38	31	29	2	3	1	27
Elevator operators	185	135	135		8	18	109
Engineers (gas)	23	18	10	8		1	17
Engineers (steam)	86	68	33	35		3	65
Engineers' helpers	4	4	3	1		1	3
Farm hands	564	440	2	438		5	435
Firemen	22	18	8	10		1	17
Fire fighters	89	89		89	89		

TABLE No. 15. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922—Continued.

LOS ANGELES OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Floor layers	40	30	26	4		26	4
Floor scrapers	45	34	33	1	1	27	6
Flunkies	121	94		94			94
Foremen, miscellaneous	45	18	4	14			18
Fruit pickers, miscellaneous	7	7	1	6	1	1	5
Fruit pickers, oranges	23	19		19			19
Furniture finishers	62	42	42			1	41
Furniture repairers	37	31	31				31
Garagemen	47	39	39		1	4	34
Gardeners	94	81	74	7	1	12	68
Glass cutters	5	2	2				2
Glassmen	22	21	18	3	2		19
Glaziers	37	21	21			1	20
Hay hands	364	207	15	192	1	10	196
Hod carriers	194	177	168	9	8	80	89
Housemen	175	142	116	26	2	7	133
Irrigators	16	12		12		5	7
Janitors	641	516	485	31	22	54	440
Kitchen helpers	441	374	273	101	12	24	338
Laborers, building	9,767	9,341	8,887	454	1,929	4,712	2,700
Laborers, concrete	4,454	4,314	4,174	140	818	2,589	907
Laborers, draying	595	586	584	2	492	62	32
Laborers, factory	1,395	1,252	974	278	319	166	767
Laborers, foods and beverages	416	357	350	7	164	59	134
Laborers, highway	383	360		360			360
Laborers, lumber	2,136	2,070	1,960	110	777	1,019	274
Laborers, metals and machinery	3,997	3,873	3,837	36	2,423	1,006	444
Laborers, mines and quarries	756	728	25	703	7	31	690
Laborers, private homes	2,815	2,716	2,666	50	2,136	542	38
Laborers, public utility	559	384	124	260	2	23	358
Laborers, railroad	1,106	980	7	973		2	978
Laborers, warehouse	370	364	363	1	208	110	46
Laborers, wholesale and retail	3,587	3,476	3,427	49	1,944	1,144	388
Laborers, wrecking	69	66	66		10	38	18
Lathers	818	691	629	62	23	559	109
Laundry washers	6	5	5				5
Laundry workers, general	35	29	28	1			29
Laundry wringermen	20	13	13			1	12
Layers-out	26	17	10	7			17
Linemen, electrical	53	29	17	12	1	4	24
Liner-men	12	11	11				11
Machinists	287	222	179	43		3	219
Machinists' helpers	132	106	97	9		4	102
Mattress makers	7	4	3	1			4
Meat boners	5	5	5				5
Metal polishers	48	29	27	2	1	1	27
Metal spinners	6	1	1				1
Milkers	93	65	6	59			65
Millwrights	69	54	42	12	2	5	47
Miners	119	65	4	61		2	63
Mortar mixers	67	63	54	9	3	38	22
Molders	17	13	11	2			13
Movies	135	115	115		115		
Muckers	108	75		75			75
Nurses	50	42	23	19		2	40
Orchard hands	80	68		68		5	63
Orderlies	37	30	21	9			30
Ornamental iron workers	9	6	6				6
Packers	77	64	64		12	3	49
Painters	1,483	1,320	1,199	121	62	555	703
Painters' helpers	57	56	51	5	12	20	24
Pantrymen	34	22	16	6			22
Paperhangers	306	251	242	9	45	136	70
Patients	42	41	41		41		
Pattern makers	26	11	10	1			11
Pin setters	89	71	71				71
Pipe fitters	100	68	37	31	1	6	61
Pipe fitters' helpers	93	84	58	26	3	27	54
Plasterers	885	660	580	80	33	298	329
Plasterers' helpers	105	99	95	4	8	56	35
Plumbers	270	211	181	30	15	84	112
Plumbers' helpers	130	124	117	7	22	61	41
Porters	444	374	325	49	20	24	330

TABLE No. 15. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922—Concluded.

LOS ANGELES OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Pot washers	103	85	60	25	5	4	76
Power machine operators	10	2	2				2
Press feeders	18	12	12				12
Pressers	32	26	25	1		2	24
Printers	19	12	12				12
Pruners	35	28	2	26	1	2	25
Riggers	26	16	7	9		7	9
Riveters	34	19	16	3		1	18
Roofers	146	123	122	1	16	38	69
Roofers' helpers	142	132	131	1	36	64	32
Sack sewers	11	11	6	5		2	9
Salesmen	26	9	8	1			9
Sample carriers	27	24	24		21	1	2
Sash and door men	22	6	6				6
Sawmill workers	63	45	45		3		42
Sawyers	4	3	2	1			3
Seamen	40	28		28			28
Sheet metal workers	207	137	132	5		5	132
Sheet metal workers' helpers	29	26	25	1	1	3	22
Shinglers	529	451	405	46	24	374	53
Silvermen	34	32	21	11	5	8	19
Solicitors	37	22	22				22
Stablemen	22	18	14	4			18
Stenographers	203	138	115	23		4	134
Stevedores	87	81		81		27	54
Stonemasons	55	45	25	20	3	13	29
Stonemasons' helpers	10	8	8			1	7
Structural iron workers	32	16	12	4		3	13
Substation operators	6	5		5			5
Supervisors	27	26		26			26
Tailors	8	4	2	2			4
Teamsters, farm	252	188	6	182		11	177
Teamsters, others	356	265	185	80	2	62	201
Tent pullers	8	8		8			8
Tile setters	41	32	31	1	3	11	18
Timekeepers	3	3	1	2			3
Tire makers	8	2	2				2
Traymen	7	6	6			1	5
Typists	68	46	43	3	6	12	28
Upholsterers	46	20	19	1	3	1	16
Vegetable men	123	105	101	4	4	4	97
Waiters	443	380	291	89	34	18	328
Watchmen	68	59	32	27		4	55
Weavers	3	2	2				2
Welders	79	57	42	15	3	5	49
Window cleaners	48	38	36	2	6	5	27
Window trimmers	10	8	8				8
Wood turners	39	26	25	1			26
Woodchoppers	53	44	17	27	2	9	33
Yardmen	91	75	56	19	6		69
Miscellaneous mechanics	48	29	13	16	1	2	26
Miscellaneous N. E. S.	19	18	13	5			18
Totals	65,590	58,096	49,455	8,641	14,552	17,672	25,872

TABLE No. 16. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

LOS ANGELES OFFICE—FEMALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Agents and solicitors	233	102	101	1	8	30	63
Agricultural workers	13	11		11			11
Artificial flower workers	23	19	19			3	16
Attendants	21	16	14	2	1	1	14
Bindery workers	18	15	14	1			15
Biscuit workers	18	13	13			2	11
Bookkeepers and cashiers	259	164	162	2		2	162
Butchers	8	7	7			1	6
Cannery workers	393	291	151	140		6	285
Caterers	68	64	64		64		
Clerks, office	1,234	1,093	1,092	1	93	631	369
Clerks, sales	80	36	34	2	2	2	32
Clerks, stock	25	16	16			3	13
Companions	40	22	22		1	5	16
Confectionery workers	155	110	110			7	103
Cooks, family	456	169	151	18		1	168
Cooks, others	603	322	271	51	3	3	316
Couples (females)	158	96	32	64			96
Day workers	5,487	5,305	5,292	13	5,160	145	
Demonstrators	12	5	5				5
Dish washers	246	192	191	1	39	11	142
Domestics	3,128	2,062	1,901	161	5	81	1,976
Elevator operators	8	1	1				1
Entertainers	4	2	2		1		1
Errand girls	3	3	3			3	
Folders, factory	8	8	8				8
Fruit packers	7	1	1				1
Fruit pickers	27	27	27			5	22
Garment workers	367	159	159		2	4	153
Housekeepers	22	10	7	3			10
Janitress	473	354	353	1	74	93	187
Kitchen helpers	596	429	416	13	61	27	341
Labelers	98	89	89			9	80
Laundresses, family	5	2	2				2
Laundry workers	215	116	115	1	1	3	112
Leather workers	54	45	45				45
Linen room workers	6	3	3			1	2
Maids, chamber	771	586	570	16	69	36	481
Maids, second	123	46	38	8			46
Matrons	26	14		14			14
Mechanical workers	109	86	86				86
Messenger girls	7	2	2				2
Millinery workers	15	9	9				9
Molders	7	6	6				6
Nurses, children's	257	126	123	3	24	3	99
Nurses, practical	166	95	87	8	3	25	67
Packers, foods	111	81	81			4	77
Packers and wrappers	112	61	60	1	16	9	36
Paper box workers	80	56	56			2	54
Pressers	47	21	21			1	20
Punch press operators	8	5	5				5
Rag sorters	6	4	4				4
Saleswomen	86	57	57		8	12	37
Seamstress	216	133	132	1	30	36	67
Seed workers	8	8	8				8
Shirt and neckwear workers	15	8	8			3	5
Stenographers	966	687	675	12	36	147	504
Tea, coffee and spice workers	7	5	5		2	2	1
Telephone operators	85	62	62		2	6	54
Tent and awning workers	15	10	10		1	1	8
Textile workers	113	54	54				54
Typists	1,139	988	987	1	52	529	407
Ushers	3	1	1				1
Waitresses	1,949	1,096	985	111	31	49	1,016
Walnut workers	20	8	8				8
Woodworkers	57	43	43			3	40
Wreath makers	15	13	13				13
Miscellaneous	12	9	8	1			9
Totals	23,152	15,759	15,097	662	5,790	1,947	8,022

TABLE No. 17. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

SAN FRANCISCO OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Asbestos workers	11	9		9			9
Attendants, hospitals, etc.	13	10	6	4			10
Auto mechanics	29	26	20	6	1	3	22
Auto mechanics' helpers	7	7	7			3	4
Auto washers	49	43	43		1	1	41
Bakers	59	42	24	18	2		40
Bakers' helpers	79	66	51	15		2	64
Barbers	6	3	1	2			3
Bed makers	95	64	38	26	2		62
Blacksmiths	82	58	17	41		3	55
Blacksmiths' helpers	22	19	13	6			19
Boilermakers	30	21	10	11	1	7	13
Boilermakers' helpers	17	12	4	8	1	3	8
Bolters-up	260	207		207			207
Bookkeepers and accountants	5	2	2				2
Bootblacks	3	3	2	1			3
Box makers	27	19	17	2	1	10	8
Box strappers	28	25	21	4	1	7	17
Boys:							
Apprentice	138	107	103	4	1	1	105
Bell	53	41	32	9			41
Bus	388	309	286	23	51	11	247
Delivery	18	10	10			1	9
Errand and messenger	100	53	53			2	51
Factory	148	118	3	115		2	116
Mess	63	62		62			62
News	130	124	124				124
Office	42	20	19	1			20
Supply and stock	18	15	15		1		14
Miscellaneous	13	8	6	2			8
Brakemen and switchmen	8	5	1	4			5
Brick cleaners	41	38	38		8	1	29
Bricklayers	29	7	4	3		3	4
Buckers, wood	10	7		7			7
Bushelmen	17	17	9	8			17
Butchers	22	10	4	6			10
Cabinetmakers	56	48	8	40			48
Carpenters	605	490	288	202	13	133	344
Carpenters' helpers	115	90	29	61	4	8	78
Carpenters, bridge	31	15		15			15
Car repairers	15	1		1			1
Cement finishers	19	15	6	9	1	5	9
Chainmen and rodmen	17	14	3	11		1	13
Chauffeurs and truck drivers	80	69	58	11	3	8	58
Choremen	121	94	10	84			94
Cleaners	1,077	1,013	1,011	2	852	134	27
Clerks:							
Hotel	44	32	26	6		1	31
Office	39	27	18	9		1	26
Shipping	25	22	22			1	21
Stock and supply	52	45	43	2	1	1	43
Store	11	6	4	2		2	4
Cooks	973	774	220	554	10	28	736
Cooks' helpers	103	81	36	45			81
Coopers	7	3	3				3
Cotton and hop pickers	120	55		55			55
Couples (male half)	164	101	14	87			101
Creamery hands	14	14	9	5			14
Deck hands	1,234	1,175	64	1,111	33	13	1,129
Dishwashers	1,867	1,574	1,201	373	70	57	1,447
Distributors	75	68	68		9	48	11
Dredger hands	10	8		8			8
Drillers	37	14	7	7		1	13
Electricians	29	29	10	19	3	5	21
Electricians' helpers	3	3		3			3
Elevator operators	179	142	140	2	3	8	131
Engineers, various	80	46	22	24		1	45
Fallers, timber	43	21		21			21
Farm hands, N. E. S.	286	201		201			201
Firemen	86	68	16	52			68
Flunkies	110	97	4	93			97
Foremen, various	15	11	11				11
Foundry helpers	20	20	20				20

TABLE No. 17. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921—Continued.

SAN FRANCISCO OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Fruit and berry pickers	86	72		72			72
Garagemen	7	6	6				6
Gardeners and helpers	97	80	35	45	6	11	63
Glassmen	10	9	8	1			9
Handy men	79	65	57	8	6	16	43
Helpers, various	220	157	8	149	3		154
Hod carriers	8	8	2	6		2	6
Hotel help, N. E. S.	25	21	16	5		1	20
Housemen	158	120	108	12		3	117
Janitors	395	318	295	23	17	14	287
Kitchen helpers	369	294	204	90	25	8	261
Laborers:							
Agriculture	43	22	22				22
Auto accessories	116	113	113		84	21	8
Building construction	860	786	705	81	162	440	184
Factories	1,195	1,048	827	221	325	307	416
Foods	745	648	337	311	152	134	362
Freight handlers	887	878	878		817	30	31
Hotels and institutions	199	189	164	25	98	40	51
Lumber industry	1,022	770	247	523	57	97	616
Metals and machinery	1,879	1,483	1,439	44	670	507	306
Mines, oils, etc	218	147	37	110	4	20	123
Nursery	33	33	23	10	4	15	14
Office buildings	27	26	26		17	9	
Private homes	180	178	125	53	137	35	6
Public utilities	485	374	236	138	126	90	158
Recreation and amusement	33	27	27		13	8	6
Shipyards	100	89	9	50			59
Street and highway	163	104	34	70		7	97
Sugar refineries	899	891	107	784	7	110	774
Transportation	1,328	1,082	398	684	272	81	729
Warehouse	321	296	293	3	95	140	61
Wholesale and retail	3,196	3,055	3,026	29	1,598	1,149	308
Wrecking	161	140	140		1	77	62
Miscellaneous	274	260	256	4	93	122	45
Lathers and shinglers	36	31	30	1		14	17
Laundrymen	75	42	32	10	1		41
Linemen	43	39	35	4	1		38
Machinists	121	87	13	74		1	86
Machinists' helpers	69	64	13	51		2	62
Machine hands	19	13	12	1			13
Mechanics, miscellaneous	65	53	5	48			53
Milkers	85	61	3	58		1	60
Millwrights	9	8	2	6			8
Miners	71	45		45			45
Muckers	42	21		21			21
Orchard hands	7	4		4			4
Orderlies	23	18	17	1			18
Nurses, male	9	8	2	6			8
Oilers and wipers	22	18		18			18
Packers	102	75	69	6	5	4	66
Painters	502	437	314	123	15	146	276
Painters' helpers	34	25	20	5		5	20
Pantrymen	89	66	30	36			66
Paperhangers	54	48	46	2	7	22	19
Pin setters	26	21	21		3		18
Pipe fitters	62	39	6	33		3	36
Pipe fitters' helpers	51	33	7	26		1	32
Plasterers	26	20	14	6	5	6	9
Plumbers	44	37	21	16	1	7	29
Plumbers' helpers	27	27	16	11	3	2	22
Porters	735	590	424	166	27	13	550
Pot washers	164	129	106	23		3	126
Powder men	5	4		4			4
Printers	6	5	1	4			5
Riggers, lumber	14	3		3			3
Riggers' helpers	16	15	1	14			15
Rigging slingers	86	70		70			70
Riveters	5	5	5				5
Roofers	30	29		29			29
Sack sewers	19	17	15	2		4	13
Salesmen	85	54	53	1		1	53
Sawmill hands	155	106	12	94			106

TABLE No. 17. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921—Concluded.

SAN FRANCISCO OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Seamen	34	30		30			30
Sheep and goat herders	11	8		8			8
Sheet metal workers	28	17	9	8		1	16
Shipwrights and joiners	15	8		8			8
Silvermen	47	38	32	6			38
Solderers	6	3	3				3
Solicitors	83	23	23		1	6	16
Stablemen	69	52	50	2	2	1	49
Stenographers and typists	26	10	8	2			10
Stevedores	20						
Storekeepers	5	4	1	3			4
Tailors and pressers	5	3	3				3
Teamsters, farm	150	135		135			135
Teamsters, other	47	43	15	28		3	40
Tie makers	28	24		24			24
Towermen	7	7		7			7
Tractor drivers	4	3		3			3
Traymen	12	9	6	3			9
Truckers	341	329	41	288	36	7	286
Upholsterers	21	14	5	9			14
Vegetable men	96	81	58	23	2	4	75
Waiters	813	613	185	428	15	45	553
Watchmen and caretakers	162	111	72	39		22	89
Welders	18	15	11	4		2	13
Well borers	5	4	3	1		2	2
Window cleaners	113	100	98	2	54	19	27
Woodchoppers	120	108	39	69	2	1	105
Woodsmen	101	52		52			52
Woodworkers	4	4	2	2			4
Yardmen	24	21	10	11			21
Miscellaneous skilled, N. E. S.	216	134	64	70	3	13	118
Miscellaneous unskilled, N. E. S.	55	43	24	19	2		41
Totals	31,183	26,245	16,669	9,576	6,047	4,371	15,827

TABLE No. 18. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

SAN FRANCISCO OFFICE—FEMALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Amusement workers	14	2	2				2
Bookkeepers and cashiers	46	24	24			1	23
Bus girls	84	74	74		4	1	69
Chambermaids	1,263	1,063	1,018	45	22	8	1,033
Clerks, office	241	195	195		4	48	143
Companions	3	2	2				2
Cooks:							
Hotels and restaurants	270	177	100	77	4	2	171
Private homes	324	92	65	27	1	2	89
Couples (female half)	164	101	14	87			101
Day workers	1,508	1,460	1,460		1,306	90	64
Demonstrators	17	12	12			11	1
Dishwashers	78	67	62	5	11		56
Domestics	1,376	469	417	52	1	7	461
Elevator operators	22	17	17				17
Factory:							
Biscuit workers	50	21	21				21
Cannery hands	183	166	136	30		11	155
Confectionery workers	100	78	78				78
Foods	209	176	176			9	167
Garment workers	43	30	30			1	29
Paper box workers	42	30	30				30
Printing and binding	20	16	16			1	15
Miscellaneous	689	539	539		2	12	525
Fruit and berry pickers	36	30		30			30
Fruit packers	46	46	46				46
Housekeepers	79	46	37	9			46
Janitresses	78	54	54		3	4	47
Kitchen helpers	239	186	183	3	4		182
Laundry workers	198	134	133	1	6	2	126
Linen-girls	17	14	14		2		12
Maids	4	3	3				3
Matrons	4	2	2				2
Nurses, children's	125	41	37	4	5	1	35
Nurses, practical	181	131	105	26		11	120
Packers and wrappers	211	171	171		1	6	164
Pantrywomen	78	54	48	6			54
Pressers	19	10	10				10
Saleswomen	143	102	87	15	1	10	91
Scrubwomen	17	17	17		1	5	11
Seamstresses	45	38	37	1		6	32
Second girls	162	49	43	6	2		47
Service girls	180	137	137			2	135
Solicitors	61	32	27	5			32
Stenographers and typists	193	119	119		1	12	106
Stock girls	15	11	11				11
Telephone operators	21	14	14			1	13
Waitresses	830	520	383	137	22	15	483
Wardmaids	11	4	4				4
Miscellaneous occupations	83	42	42			2	40
Totals	9,822	6,818	6,252	566	1,403	281	5,134

TABLE No. 19. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

SAN FRANCISCO OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Acetylene burners	35	33	31	2		11	22
Amusement workers	16	16	7	9	1		15
Auto and truck drivers	122	110	97	13	2	8	100
Auto mechanics	64	64	60	4	2	6	56
Auto mechanics' helpers	7	7	7			3	4
Auto washers	58	53	53		4	5	44
Bakers	20	17	8	9			17
Bakers' helpers	27	27	21	6		2	25
Bed makers	56	55	42	13			55
Blacksmiths	56	52	19	33	1	1	50
Blacksmiths' helpers	23	22	18	4		2	20
Boilermakers	27	21	19	2		5	16
Boilermakers' helpers	34	27	25	2		1	26
Bolters-up	28	21	21				21
Bookkeepers	11	4	2	2			4
Bootblacks	19	14	14			11	3
Boys:							
Apprentice	215	184	176	8	2	5	177
Bus	331	312	310	2	180	11	121
Errand	36	34	34		1	7	26
Factory	96	89	89		3	8	78
Messenger	40	29	29		1		28
News	80	58	58				58
Office	14	12	12		1		11
Miscellaneous	5	5	4	1		1	4
Box makers	71	68	39	29	8	13	47
Brick cleaners	43	35	35			8	27
Bricklayers	86	30	14	16	2	6	22
Buckers, lumber	8	3		3			3
Bushelmen	6	6	5	1			6
Butchers	31	19	3	16		3	16
Cabinetmakers	108	67	41	26		1	66
Candy makers and helpers	8	7	7				7
Carpenters	979	826	691	135	40	274	512
Carpenters' helpers	42	40	39	1	3	19	18
Carpet layers	5	5	5		3	1	1
Cement workers	74	53	38	15	1	19	33
Chippers and caulkers	47	24	21	3		1	23
Choremen	114	92	3	89			92
Cleaners	953	939	938	1	793	123	23
Clerks:							
Hotel	22	21	20	1			21
Office	49	28	20	8	1	2	25
Shipping	25	21	20	1		2	19
Stock and order	23	22	22				22
Store	18	18	16	2		2	16
Cooks	486	447	207	240	3	11	433
Cooks' helpers	48	46	21	25	3		43
Cotton pickers	20	20		20			20
Couples (male half)	174	125	40	85			125
Crane operators	8	6	5	1			6
Creamery hands	5	4	2	2			4
Deck hands	69	61	5	56	2	1	58
Deliverymen	45	44	44		11	18	15
Demonstrators	8	5	5			1	4
Dishwashers	989	959	869	90	138	38	783
Distributors	157	155	155		78	48	29
Drillers and helpers	19	18	18				18
Electricians and helpers	55	49	30	19	2	7	40
Elevator operators	53	51	51		7	10	34
Engineers	42	40	15	25			40
Fallers, timber	30	9		9			9
Farm hands, N. E. S.	263	177		177	2	1	174
Firemen	59	55	4	51		2	53
Fishermen	50	27		27			27
Floor layers	19	17	13	4			17
Flunkies	30	26	1	25			26
Foremen, various	5	5	2	3			5
Fruit and berry pickers	305	210		210		4	206
Garagemen	10	10	10				10
Gardeners	75	71	59	12	13	20	38
Gardeners' helpers	12	11	4	7		1	10
Glaziers	8	3	2	1	1	1	1

TABLE No. 19. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922—Continued.

SAN FRANCISCO OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Handy men	112	106	84	22	15	40	51
Helpers, various	54	41	40	1	1	8	32
Holders-on	10	6	6				6
Hod carriers	72	65	63	2	2	13	50
Housemen	75	67	59	8		4	63
Housesmiths	25	24	19	5		1	23
Irrigators	20	13		13			13
Janitors	215	201	183	18	3	12	186
Kitchen helpers	215	213	156	57	12	12	189
Laborers:							
Building construction	1,294	1,210	1,183	27	276	603	331
Factories	455	416	374	42	154	95	167
Foods, etc	448	394	153	241	22	52	320
Hotels, institutions, etc	247	243	235	8	103	83	57
Lumber industry	488	313	159	154	45	83	185
Metals and machinery	427	385	341	44	170	121	94
Mines, oils, etc	57	48	32	16	1	19	28
Office buildings	29	29	29		22	5	2
Private homes	246	245	243	2	190	41	14
Recreation and amusement	112	112	77	35	71	36	5
Street and highway	174	143	66	77	20	10	113
Transportation and public utilities	1,413	1,189	637	552	362	199	628
Wholesale and retail	4,163	4,093	4,058	35	2,170	1,556	367
Miscellaneous	131	124	108	16	24	60	40
Lathers	188	143	117	26	1	46	96
Laundry workers	37	35	27	8	1	3	31
Linemen	24	16	3	13			16
Lumber graders	14	8		8			8
Machinists	82	63	38	25		7	56
Machists' helpers	32	31	26	5		6	25
Marble setters	7	2	1	1	1	1	
Messmen	18	18	1	17			18
Milkers	96	63		63			63
Millwrights	29	27	1	26		1	26
Miners	8	8		8			8
Muckers	44	31		31			31
Nurses, male	19	9	3	6		2	7
Orderlies	64	61	53	8			61
Packers	46	44	44		7	15	22
Painters	1,197	1,108	979	129	22	734	352
Painters' helpers	50	49	29	20	20	14	15
Painters, sign	10	9	8	1		4	5
Pantrymen	52	51	28	23	1		50
Paperhangers	129	120	118	2	11	63	46
Pea pickers	22	12		12			12
Pipe fitters	19	12	12			2	10
Pin setters	36	33	33		1	2	30
Plasterers	173	96	81	15	5	26	65
Plumbers	111	97	88	9	2	8	87
Plumbers' helpers	17	17	17		2	7	8
Porters	374	350	266	84	12	30	308
Pot washers	71	69	51	18	4	2	63
Poultrymen	10	9	2	7			9
Pressers	7	6	6				6
Printers	14	12	10	2			12
Pruners	5	5		5			5
Quartermasters	8	3		3			3
Riggers	31	25	21	4		1	24
Rivet heaters and passers	37	19	19			1	18
Roofers	37	28	19	9		1	27
Sack sewers	25	23	20	3	4	6	13
Sailmakers	6	6	6				6
Salesmen	300	164	162	2			164
Sawmill hands	194	82	31	51		3	79
Seamen	38	31		31			31
Sheepherders	6	3		3			3
Sheet metal workers	70	65	50	15		3	62
Shinglers	61	57	41	16	4	18	35
Shipwrights and joiners	166	88	50	38		22	66
Silversmen	22	18	17	1	6		12
Solicitors	449	325	324	1		18	307
Soldiers	7	7	7				7
Stablemen	21	19	17	2		1	18

TABLE No. 19. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922—Concluded.

SAN FRANCISCO OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Steam and pipe fitters	17	12	6	6			12
Stenographers and typists	55	20	12	8			20
Supers, theatrical	42	38	38			32	6
Supplymen	12	11	11		1		10
Tallymen	7	5	2	3			5
Teamsters, farm	414	341		341			341
Teamsters, other	149	114	70	44		6	108
Tie and stake makers	51	19		19			19
Tile setters	38	17	15	2		2	15
Tinsmiths	12	10	9	1			10
Upholsterers	18	11	9	2		1	10
Vegetable men	46	44	39	5		2	42
Waiters	380	364	224	140	67	17	280
Wardmen	5	5	5				5
Watchmen	134	72	49	23		29	43
Welders	21	16	9	7		1	15
Window cleaners	109	98	98		32	26	40
Wirestrappers	13	13	12	1	3	5	5
Woodchoppers	62	47	19	28	2	3	42
Woodsmen	46	30		30		1	29
Wrappers	24	24	24		9	5	10
Yardmen	12	12	7	5			12
Miscellaneous skilled, N. E. S.	198	116	78	38	3	8	105
Miscellaneous unskilled, N. E. S.	85	66	57	9	26	10	30
Totals	24,491	21,003	16,619	4,384	5,219	4,972	10,812

TABLE No. 20. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

SAN FRANCISCO OFFICE—FEMALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Amusement workers	31	31	31			17	14
Attendants	11	10	10				10
Bus girls	46	43	43		5		38
Bookkeepers and cashiers	37	29	29		11	2	16
Chambermaids	1,181	1,097	1,081	16	24	23	1,050
Checkers	9	9	9				9
Clerks, office	190	157	157		3	28	126
Clerks, stock	22	18	18				18
Companions	7	4	3	1		1	3
Cooks, hotels, etc	320	212	141	71	3	5	204
Cooks, private homes	274	105	66	39	11	1	93
Couples (female half)	174	125	40	85			125
Counter girls	9	9	8	1			9
Day workers	1,744	1,705	1,705		1,274	41	390
Demonstrators	14	12	12		1	1	10
Dishwashers	19	18	18		2		16
Distributors	8	8	8			5	3
Domestics	2,233	799	704	95	2	25	772
Elevator operators	23	16	16				16
Factory workers:							
Biscuit	116	106	106				106
Canning and packing	457	407	356	51		23	384
Confectionery	159	144	144		1	7	136
Foods, etc	223	200	200			19	181
Garment workers	83	71	71		5	8	58
Paper box	57	51	51				51
Miscellaneous	750	671	671		4	92	575
Hotel help, N. E. S.	25	22	22				22
Housekeepers	123	62	44	18		1	61
Janitresses	73	61	61		6	9	46
Kitchen helpers	186	159	156	3	15	4	140
Laundry workers	155	112	104	8	4	2	106
Linen girls	7	5	5				5
Maids	8	5	5				5
Matrons	14	10	8	2			10
Nurses, children's	182	99	89	10	11	2	86
Nurses, practical	375	287	261	26	6	46	235
Pantrywomen	86	79	78	1	2	21	56
Pressers	4	3	3				3
Saleswomen	115	98	89	9	17	10	71
Seamstresses	34	23	23		3	7	13
Second girls	170	57	34	23			57
Service girls	116	107	107		11	2	94
Solicitors	239	127	125	2		9	118
Stenographers and typists	261	184	184		8	53	123
Telephone operators	19	14	14				14
Waitresses	842	658	583	75	152	8	498
Wardmaids	12	8	8				8
Miscellaneous occupations	33	22	22		3	2	17
Totals	11,276	8,259	7,723	536	1,584	474	6,201

TABLE No. 21. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

OAKLAND OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Amusement workers	25	19	19				19
Attendants, hospitals, etc.	4	4	4			1	3
Auto body builders	8	7	7				7
Auto mechanics	48	43	42	1	1	3	39
Auto trimmers	5	3	3				3
Auto washers	41	37	37		11	2	24
Bakers and helpers	23	18	14	4		1	17
Barbers	6	4	4		2		2
Bed makers	19	16	2	14	1		15
Blacksmiths	13	10	6	4			10
Blacksmiths' helpers	54	37	36	1	1	4	32
Boilermakers	14	7	2	5	1	1	5
Boilermakers' helpers	3	3	3				3
Bolters-up	683	597	597				597
Bookkeepers	6	4	4				4
Bootblacks	4	2	2				2
Box makers	10	10	8	2		3	7
Boys:							
Apprentice	273	213	177	36		1	212
Bell	30	24	24			1	23
Bus	104	79	79		6	5	68
Delivery	23	19	19		2	1	16
Factory	42	36	36		2		34
Messenger and errand	39	31	31		2	1	28
Office	28	21	21				21
Second	37	29	26	3			29
Miscellaneous	13	12	12			3	9
Brick cleaners	33	28	28			1	27
Bricklayers	38	20	15	5	2	7	11
Butchers	4	4	3	1			4
Cabinetmakers	51	40	37	3			40
Cannery hands	115	22	13	9			22
Canvassers and solicitors	275	161	160	1			161
Car cleaners	9	8	8				8
Carpenters	759	513	445	68	38	184	291
Carpenters' helpers	59	58	56	2	2	9	47
Car repairers	6	6	6				6
Cement workers	29	27	27		7	15	5
Chauffeurs and truck drivers	84	73	69	4	11	6	56
Choremen	113	91	27	64		1	90
Cleaners	688	671	670	1	627	38	6
Clerks:							
Hotel	8	6	6				6
Office	33	23	20	3			23
Shipping and stock	15	11	11			1	10
Cooks	360	231	141	90	3	2	226
Couples (males)	84	42	11	31			42
Creamery hands	8	5	5		2	1	2
Dairy hands	9	8	3	5			8
Deck hands	166	137	50	87	7	21	109
Dishwashers	923	772	587	185	69	9	694
Distributors	54	54	53	1	33	12	9
Drillers and helpers	58	30	28	2			30
Electricians	68	45	39	6		7	38
Elevator operators	32	25	25		2		23
Engineers, various	26	17	10	7			17
Fallers, timber	6	2		2			2
Farm hands, N. E. S.	210	174		174		11	163
Firemen	24	12	8	4			12
Flunkies	12	5	1	4			5
Foremen, various	11	5	1	4			5
Fruit and berry pickers	33	26		26		12	14
Garagemen	6	6	6				6
Gardeners	374	346	333	13	237	61	48
Glass and silver men	16	11	11		1	1	9
Handy men	194	163	155	8	58	24	81
Helpers, various	361	222	222		4	10	208
Hod carriers	42	39	39		6	10	23
Holders-on	311	255	255				255
Hop pickers	100	18		18			18
Hotel help, N. E. S.	27	18	11	7			18
Housemen	40	38	34	4			38
Ironworkers	14	9	9				9
Janitors	174	143	136	7	5	3	135
Joiners	47	25	25				25

TABLE No. 21. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921—Concluded.

OAKLAND OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Kitchen helpers	184	147	120	27	10	13	124
Laborers:							
Building construction	1,742	1,687	1,611	76	764	635	288
Factories	1,321	1,186	1,140	46	499	253	434
Foods	216	201	199	2	63	51	87
Hotels, etc	121	121	119	2	65	35	21
Lumber industry	453	294	193	101	61	49	184
Metals and machinery	912	620	600	20	68	59	493
Mining, oils, etc	193	157	60	97	4	20	133
Private homes	683	656	655	1	576	76	4
Street and highway	402	266	88	178	18	25	223
Sugar refineries	294	146		146	31		115
Transportation and public utilities	771	510	467	43	178	101	231
Wholesale and retail	1,799	1,748	1,724	24	996	567	185
Wrecking	38	38	38		1	18	19
Miscellaneous	19	18	18		2	16	
Lathers and shinglers	71	57	38	19	5	36	16
Laundry workers	64	50	48	2		1	49
Linemen	11	2	1	1			2
Machinists	87	39	16	23		1	38
Machinists' helpers	17	14	8	6		1	13
Milkers	38	27	13	14			27
Millwrights	6	4		4			4
Miners	74	24	12	12			24
Molders	4	4	3	1			4
Molders' helpers	24	21	21				21
Muckers	17	3	2	1			3
Nurses, male	20	14	14				14
Orderlies	9	5	5				5
Packers	8	8	8		1	1	6
Painters	441	371	342	29	13	145	213
Painters' helpers	27	25	25		1	3	21
Pantrymen	17	11	11				11
Paperhangers	26	25	24	1	6	14	5
Pipe fitters and helpers	34	10	6	4			10
Pin setters	64	57	57				57
Plasterers	70	58	53	5	4	26	28
Plate hangers and helpers	112	57	57				57
Plumbers	34	33	27	6	8	16	9
Plumbers' helpers	6	6	6		4	1	1
Porters	385	332	302	30	151	15	166
Pot washers	37	30	30		3	1	26
Powder mill workers	84	71		71			71
Pressers	13	9	9				9
Punchmen	16	16	16				16
Riveters	224	139	139		1		138
Rivet heaters	143	93	93				93
Rivet passers	133	99	99				99
Roofers	20	20	20				20
Sack sewers	16	14	14				14
Salesmen	85	66	64	2	1		65
Sawmill hands	114	58	40	18			58
Seamen	15	5		5			5
Sheepherders	5	4		4			4
Sheet metal workers	22	9	8	1			9
Shipfitters	79	11	6	5			11
Shoe repairmen	8	7	3	4			7
Stenographers and typists	21	9	8	1			9
Supplymen	8	4	4				4
Teamsters, farm	27	19		19			19
Teamsters, other	146	106	63	43	1	11	94
Textile workers	8	8		8			8
Upholsterers	18	14	12	2			14
Vegetable men	20	15	14	1	1	1	13
Waiters	183	118	58	60	10	1	107
Watchmen	23	19	12	7		1	18
Welders	10	10	10		1		9
Well borerers	16	14	10	4			14
Window cleaners	136	132	132		126	5	1
Woodchoppers	176	141	86	55	6	16	119
Yardmen	10	9	9				9
Miscellaneous skilled, N. E. S.	266	119	99	20	2	16	101
Miscellaneous, unskilled, N. E. S.	42	34	32	2	11	17	16
Totals	20,611	16,404	14,235	2,169	4,825	2,720	8,859

TABLE No. 22. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

OAKLAND OFFICE—FEMALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Amusement workers	27	12	12			5	7
Binders and wrappers	26	19	19		2	5	12
Bookkeepers	44	23	23		1		22
Bus girls	18	9	9			1	8
Cafeteria help	179	128	128		11	1	116
Canvassers and solicitors	151	38	38			1	37
Car cleaners	18	13	13				13
Cashiers	7	6	6				6
Cateresses	13	9	9		9		
Chambermaids	251	153	88	65	10	2	141
Clerks, office	186	143	142	1	24	21	98
Clerks, stock	4	4	4				4
Companions	25	10	8	2	1		9
Comptometer operators	41	25	25				25
Cooks, private homes	207	69	34	35	3	1	65
Cooks, hotels, etc	313	190	171	19	1	3	186
Couples (females)	84	42	11	31			42
Dayworkers	2,586	2,451	2,450	1	2,387	60	4
Demonstrators	15	12	12				12
Dishwashers	116	82	81	1	7	2	73
Domestics	2,082	769	706	63	3	25	741
Elevator operators	17	14	14				14
Factory workers:							
Canneries	100	40	40				40
Foods, etc	128	115	115		2	7	106
Miscellaneous	347	288	287	1	14	20	254
Fruit and berry pickers	21	9		9			9
Hotel help, N. E. S	47	23	22	1	1		22
Hop pickers	100	5		5			5
Housekeepers	335	171	143	28		4	167
Janitresses	62	45	45		5		40
Kitchen helpers	412	304	283	21	11	15	278
Laundry workers	168	92	82	10			92
Laundresses	9	6	6		2	1	3
Maids	6	1	1				1
Matrons	34	24	22	2			24
Nurses, children's	167	86	81	5	4	7	75
Nurses, practical	203	136	123	13	1	9	126
Pantrywomen	33	16	15	1			16
Pressers	17	10	8	2			10
Saleswomen	182	124	124		13	10	101
Seamstresses	35	26	26		5	5	16
Second girls	154	57	39	18	1	1	55
Servers, cafeteria	26	22	21	1			22
Stenographers and typists	402	302	296	6	20	65	217
Telephone operators	34	17	17		1	2	14
Waitresses	676	392	356	36	52	7	333
Miscellaneous occupations	41	20	20		2	1	17
Totals	10,149	6,552	6,175	377	2,593	281	3,678

TABLE No. 23. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

OAKLAND OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Amusement workers	89	82	81	1	61	6	15
Anglesmiths	18	9	9			2	7
Auto and truck drivers	98	89	73	16	15	19	55
Auto mechanics	51	41	40	1	5	11	25
Auto top trimmers	8	8	7	1	1	1	6
Auto washers	51	50	49	1	24	7	19
Bakers and helpers	14	10	8	2		2	8
Bed makers	4	3	1	2			3
Bevelers	19	2	2				2
Blacksmiths	22	19	11	8	1	2	16
Blacksmiths' helpers	30	27	27			2	25
Boilermakers and helpers	23	21	21		2	3	16
Bolters-up	95	72	72			14	58
Bookkeepers	14	8	8				8
Boys:							
Apprentice	68	60	60				60
Bell and door	4	2	2				2
Bus	55	49	44	5	2	3	44
Delivery	36	30	29	1	2	10	18
Errand and Messenger	8	7	7		2		5
Factory	32	30	30		5	5	20
Office	7	5	5				5
Second	33	26	26				26
Stock	4	4	4				4
Box makers	14	14	14		1	2	11
Brick cleaners	44	38	36	2	7	18	13
Bricklayers	110	79	76	3	9	28	42
Butchers	3	2	2				2
Cabinetmakers	88	62	54	8			62
Carpenters	1,027	860	788	72	90	281	489
Carpenters' helpers	69	44	39	5	6	11	27
Car cleaners	10	8	8				8
Cement workers	64	54	53	1	8	26	20
Chippers and caulkers	32	26	26			15	11
Chiremen	96	73	31	42			73
Cleaners	907	893	893		840	49	4
Clerks:							
Office	18	11	10	1		1	10
Shipping	6	6	6			1	5
Stock	5	4	3	1			4
Store	6	6	6		1	1	4
Cooks	262	195	109	86	5	8	182
Couples (male half)	87	43	12	31			43
Dairy hands	16	13	11	2	3	2	8
Deck hands	33	33	26	7	34		9
Demonstrators	25	21	21		19		2
Dishwashers	602	572	458	114	39	42	491
Distributors	69	66	66		32	33	11
Draftsmen	6	5	3			2	1
Drillers	59	50	50			19	31
Drillers' helpers	33	33	33			13	20
Electricians	30	30	30		6	7	17
Electricians' helpers	10	8	8			1	7
Elevator operators	12	10	10			1	8
Engineers	17	14	11	3		2	12
Farm hands, N. E. S.	295	202		202			202
Firemen	23	11	6	5			11
Floor layers	20	17	15	2		1	16
Flunkies	18	15	10	5	2		13
Foremen, various	7	6	6				6
Fruit and berry pickers	47	42		42			42
Gardeners	474	441	417	24	292	87	62
Glassmen and silvermen	5	3	3				3
Glaziers	44	3	3				3
Handymen	241	218	215	3	85	59	74
Helpers, various	59	50	50		2	12	36
Holders-on	34	31	31		1	17	13
Hod carriers	24	22	22		1	14	7
Housesmiths	8	6	5	1		1	5
Janitors	56	50	47	3	2	8	40
Kitchen helpers	185	164	135	29	13	15	136
Laborers:							
Building construction	2,306	2,194	2,107	87	836	1,072	286
Factories	615	579	561	18	254	193	132
Foods	143	142	142		66	44	32

TABLE No. 23. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922—Concluded.

OAKLAND OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Laborers—(Continued):							
Hotels, etc.	76	76	70	6	49	17	10
Lumber industry	366	282	267	15	144	75	63
Metals and machinery	445	393	389	4	104	214	75
Mines, oils, etc.	75	69	49	20	17	15	37
Private homes	491	475	468	7	422	52	1
Street and highway	167	130	96	34	6	11	113
Transportation and public utilities	350	301	263	38	102	57	142
Wholesale and retail	1,444	1,420	1,412	8	816	565	39
Lathers and shinglers	338	236	228	8	11	111	114
Laundrymen	22	18	18		1	4	13
Machine hands	31	28	28				28
Machinists	39	33	25	8		3	30
Machinists' helpers	19	17	15	2	2	4	11
Mattress makers	10	7	5	2			7
Milkers	38	22	5	17			22
Millwrights	25	22	6	16			22
Miners	17	16	2	14			16
Motormen	18	13	13				13
Muckers	10	4		4			4
Nurses, male	19	15	15				15
Orchard hands	43	39		39		6	33
Orderlies	7	6	6			1	5
Painters	1,097	926	888	38	164	568	194
Painters' helpers	1,338	1,228	1,226	2	689	533	6
Pantrymen	12	8	7	1			8
Paperhangers	107	94	93	1	21	40	33
Pile driver men	11	10	9	1			10
Pin setters	32	23	23		3		20
Plasterers	156	118	113	5	9	32	77
Plate hangers	13	8	8				8
Pipe fitters	25	24	23	1	2	6	16
Plumbers	47	44	41	3	9	14	21
Plumbers' helpers	13	13	13		8	4	1
Porters	156	139	111	28	14	8	117
Pot washers	51	44	44		2	6	36
Pressers	30	23	21	2		5	18
Printing trades	8	3	3			1	2
Riggers	22	20	20			12	8
Rivet heaters and passers	91	77	77			37	40
Riveters	34	27	27		2	15	10
Roofers	31	21	21		1	7	13
Sack sewers	19	14	14		4	4	6
Salesmen	78	44	44				44
Sawmill hands	112	72	72			2	70
Sailors and seamen	128	55		55			55
Sheepherders	2	1		1			1
Sheet metal workers	54	40	35	5		3	37
Shipwrights	16	6	6			2	4
Ship joiners and fitters	160	71	71			6	65
Shipyard workers, N. E. S.	31	25	25		1		24
Shoemakers	13	9	6	3			9
Signal men	9	7	7				7
Solicitors	623	346	345	1	2	20	324
Stablemen	7	6	6				6
Stenographers and typists	19	9	9				9
Structural iron workers	10	10		10			10
Teamsters, farm	32	25		25			25
Teamsters, others	132	103	32	71	1	6	96
Toolmakers	15	14	14				14
Upholsterers	35	19	16	3	2	2	15
Vegetable men	19	18	18		2		16
Waiters	99	75	55	20	9	6	60
Watchmen	18	16	14	2	1	1	14
Welders and burners, acetylene	117	80	78	2	2	15	63
Welders, electric	8	5	3	2			5
Well borers	7	5	2	3		3	2
Window cleaners	128	129	128	1	123	6	
Woodchoppers	141	123	97	26	8	57	58
Woodsmen	25	1		1			1
Miscellaneous skilled, N. E. S.	13	12	12		12		
Miscellaneous unskilled, N. E. S.	12	8	8		8		
Totals	18,553	15,941	14,549	1,392	5,547	4,720	5,674

TABLE No. 24. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

OAKLAND OFFICE—FEMALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Amusement workers	25	14	14				14
Bookkeepers and cashiers	39	24	24			1	23
Bus girls	9	7	7		1	2	4
Cafeteria help, N. E. S.	27	15	11	4			15
Cannery hands	120	82	80	2			82
Cateresses	6	6	6		6		
Chambermaids	132	89	85	4	9	2	78
Clerks, office	143	121	120	1	10	40	71
Clerks, stock	5	3	3				3
Clerks, store	9	8	8				8
Companions	16	8	8				8
Cooks, hotels, etc.	276	171	142	29	5	9	157
Cooks, private homes	130	62	46	16		6	56
Couples (female half)	87	43	12	31			43
Day workers	1,887	1,817	1,815	2	1,759	39	19
Demonstrators	26	17	17		1	4	12
Dictaphone operators	3	2	2				2
Dishwashers	36	27	26	1	8	3	16
Domestics	2,296	781	737	44	2	40	739
Elevator operators	3	2	2				2
Factories, foods, beverages, etc.	79	63	63		6	6	51
Factories, miscellaneous	368	269	261	8	4	17	248
Fruit and berry pickers	30	29		29			29
Hotel help, N. E. S.	26	17	16	1			17
Housekeepers	242	100	77	23		1	99
Janitresses	39	33	33		3		30
Kitchen helpers	244	163	157	6	8	8	147
Laundry workers	115	68	66	2	3	17	48
Matrons	12	8	7	1	1		7
Nurses, children's	88	37	32	5	3	2	32
Nurses, practical	234	148	123	25		18	130
Pantrywomen	8	5	5				5
Pea pickers	30	15		15		15	
Pressers and cleaners	10	2	2				2
Saleswomen	189	95	84	11	3	3	89
Seamstresses	29	21	21		7	4	10
Second girls	150	54	48	6		3	51
Solicitors	405	148	145	3		15	133
Stenographers and typists	250	185	184	1	16	54	115
Telephone operators	17	11	11		1		10
Waitresses	545	348	317	31	46	16	286
Totals	8,354	5,118	4,817	301	1,902	325	2,891

TABLE No. 25. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

FRESNO OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Apricot pickers	8	8		8		8	
Auto and truck drivers	62	62	16	46	3	5	54
Auto mechanics	24	24	7	17		1	23
Auto washers	15	15	14	1	2	4	9
Bakers	6	6		6			6
Blacksmiths	63	56	4	52			56
Blacksmiths' helpers	10	10	3	7			10
Box makers	25	23	8	15			23
Brick cleaners	13	13	13		5	8	
Bricklayers	5	1		1			1
Buckers, lumber	16	14		14			14
Bus boys	30	26	26		1	4	21
Carpenters	261	235	47	188		19	216
Carpenters' helpers	20	20		20		1	19
Choremen	39	31		31			31
Cleaners	65	65	65		57	6	2
Clerks, office	7	5	3	2			5
Clerks, stock	4	3	3				3
Concrete workers	8	7	1	6		1	6
Cooks	228	194	8	186			194
Corn cutters	82	81		81		3	78
Cotton pickers	537	420		420			420
Couples (male half)	17	12		12			12
Dishwashers	196	182	96	86	5	2	175
Elevator operators	2	2	2				2
Electricians	2	1		1			1
Engineers, stationary	39	36	3	33			36
Engineers, tractor	43	41		41			41
Fallers, timber	14	14		14			14
Farm hands, N. E. S.	733	690		690	1	19	670
Fig pickers	131	131		131	21	87	23
Firemen	10	8	4	4			8
Flunkies	109	102		102			102
Foremen, various	4	4		4			4
Fruit and berry pickers	8	8		8			8
Gardeners	31	29	22	7	17	4	8
Grape pickers	643	643		643	38	195	410
Groundmen	82	68		68			68
Handy men	18	17	8	9	1	6	10
Hay hands	319	306		306	6	63	237
Helpers, various	7	7	4	3		3	4
Hide shakers	62	62		62	25	37	
Irrigators	170	163		163	1	12	150
Janitors	18	14	13	1		2	12
Kitchen helpers	69	66	14	52	1		65
Laborers, agricultural	238	234		234	43	44	147
Laborers, building construction	494	490	341	149	312	139	39
Laborers, factories	52	52	12	40	14	5	33
Laborers, foods	240	236	231	5	207	16	13
Laborers, hotels, etc	35	35	34	1	26	2	7
Laborers, lumber industry	656	612	179	433	179	14	419
Laborers, metals and machinery	199	198	188	10	129	59	10
Laborers, mining, oils, etc	333	310	67	243	49	22	239
Laborers, orchard and vineyard	434	419		419	43	103	273
Laborers, packing houses	422	407	338	69	117	95	195
Laborers, private homes	305	303	303		257	44	2
Laborers, recreation and amusement	41	41	34	7	21	10	10
Laborers, street and highway	238	189	14	175	7	19	163
Laborers, transportation and public utilities	1,080	1,036	336	700	252	64	720
Laborers, wholesale and retail	914	912	849	63	754	88	70
Laborers, miscellaneous	135	129	93	36	69	31	29
Linemen	16	15		15			15
Machinists and helpers	9	8	4	4		1	7
Milkers	77	59		59			59
Miners	60	58		58			58
Muckers	589	589	3	586		9	580
Orange pickers	50	50		50	12	8	30
Painters	25	24	14	10		4	20
Peach pickers	122	121		121		41	80
Pin setters	34	32	32				32
Planters, vine and tree	150	141		141	13	53	75
Plasterers	3	1	1				1
Plow tenders	7	7		7			7

TABLE No. 25. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921—Concluded.

FRESNO OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Plumbers and pipe fitters	9	6	1	5			6
Porters	39	32	21	11	8	2	22
Pot washers	19	18	17	1			18
Powdermen	6	6		6			6
Pruners	249	240		240		37	203
Riders	13	12		12	3	3	6
Rigging slingers	31	31		31			31
Riggers	10	10		10			10
Roustabouts	17	17		17			17
Sack buckers	52	50		50		1	49
Sack jiggers	12	11		11			11
Sack sewers	21	19	2	17	2	1	16
Sawmill hands	26	15		15			15
Scrapermen	551	532	1	531		5	527
Sheepherders	2	2		2			2
Stablebucks	9	9	2	7			9
Swampers, farm	21	21		21			21
Swampers, other	103	103	103		103		
Teamsters, farm	433	431		431	2	10	419
Teamsters, other	154	147	7	140	3	1	143
Tractor drivers	81	77		77			77
Tray turners and stackers	161	161		161	104	55	2
Truckers	238	235	233	2	194	13	28
Vegetable men	8	8	7	1		1	7
Waiters	46	38	6	32			38
Watchmen	19	17	1	16			17
Well borers	12	10		10		3	7
Woodchoppers	112	101	2	99	1	20	80
Woodsmen	51	45		45			45
Yardmen	3	3	1	2			3
Miscellaneous, N. E. S.	215	195	38	157	8	14	173
Totals	13,956	13,235	3,899	9,336	3,116	1,527	8,592

TABLE No. 26. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

FRESNO OFFICE—FEMALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Chambermaids	4	2		2			2
Cooks	73	66	1	65			66
Couples (female half)	17	12		12			12
Day workers	35	32	32		29	1	2
Domestics	17	9	6	3	3		6
Fruit cutters	101	101		101			101
Fruit and berry pickers	6	6		6			6
Waitresses	10	5	2	3			5
Miscellaneous occupations	10	4	1	3			4
Totals	273	237	42	195	32	1	204

TABLE No. 27. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

FRESNO OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Auto and truck drivers	24	24	7	17	4	5	15
Auto mechanics	20	17	11	6	1	4	12
Auto washers	16	16	16		6	3	7
Axemen	7	7		7			7
Bakers and helpers	13	10	1	9			10
Blacksmiths	50	50	1	49		2	48
Blacksmiths' helpers	18	18	5	13	3	2	13
Box makers	19	17	10	7		9	8
Bricklayers	3	3	3			3	
Buckers, lumber	26	25		25			25
Bus boys	13	13	9	4	2	3	8
Butchers	8	6		6			6
Carpenters	252	231	53	178	8	28	195
Carpenters' helpers	13	13	3	10		3	10
Choremen	30	26		26		1	25
Cleaners	98	98	96	2	88	6	4
Clerks, various	9	8	5	3		1	7
Concrete workers	35	33	24	9	13	18	2
Cooks	231	218	3	215	1	2	215
Corn pickers and cutters	13	13		13			13
Couples (male half)	18	16		16			16
Cotton pickers	150	116		116			116
Dishwashers	77	71	31	40	4	5	62
Engineers	15	15	1	14		1	14
Fallers, timber	16	16		16			16
Farm hands, N. E. S.	848	806		806	13	88	705
Fence builders	8	6		6		6	
Fig pickers	211	211		211	17	100	94
Firemen	11	11	3	8	1		10
Flunkies	174	171		171			171
Foremen, various	7	7		7			7
Gardeners	12	12	8	4	4	1	7
Grape pickers	881	812		812	522	98	192
Groundmen	21	21		21			21
Handy men	18	17	13	4	8	6	3
Hay hands	738	726		726	5	147	574
Helpers, various	13	12	5	7	3	3	6
Hide shakers	141	77	6	71	53	24	
Hog men	5	5		5			5
Housemen	5	4	3	1	1		3
Irrigators	178	167		167	10	29	128
Janitors	13	13	11	2	1		12
Kitchen helpers	69	68	5	63	4	2	62
Laborers, building construction	562	557	461	96	286	249	22
Laborers, factory	51	51	12	39	16	5	30
Laborers, foods, beverages, etc	94	94	92	2	89	4	1
Laborers, hotels, etc	22	22	21	1	15	6	1
Laborers, lumber industry	345	328	164	164	114	51	163
Laborers, metals and machinery	194	191	186	5	147	38	6
Laborers, mines, oils, etc	76	75	52	23	43	11	21
Laborers, orchard and vineyard	584	557	4	553	68	127	362
Laborers, packing houses	361	359	342	17	148	163	48
Laborers, private homes	372	370	363	7	325	44	1
Laborers, street and highway	196	186	1	185			186
Laborers, transportation and public utilities	1,599	1,553	234	1,319	208	63	1,282
Laborers, wholesale and retail	1,166	1,164	1,083	81	1,020	135	9
Laborers, miscellaneous	125	123	75	45	66	37	20
Lathers and shinglers	26	26	21	5	2	24	
Linemen	14	11	2	9		1	10
Machinists	20	20		20			20
Milkers	50	40		40			40
Millwrights	6	5		5			5
Miners	555	554		554			554
Muckers	448	444		444		7	437
Orange pickers	29	28		28		2	26
Orderlies	15	14	13	1			14
Painters	39	37	16	21	3	18	16
Paperhangers	4	4	4		1	3	
Peach pickers	88	79		79	15	14	50
Peach thinners	30	30		30		2	28
Pin setters	15	15	15				15
Pipe fitters	18	17	4	13	1	3	13
Planters, tree and vine	192	188		188	14	61	113

TABLE No. 27. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922—Concluded.

FRESNO OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Plasterers	7	7	6	1		3	4
Plumbers and helpers	11	9	4	5		2	7
Porters	7	7	6	1	1		6
Pot washers	15	14	13	1	1		13
Powdermen	9	9		9			9
Pruners	171	169		169		17	152
Riggers	16	16		16			16
Rigging slingers	10	9		9			9
Roustabouts	19	19		19			19
Sack buckers	14	14		14			14
Sack jiggers	9	9		9			9
Sack sewers	22	21	1	20	1	2	18
Sawmill hands	35	24		24			24
Scrapermen	450	427	4	423	1	5	421
Sheepherders	6	6		6			6
Sprayers, tree	7	7		7	1	1	5
Stake drivers	34	34		34	1	8	25
Swampers, farm	20	19		19		1	18
Swampers, other	58	58	57	1	57	1	
Teamsters, farm	762	743		743	1	13	729
Teamsters, other	116	114	2	112	2		112
Timekeepers	4	3		3			3
Tractor drivers	82	80		80		2	78
Tray turners and stackers	170	168		168	98	51	19
Truckers	96	88	79	9	63	25	
Waiters	34	33	1	32		1	32
Watchmen	18	18	3	15		1	17
Welders	3	2		2			2
Woodchoppers	83	72		72		2	70
Woodsmen	46	40		40			40
Miscellaneous skilled, N. E. S.	64	38	7	31		5	33
Miscellaneous unskilled, N. E. S.	110	84	23	61	7	25	52
Totals	14,325	13,767	3,711	10,056	3,587	1,838	8,342

TABLE No. 28. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

FRESNO OFFICE—FEMALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Cooks	70	54	1	53			54
Cutters, fruit	18	18		18		5	13
Day workers	36	36	36		33	3	
Domestics	4	4	3	1			4
Hotel and restaurant help	8	2	1	1			2
Miscellaneous occupations	6	6	5	1			6
Totals	142	120	46	74	33	8	79

TABLE No. 29. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

SACRAMENTO OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Almond knockers	45	39		39		18	21
Auto and truck drivers	14	11	8	3	1		10
Auto mechanics	7	6	2	4	1		5
Auto washers	7	6	6		1		5
Bakers	20	14	2	12		1	13
Bakers' helpers	7	6	6			1	5
Beet toppers	12	12		12			12
Bed makers	14	13	8	5	1		12
Blacksmiths	29	25	1	24			25
Blacksmiths' helpers	3	3		3			3
Boilermakers	11	6	6				6
Bookkeepers	5	4	3	1			4
Box makers	6	5	1	4		1	4
Boys, apprentice	3	3	3				3
Boys, bus	53	44	29	15	2	10	32
Boys, mess	3	2	1	1			2
Bricklayers	2	1	1				1
Brick cleaners	17	17	17			13	4
Brush cutters	4	4	4				4
Buckers, lumber	23	22		22			22
Carpenters	224	139	15	124		6	133
Carpenters' helpers	4	2		2			2
Car repairers	47	20		20			20
Chainmen	12	10	6	4	4		6
Choremen	50	39		39			39
Cleaners	176	173	172	1	168	5	
Clerks, store	17	13	11	2	1		12
Clerks, office	6	4	4				4
Cooks	375	284	18	266		6	278
Cooks' helpers	22	15	3	12			15
Couples (male half)	17	4		4			4
Deck hands	675	582	189	393	115	5	462
Dishwashers	309	273	154	119	2	6	265
Engineers	18	14		14		2	12
Fallers, timber	41	20		20			20
Farm hands, N. E. S.	387	347		347	19	40	288
Firemen	6	6		6			6
Flunkies	122	102	3	99		3	99
Fruit and berry pickers	164	140	3	137	1	16	123
Gardeners	66	61	57	4	42	11	8
Handy men	152	143	131	12	108	16	19
Hay hands	191	182		182	2	56	124
Holders-on	16	14		14			14
Hop pickers	173	127		127		5	122
Irrigators	8	8		8		4	4
Janitors	63	49	47	2	22	2	25
Kitchen helpers	59	54	20	34	2		52
Laborers, agricultural	64	58		58	7	20	31
Laborers, building construction	110	108	74	34	33	48	27
Laborers, foods	360	312	174	138	131	19	162
Laborers, lumber industry	847	779	22	757	1	12	766
Laborers, metals and machinery	133	132	120	12	87	27	18
Laborers, mining, oils, etc	43	32		32			32
Laborers, private homes	209	194	183	11	167	26	1
Laborers, street and highway	317	247	22	225		8	239
Laborers, transportation and public utilities	1,092	869	616	253	527	50	292
Laborers, wholesale and retail	1,040	906	615	291	424	179	303
Laborers, miscellaneous	81	76	70	6	28	32	16
Linemen	33	19	3	16		1	18
Machinists and helpers	22	15	9	6			15
Milkers	53	36		36			36
Miners	325	219		219			219
Muckers	318	242		242			242
Orchard hands	38	35		35	3	17	15
Orderlies	8	7	1	6			7
Painters and paperhangers	22	16	8	8		5	11
Pipe fitters	16	10		10			10
Plumbers	3	2		2			2
Plumbers' helpers	20	19	7	12	7	2	10
Porters	104	84	46	38	5	11	68
Potato and onion pickers	555	469	50	419	50		419
Pot washers	32	28	24	4	1		27
Rigging slingers	19	13		13			13

TABLE No. 29. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921—Concluded.

SACRAMENTO OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Rivet passers	18	16		16			16
Roofers	7	7	3	4	4	3	
Sack buckers	14	13		13		4	9
Sack jiggers	8	8		8			8
Sack sewers	30	26	2	24		4	22
Sawmill hands	85	71		71			71
Sheepherders	20	15		15		2	13
Shinglers	6	5	2	3			5
Teamsters, farm	182	163		163		28	135
Teamsters, other	97	85	26	59	1		84
Towermen	55	38		38			38
Truckers	455	428	365	63	380	10	38
Vegetable men	21	16	11	5		1	15
Waiters	153	139	20	119	1	3	135
Watchmen	17	10	7	3		1	9
Well borers	3	3	3		2		1
Window cleaners	7	5	5		4		1
Woodchoppers	187	148	1	147	1	1	146
Woodsmen	187	185		185			185
Miscellaneous skilled, N. E. S.	47	33	7	26	1	5	27
Miscellaneous unskilled, N. E. S.	69	50	23	27	7	3	40
Totals	11,247	9,459	3,450	6,009	2,364	749	6,346

TABLE No. 30. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

SACRAMENTO OFFICE—FEMALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Chambermaids	41	22	14	8			22
Clerical	4	1	1				1
Cooks, hotels, etc.	30	14	5	9			14
Cooks, private homes	85	33	5	28			33
Couples (female half)	17	4		4			4
Day workers	197	170	170		160	10	
Domestics	152	40	33	7		1	39
Hop pickers	49	14		14			14
Kitchen helpers	6	4	3	1			4
Nurses	12	2	2				2
Saleswomen	14	13	13				13
Stenographers	13	6	6				6
Waitresses	79	31	9	22			31
Miscellaneous occupations	59	7	6	1			7
Totals	758	361	267	94	160	11	190

TABLE No. 31. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

SACRAMENTO OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Almond knockers	8	4		4			4
Amusement workers	23	23	21	2	23		
Auto and truck drivers	14	10	7	3	1	3	6
Auto mechanics	24	19	10	9	1	4	14
Auto washers	4	4	4		3	1	
Bakers	11	9	3	6		2	7
Bakers' helpers	5	4	2	2			4
Bed makers	10	8	7	1			8
Blacksmiths	18	13	4	9			13
Box makers	15	12	8	4		2	10
Brick cleaners	35	33	33			13	20
Bricklayers	8	5	5		1	2	2
Bus boys	15	14	14			6	8
Carpenters	142	98	58	40	6	18	74
Carpenters' helpers	29	22	3	19	1	1	20
Car builders and repairers	41	29		29			29
Cement workers	15	12	4	8	1	4	7
Cherry pickers	22	11		11			11
Choremen	67	48	4	44		3	45
Cleaners	235	229	223	6	213	16	
Clerical	5	2	2				2
Cooks	212	161	24	137	1	3	157
Couples (male half)	9	4		4			4
Deck hands	35	26		26			26
Dishwashers	150	135	93	42	12	10	113
Distributors	25	25	25		2	23	
Electricians	5	5	2	3		1	4
Engineers	12	9		9		2	7
Fallers, timber	10	3		3		2	1
Farm hands, N. E. S.	530	451		45?	6	111	334
Firemen	9	8	5	3			8
Flunkies	32	25	4	21			25
Fruit and berry pickers	48	48		48		5	43
Gardeners	74	69	60	9	47	13	9
Grape pickers	13	13		13			13
Handy men	116	110	88	22	68	16	26
Hay hands	425	325		325	2	145	178
Hod carriers	6	5	5		3		2
Hop pickers	315	245		245		6	239
Housemen	7	1		1			1
Irrigators	44	22		22			22
Janitors	24	18	16	2	1	2	15
Kitchen helpers	47	43	27	16	2	5	36
Laborers, agricultural	429	410		410	61	99	250
Laborers, building construction	292	272	204	68	117	104	51
Laborers, factory	47	44	38	6	28	8	8
Laborers, foods, beverages, etc	320	253	90	163	55	47	151
Laborers, hotel, etc	22	22	18	4	8	13	1
Laborers, lumber industry	591	546	66	480	28	37	481
Laborers, metals and machinery	26	26	17	9	5	18	3
Laborers, mines, oils, etc	6	6	6			5	1
Laborers, private homes	188	179	170	9	145	29	5
Laborers, street and highway	213	197	42	155	4	25	168
Laborers, transportation and public utilities	950	913	837	76	759	68	86
Laborers, wholesale and retail	835	810	765	45	582	170	58
Laborers, miscellaneous	37	33	29	4	27	4	2
Lathers	11	10	8	2	2	1	7
Machinists	20	12		12			12
Milkers	33	20		20			20
Millwrights	3	2		2			2
Miners	47	30		30			30
Muckers	126	70		70			70
Orchard hands	158	106		106	2	34	70
Orderlies	11	11	8	3*			11
Painters	23	21	14	7	1	5	15
Paperhangers	9	4	4			1	3
Pear pickers	25	17		17		17	
Plasterers	10	7	7			2	5
Porters	55	46	32	14	6	1	39
Pot washers	25	23	23		1	2	20
Pruners	10	9	1	8	1	2	6
Prune pickers	5	4		4		4	
Rice hands	8	8		8			8

TABLE No. 31. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922—Concluded.

SACRAMENTO OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Sack buckers	21	16	1	15	2	10	4
Sack jiggers	7	3		3			3
Sack sewers	35	28	4	24		8	20
Salesmen	15	2	2				2
Sawmill hands	23	11		11			11
Sheepherders	19	18		18		2	16
Solicitors	43	21	13	8			21
Teamsters, farm	360	299		299		34	265
Teamsters, other	81	55	15	40	2	8	45
Tractor drivers	6	5		5			5
Truckers	396	393	298	95	303	38	52
Vegetable men	5	4	4			2	2
Waiters	31	21	13	8	1	3	17
Watchmen	9	7	5	2		1	6
Well borers	19	15	2	13	5	8	2
Woodchoppers	210	116	11	105		1	115
Woodsmen	39	35		35			35
Miscellaneous, N. E. S.	9	4		4			4
Totals	8,748	7,520	3,508	4,012	2,539	1,230	3,751

TABLE No. 32. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

SACRAMENTO OFFICE—FEMALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Chambermaids	13	11	4	7			11
Clerks, office	5	3	3				3
Cooks	93	35	9	26		1	34
Couples, females	9	4		4			4
Day workers	137	134	133	1	122	11	1
Domestics	213	35	28	7		3	32
Kitchen helpers	4	2	2				2
Laundry workers	6						
Nurses	10	5	4	1			5
Stenographers and typists	11	8	8			3	5
Waitresses	46	19	6	13			19
Miscellaneous	26	10	4	6			10
Totals	573	266	201	65	122	18	126

TABLE No. 33. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

SAN JOSE OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Apple pickers	23	23		23			23
Apricot pickers	137	122	3	119	3	24	95
Auto and truck drivers	13	12	6	6	2		10
Auto mechanics	6	4	2	2		1	3
Auto washers	9	8	8		5		3
Bakers and helpers	6	4	1	3			4
Blacksmiths and helpers	24	15	2	13		2	13
Bookkeepers	5	2	2				2
Boys, apprentice	7	6	5	1			6
Boys, bus	36	28	27	1	3	6	19
Boys, miscellaneous	8	5	5		1	1	3
Box makers	40	21	14	7			21
Cannery workers	71	65	59	6	3		62
Carpenters and helpers	107	87	30	57	1	7	79
Cement workers	39	31	8	23	11	9	11
Cherry pickers	101	99		99	2	56	41
Choremen	180	147	3	144			147
Cleaners	665	652	622	30	632	19	1
Clerks, various	17	4	4				4
Cooks and helpers	214	155	28	127	1	5	149
Couples (male half)	128	79		79			79
Creamery help	7	7	7				7
Cucumber pickers	44	35	15	20		7	28
Dairy hands	14	10	3	7			10
Delivery men	30	24	24			4	20
Dishwashers	506	429	327	102	34	23	372
Distributors	16	16	16		13	3	
Dry yardmen	451	407		407	1	33	373
Elevator operators	19	15	15				15
Engineers	16	14	2	12		1	13
Farm hands, N. E. S.	426	354		354	9	7	338
Flunkies	13	9		9			9
Fruit and berry pickers	104	93		93		26	67
Fruit packers	150	139	108	31	1	13	125
Gardeners	53	45	10	35	4	7	34
Grape pickers	40	27		27			27
Handy men	14	11	5	6	2	1	8
Hay hands	179	170		170	1	26	143
Hotel help, N. E. S.	8	7	5	2		2	5
Housemen	42	34	32	2			34
Irrigators	74	64		64	7	17	40
Janitors	34	26	24	2	1	5	20
Kitchen helpers	137	118	75	43	4	12	102
Laborers, agricultural	77	72		72	12	22	38
Laborers, building construction	123	121	71	50	51	52	18
Laborers, factories	195	164	96	68	46	10	108
Laborers, hotels, etc.	99	90	72	18	55	21	16
Laborers, lumber industry	71	67	32	35	16	2	49
Laborers, metals and machinery	139	118	114	4	56	26	36
Laborers, mining, oils, etc.	46	39	9	30	21	6	12
Laborers, office buildings	15	15	15		10	5	
Laborers, private homes	1,248	1,226	1,131	95	1,102	116	8
Laborers, street and highway	328	294	31	263	3	21	270
Laborers, transportation and public utilities	143	129	113	16	59	23	47
Laborers, wholesale and retail	708	680	648	32	434	128	118
Laborers, miscellaneous	88	82	54	28	45	25	12
Laundry workers	10	8	6	2	4	1	3
Milkers	92	69	1	68			69
Miners	17	8		8			8
Muckers	17	9	6	3			9
Nurses	8	7	6	1			7
Orchard hands	412	347	3	344	7	76	264
Painters and helpers	19	16	8	8	4	6	6
Peach pickers	184	172		172		43	129
Pear pickers	40	33		33		13	20
Plumbers	2	2	2			1	1
Porters	219	194	131	63	116	13	65
Pot washers	23	18	16	2		2	16
Pruners and grafters	97	81	2	79	3	3	75
Prune pickers	568	416		416	6	54	356
Sawmill hands	8	8		8			8
Solicitors and canvassers	41	23	22	1			23
Teamsters, farm	249	229		229			221

TABLE No. 33. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921—Concluded.

SAN JOSE OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Teamsters, other	47	45	16	29		2	43
Tie-makers	13	9		9			9
Tractor drivers	15	15		15			15
Tomato pickers	182	155		155		5	150
Vegetable men	60	52	48	4		3	49
Waiters	22	18	12	6			18
Watchmen	7	4	1	3			4
Well borers	32	30	5	25	4	3	23
Window cleaners	130	121	108	13	110	8	3
Woodchoppers	285	209	22	187	11	20	178
Woodsmen	20	17		17	3		14
Miscellaneous skilled, N. E. S.	32	20	7	13	3		17
Miscellaneous unskilled, N. E. S.	91	58	32	26	17	7	34
Totals	10,435	9,113	4,337	4,776	2,937	1,042	5,134

TABLE No. 34. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

SAN JOSE OFFICE—FEMALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Cannery hands	34	14	14				14
Chambermaids	34	17	12	5			17
Clerical	2	2	2			1	1
Cooks	189	78	25	53			78
Couples (female half)	128	79		79			79
Day workers	153	140	131	9	123	5	12
Dishwashers	4	4	4		2		2
Domestics	183	74	48	26			74
Fruit cutters	51	33		33		4	29
Kitchen helpers	6	3	3				3
Nurses	18	4	3	1			4
Fruit packers	74	46	29	17			46
Fruit and berry pickers	10	10		10			10
Prune pickers	126	126		126			126
Tomato pickers	5	5		5			5
Second girls	24	11	6	5			11
Stenographers and typists	6	3	3				3
Waitresses	57	27	16	11	1		26
Miscellaneous occupations	31	8	5	3	1		7
Totals	1,135	684	301	383	127	10	547

TABLE No. 35. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

SAN JOSE OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Apricot pickers	101	93		93	1	61	31
Apple pickers	33	31		31			31
Auto and truck drivers	12	11	5	6	1	2	8
Auto mechanics	24	18	15	3		1	17
Auto washers	60	53	52	1	17	5	31
Bakers and helpers	8	6	3	3			6
Bean pickers	178	161		161			161
Blacksmiths and helpers	26	21	7	14			21
Boys, apprentice	14	10	10				10
Boys, bus	33	31	31		4	4	23
Box makers	43	28	17	11		3	25
Cannery hands	324	287	233	54	66	76	145
Carpenters	134	90	65	25	6	36	48
Carpenters' helpers	16	16	6	10	1	10	5
Chainmen	11	11	9	2	10	1	
Cherry pickers	139	100		100	4	31	65
Choremen	152	122	2	120			122
Cleaners	1,097	1,079	1,024	55	1,039	34	6
Clerks, office	4	1		1			1
Clerks, shipping and stock	3	2	2			1	1
Clerks, store	6	3	3		2		1
Concrete mixers	28	23	16	7	5	15	3
Cooks	242	188	17	171	1	5	182
Coupler	141	89	1	88			89
Cucumber pickers	15	9		9			9
Dairy hands	14	13	5	8	5		8
Deliverymen	8	2	2				2
Dishwashers	445	396	327	69	30	20	346
Distributors	32	32	32		24	8	
Dry yardmen	361	343		343	31	58	254
Elevator operators	6	5	5				5
Engineers	10	9	1	8		2	7
Farm hands, N. E. S.	344	304		304	11	56	237
Flunkies	29	27		27			27
Fruit packers	100	98	73	25	45	32	21
Gardeners	39	33	12	21	5	6	22
Grape pickers	17	13		13		4	9
Handy men	34	28	18	10	12	6	10
Hay hands	262	200		200	2	25	173
Hod carriers	15	13	13			8	5
Housemen	18	12	6	6		1	11
Irrigators	100	78		78	1	35	42
Janitors	52	43	24	19	2	3	38
Kitchen helpers	100	90	56	34	18	8	64
Laborers, agricultural	128	110		110	4	42	64
Laborers, building construction	145	121	84	37	28	48	45
Laborers, factory	142	127	93	34	28	57	42
Laborers, foods, beverages, etc	9	8	6	2		2	6
Laborers, hotel, etc	85	81	55	26	44	26	11
Laborers, lumber industry	92	81	74	7	47	12	22
Laborers, metals and machinery	64	64	54	10	25	26	13
Laborers, mining, oils, etc	35	29	1	28	6	5	18
Laborers, office buildings	14	12	10	2	9		3
Laborers, private homes	1,443	1,416	1,298	118	1,220	163	33
Laborers, recreation and amusement	33	31	20	11	23	8	
Laborers, street and highway	165	151	31	120	3	28	120
Laborers, transportation and public utilities	215	189	77	112	48	36	105
Laborers, wholesale and retail	760	724	659	65	590	95	39
Laborers, miscellaneous	96	87	53	34	39	19	29
Lathers and shinglers	28	21	18	3	2	7	12
Machinists	6	5	4	1		2	3
Milkers	128	94		94	1	3	90
Miners	11	8		8			8
Muckers	8	4		4			4
Orchard hands	586	500		500	37	189	274
Painters	51	42	34	8	7	12	23
Peach pickers	74	68		68		47	21
Pear pickers	43	42		42		20	22
Plasterers	6	2	2		1		1
Plumbers	8	3	1	2		2	1
Plowmen	26	22		22		3	19
Porters	95	85	36	49	7	4	74
Pot washers	18	18	17	1	3	2	13

TABLE No. 35. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922—Concluded.

SAN JOSE OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Pruners	178	144		144	7	13	124
Prune pickers	664	528		528	12	114	402
Sack sewers	2	2	2			2	
Sawmill hands	7	5		5			5
Solicitors	67	20	17	3			20
Spinach pickers	44	40		40	33	7	
Stablemen	8	5	2	3			5
Teamsters, farm	444	366		366	1	14	351
Teamsters, other	55	54	11	43		10	44
Tie makers	33	17		17			17
Tomato pickers	40	28		28		4	24
Tractor drivers	33	32		32			32
Vegetable men	46	43	41	2	6	1	36
Waiters	31	27	11	16		2	25
Warehousemen	53	48	47	1	7	30	11
Watchmen	19	13	6	7			13
Well borers	8	8	2	6	1	4	3
Window washers	110	105	100	5	97	7	1
Woodchoppers	167	134	21	113	9	8	117
Woodsmen	22	4		4			4
Miscellaneous skilled, N. E. S.	38	25	12	13	1	2	22
Miscellaneous unskilled, N. E. S.	55	43	27	16	6	7	30
Totals	11,468	10,058	5,018	5,040	3,695	1,640	4,723

TABLE No. 36. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

SAN JOSE OFFICE—FEMALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Cannery workers	35	24	24				24
Chambermaids	17	9	6	3		2	7
Clerical	6	4	2	2			4
Cooks	128	63	15	48		3	60
Day workers	141	132	122	10	128	1	3
Domestics	202	88	59	29	2	1	85
Fruit cutters and packers	130	118	6	112		17	101
Housekeepers	4	2	1	1			2
Kitchen helpers	7	3	2	1	1		2
Laundry workers	4	1	1				1
Nurses	7	5	2	3			5
Second girls	10	6	1	5			6
Solicitors	12	2	2				2
Waitresses	49	26	5	21	2	8	16
Miscellaneous occupations	40	8	5	3			8
Totals	801	491	253	238	133	32	326

TABLE No. 37. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

STOCKTON OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Almond knockers	21	21		21			21
Auto and truck drivers	10	10	6	4	1		9
Auto mechanics	3	2		2			2
Bakers and helpers	32	25		25			25
Blacksmiths and helpers	28	26	5	21			26
Boilermakers and helpers	5	5	4	1			5
Brush cutters	15	15		15			15
Buckers, lumber	12	12		12			12
Carpenters	81	60	21	39	1	8	51
Carpenters' helpers	7	4	1	3			4
Cement workers	12	12	4	8		3	9
Choremen	37	29	2	27		1	28
Cleaners	299	297	296	1	284	13	
Clerical	3	3	1	2			3
Cooks	202	179	6	173		2	177
Cotton pickers	5	2		2			2
Couples (male half)	6	6		6			6
Deck hands	19	18		18		1	17
Dishwashers	217	209	81	128	1	3	205
Distributors	9	9	9		3	6	
Engineers	7	7	1	6			7
Fallers, lumber	9	9		9			9
Farm hands, N. E. S.	490	480		480	1	50	429
Firemen	19	18	2	16			18
Flunkies	244	242		242			242
Foremen	8	6		6			6
Fruit and berry pickers	138	128		128		20	108
Handy men	28	28	25	3	10	7	11
Hay hands	396	387		387	8	134	245
Irrigators	18	18		18		2	16
Janitors	30	20	19	1	1		19
Kitchen helpers	54	53	21	32	1	5	47
Laborers, agricultural	89	85		85	3	35	47
Laborers, building construction	243	226	132	94	10	96	120
Laborers, factories	413	376	152	224	13	52	311
Laborers, lumber industry	150	144	115	29	38	43	63
Laborers, metals and machinery	20	10	10				10
Laborers, mining, oils, etc.	153	146		146			146
Laborers, private homes	194	193	185	8	139	45	9
Laborers, street and highway	388	365	9	356	1	7	357
Laborers, transportation and public utilities	1,630	1,574	246	1,328	192	65	1,317
Laborers, wholesale and retail	749	741	686	55	373	274	94
Laborers, miscellaneous	70	68	56	12	37	30	1
Machinists and helpers	45	37	33	4			37
Milkers	37	28		28			28
Miners	362	351		351			351
Muckers	1,250	1,206		1,206		5	1,201
Painters	23	20	13	7	1	4	15
Plumbers and helpers	4	3	1	2		1	2
Porters	27	26	15	11			26
Pot washers	22	21	19	2			21
Pruners	11	11		11			11
Rigging slingers	14	13		13			13
Sack buckers	10	10		10		2	8
Sack jiggers	3	3		3		2	1
Sack sewers	8	8		8		2	6
Sawmill hands	58	55		55			55
Sheepherders	13	10		10			10
Solicitors	6	6	4	2		4	2
Teamsters, farm	170	161		161	1	10	155
Teamsters, other	185	181	6	175		10	171
Tool sharpeners	11	10		10			10
Tractor drivers	6	4		4			4
Truckers	13	10	10			2	8
Vegetable men	7	7	2	5			7
Waiters	31	27	1	26			27
Warehousemen	5	5	4	1			5
Well borers	3	3	3				3
Woodchoppers	58	55		55		5	50
Woodsmen	24	24		24		1	23
Miscellaneous skilled, N. E. S.	34	23	8	15			23
Miscellaneous unskilled, N. E. S.	27	23	15	8		2	21
Totals	9,030	8,609	2,229	6,380	1,119	947	6,543

TABLE No. 38. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

STOCKTON OFFICE—FEMALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Chambermaids	7	7	3	4			7
Cooks	30	18	3	15			18
Couples (female half)	6	6		6			6
Day workers	10	7	7		7		
Domestics	15	6	4	2			6
Fruit and berry pickers	4	4		4			4
Waitresses	14	11	3	8			11
Miscellaneous occupations	11	4	1	3		1	3
Totals	97	63	21	42	7	1	55

TABLE No. 39. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

STOCKTON OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Almond pickers	17	17		17			17
Auto mechanics	3	3	3		1	1	1
Auto and truck drivers	11	10	5	5		3	7
Bakers and helpers	24	22		22			22
Blacksmiths	10	10	1	9			10
Blacksmiths' helpers	4	4	2	2	1		3
Cabinetmakers	6	4	4				4
Cannery hands	7	7	7				7
Carpenters	95	85	46	39	6	15	64
Cement workers	18	16	16		4	10	2
Choremen	54	41	3	38	3	1	37
Chuck tenders	48	48		48			48
Cleaners	310	308	307	1	297	11	
Clerical	3	3	2	1			3
Cooks	127	110	3	107		4	106
Corn harvesters	8	8		8		7	1
Couples (male half)	6	4		4			4
Dishwashers	104	96	46	50	6	3	87
Distributors	12	12	12		7		5
Engineers	16	14	1	13		1	13
Fallers, timber	7	7		7			7
Farm hands, N. E. S.	515	470		470		106	364
Firemen	6	6	1	5		1	5
Flunkies	67	65		65			65
Foremen, various	6	6		6			6
Fruit and berry pickers	88	83		83		34	49
Grape pickers	21	21		21		12	9
Gardeners	10	10	9	1	5	3	2
Handy men	15	13	7	6	1	1	11
Hay hands	574	524		524	8	178	338
Irrigators	74	66		66		9	57
Janitors	19	17	11	6	2	3	12
Kitchen helpers	53	48	22	26	3	1	44
Laborers, agricultural	100	67		67	40	25	2
Laborers, building construction	376	361	315	46	72	202	87
Laborers, factories	110	103	102	1	17	7	79
Laborers, foods, beverages, etc	68	63	26	37	10	20	33
Laborers, hotels, etc	45	44	44		40	4	
Laborers, lumber industry	211	205	166	39	69	87	49
Laborers, metals and machinery	10	8	8		2	4	2
Laborers, mining, oils, etc	73	73	1	72		1	72
Laborers, private homes	195	192	183	9	163	27	2

TABLE No. 39. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922—Concluded.

STOCKTON OFFICE—MALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Laborers, street and highway	129	112	44	68	4	25	83
Laborers, transportation and public utilities	664	645	337	308	275	41	329
Laborers, wholesale and retail	559	556	550	6	295	117	144
Laborers, miscellaneous	17	17	17		10	6	1
Machinists and helpers	16	12	6	6	2	2	8
Mi kers	62	44		44		2	42
Miners	166	152		152			152
Muckers	148	147		147			147
Orchard hands	254	231		231	2	71	158
Painters	55	53	47	6	8	20	25
Peach pickers	20	20		20		12	8
Plasterers	5	2		2		1	1
Plumbers	3	1	1			1	
Plumbers' helpers	13	13	13		3	9	1
Porters	24	21	13	8	2	3	16
Pot washers	14	11	11			1	10
Prune pickers	11	11		11			11
Riggers	18	18		18			18
Roustabouts	9	9	2	7		1	8
Sack buckers	28	21		21		2	19
Sack jiggers	21	18		18		5	13
Sack sewers	49	38		38		2	36
Sawmill hands	4	4		4			4
Sheepherders	6	3		3		1	2
Shinglers	6	6	2	4		1	5
Solicitors	22	11	11				11
Teamsters, farm	491	446		446		26	420
Teamsters, other	200	165	73	92	2	9	154
Tool sharpeners	4	4		4			4
Tractor drivers	14	12		12		1	11
Vegetable men	7	6	2	4	2		4
Vineyard hands	103	91		91		47	44
Waiters	43	38	6	32	3		35
Walnut knockers	6	6		6		6	
Watchmen	33	19	1	18			19
Woodchoppers	77	61	3	58		5	56
Miscellaneous skilled, N. E. S.	6	4		4			4
Miscellaneous unskilled, N. E. S.	8	5		5			5
Totals	6,841	6,307	2,492	3,815	1,365	1,198	3,744

TABLE No. 40. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

STOCKTON OFFICE—FEMALES.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
Chambermaids	18	15	15				15
Cooks	42	14	3	11			14
Couples (female half)	6	4		4			4
Day workers	14	11	11		9	2	
Domestics	20	7	7			1	6
Factory workers	5	1	1				1
Fruit cutters	7	4		4			4
Waitresses	15	8	3	5			8
Miscellaneous occupations	9	5	3	2			5
Totals	136	69	43	26	9	3	57

TABLE No. 41. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

MARYSVILLE OFFICE.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
MALES.							
Almond knockers	27	24	.....	24	.....	6	18
Auto and truck drivers	4	2	1	1	.....	.....	2
Bean hands	61	56	.....	56	1	32	23
Carpenters and helpers	27	23	1	22	.....	5	18
Chainmen	24	21	.....	21	.....	.....	21
Cooks	94	68	5	63	.....	2	66
Couples (male half)	17	11	.....	11	.....	.....	11
Dishwashers	53	45	27	18	.....	1	44
Dry yardmen	352	302	.....	302	.....	8	294
Farm hands, N. E. S.	292	254	.....	254	5	47	202
Flunkies	31	29	.....	29	.....	.....	29
Fruit and berry pickers	18	18	.....	18	.....	5	12
Grape pickers	100	89	.....	89	.....	21	68
Handy men	8	7	1	6	.....	.....	7
Hay hands	230	214	.....	214	3	99	112
Hide shakers	6	6	5	1	5	.....	1
Hop hands	33	29	.....	29	.....	.....	29
Hop pickers	49	32	.....	32	.....	.....	32
Irrigators	21	20	.....	20	.....	5	15
Laborers:							
Agricultural	41	36	.....	36	1	4	31
Building construction	83	70	5	65	3	14	53
Factory	51	43	1	42	.....	10	33
Foods	23	21	.....	21	.....	6	15
Lumber industry	118	98	27	71	16	20	62
Mining, oil, etc.	14	14	.....	14	.....	.....	14
Private homes	52	48	33	15	39	9	.....
Street and highway	38	33	.....	33	3	7	23
Transportation	72	55	31	24	27	1	27
Wholesale and retail	193	178	157	21	94	69	15
Miscellaneous	40	37	30	7	18	12	7
Milkers	23	13	.....	13	.....	.....	13
Orchard hands	308	280	.....	280	18	91	171
Peach pickers	226	207	.....	207	12	104	91
Peach thinners	160	149	.....	149	.....	96	53
Pear pickers	18	16	.....	16	.....	2	14
Plumbers and helpers	5	5	5	.....	1	4	.....
Porters and cleaners	25	25	25	.....	19	4	2
Pruners	17	16	.....	16	.....	2	14
Prune pickers	25	21	.....	21	2	5	14
Rice hands	136	122	.....	122	2	48	72
Sack brakers	13	13	.....	13	.....	1	12
Sack jiggers	4	4	.....	4	.....	2	2
Sack sewers	10	10	.....	10	.....	3	7
Shoepicrders	14	13	.....	13	.....	.....	13
Teamsters, farm	322	290	.....	290	.....	58	232
Teamsters, other	22	20	.....	20	.....	.....	20
Tomato pickers	16	14	.....	14	.....	1	14
Tractor drivers	14	12	.....	12	.....	.....	12
Truckers	15	15	6	9	2	5	8
Warehousemen	34	21	20	1	10	5	6
Woodchoppers	115	71	.....	71	.....	.....	71
Woodsmen	10	6	.....	6	.....	.....	6
Miscellaneous skilled, N. E. S.	30	20	1	19	2	3	15
Miscellaneous unskilled, N. E. S.	16	10	4	6	.....	1	9
Totals	4,050	3,256	385	2,871	283	818	2,155
FEMALES.							
Cooks	23	10	.....	10	.....	.....	10
Couples (female half)	17	11	.....	11	.....	.....	11
Domestics	2	2	1	1	.....	.....	2
Fruit and berry pickers	4	4	.....	4	1	.....	3
Hop pickers	4	4	.....	4	.....	.....	4
Miscellaneous	7	3	1	2	.....	.....	3
Totals	57	34	2	32	1	.....	33

TABLE No. 42. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

MARYSVILLE OFFICE.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
MALES.							
Apple pickers	4	4		4			4
Carpenters	10	9	1	8		1	8
Choremen	11	8		8			8
Cleaners	4	4	4		4		
Cooks	33	24		24			24
Couples (male half)	3	3		3			3
Dishwashers	17	15	6	9	1	2	12
Farm hands, N. E. S.	107	92		92	4	15	73
Flunkies	4	4		4			4
Fruit and berry pickers	14	8		8	2	4	2
Hay hands	256	217		217		65	152
Irrigators	47	34		34		9	25
Laborers:							
Agricultural	52	43		43		10	33
Building construction	121	111	74	37	1	34	76
Factories	35	28	21	7	2	16	10
Lumber industry	25	21	16	5	2	12	7
Street and highway	47	45	16	29	4	3	38
Wholesale and retail	31	29	27	2	20	8	1
Miscellaneous	8	7	6	1	6		1
Milkers	7	4		4			4
Nursery hands	6	6	6			4	2
Orchard hands	117	102		102	3	7	92
Peach pickers	68	65		65	4	14	47
Peach thinners	634	497		497		53	444
Pear pickers	21	21		21		7	14
Sack buckers	8	8		8	1	2	5
Sack jiggers	3	3		3			3
Sack sewers	16	14		14			14
Sheepherders	3	2		2			2
Teamsters	81	70		70		8	62
Woodchoppers	9	3		3			3
Miscellaneous skilled, N. E. S.	4						
Miscellaneous unskilled, N. E. S.	12	9	7	2	2	2	5
Totals	1,818	1,510	184	1,326	56	276	1,178
FEMALES.							
Cooks	4	3		3			3
Dishwashers	2	2	2				2
Fruit and berry pickers	8	7		7			7
Totals	14	12	2	10			12

TABLE No. 43. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1921.

CHICO OFFICE.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
MALES.							
Blacksmiths	9	5	1	4			5
Box factory hands	27	7		7			7
Buckers and limbers	72	46		46			46
Carpenters and helpers	59	42	7	35	1	3	38
Choremen	37	30		30	1		29
Cleaners	8	4	4		4		
Cooks	72	49	7	42		3	46
Couples (male half)	17	5		5			5
Creamery hands	3	3	2	1	1		2
Dishwashers	38	31	19	12			31
Engineers	37	30		30			30
Fallers, timber	31	21		21			21
Farm hands, N. E. S.	900	815		815	1	37	777
Flunkies	20	19	2	17			19
Fruit and berry pickers	127	88		88	4	10	74
Gardeners	14	13	13		10	1	2
Hay hands	204	194		194	5	10	179
Hop pickers	86	46		46		7	39
Hotel help, N. E. S.	11	9	8	1	2	4	3
Irrigators	43	32		32		1	31
Laborers:							
Agricultural	10	9		9	1		8
Building construction	134	112	40	72	15	20	77
Factories	38	33	8	25	2	4	27
Lumber industry	368	197	16	181	10	6	181
Private homes	93	89	85	4	79	6	4
Street and highway	90	85		85		1	84
Transportation	118	88	18	70	10	39	39
Wholesale and retail	46	44	44		33	6	5
Miscellaneous	11	6	6			2	4
Machinists and helpers	7	5		5			5
Milkers	13	7		7			7
Millwrights	8	1		1			1
Miners	16	9		9			9
Muckers	96	61		61			61
Orchard hands	182	135	4	131	2	13	120
Potters	8	4	2	2			4
Rigging slingers	31	6		6			6
Sack lookers	18	17		17		1	16
Sack patchers	9	8		8			8
Sack sewers	30	28		28			28
Sawmill hands	252	142		142			142
Sheepherders	48	38		38			38
Solicitors	11	5	5			2	3
Stablemen	7	7		7			7
Teamsters, farm	349	323		323		9	314
Teamsters, other	20	15		15			15
Truckers	30	22	13	9	2	11	9
Truck drivers	3	3	1	2			3
Waiters	24	20	4	16			20
Woodchoppers	57	43	8	35		1	42
Window cleaners	4	4	4		3	1	
Woodsmen	127	58		58			58
Miscellaneous skilled, N. E. S.	10	8	6	2	2	2	4
Miscellaneous, unskilled, N. E. S.	31	16	9	7	4		12
Totals	4,123	3,137	336	2,801	192	200	2,745
FEMALES.							
Chambermaids	5	4	2	2			4
Cooks	93	50	9	41		2	48
Couples (female half)	17	5		5			5
Domestics	52	31	27	4	2	5	24
Waitresses	26	17	3	14		1	16
Miscellaneous	17	6	4	2	1		5
Totals	210	113	45	68	3	8	102

TABLE No. 44. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

CHICO OFFICE

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
MALES.							
Carpenters	5	5	1	4		1	4
Choremen	6	5		5			5
Cooks	7	5	1	4			5
Dishwashers	5	3	1	2			3
Farm hands, N. E. S.	27	25		25		1	24
Fire fighters	30	30		30	8		22
Hay hands	21	19		19			19
Laborers:							
Building construction	22	22	5	17	6	4	12
Lumber industry	22	14		14		2	12
Private homes	8	7	5	2	5		2
Miscellaneous	16	16	11	5	4	4	8
Milkers	2	2		2			2
Millwrights	9	1		1			1
Miners	5	5		5			5
Packers	5	5		5			5
Porters	3	3	1	2	1		2
Sack buckers	12	10		10		1	9
Sack jiggers	2	2		2			2
Sack sewers	1	1		1			1
Sawmill hands	8	7		7			7
Sheepherders	6	2		2			2
Teamsters	19	19		19			19
Miscellaneous occupations	8	7	1	6			7
Totals	249	215	26	189	24	13	178
FEMALES.							
Chambermaids	2	1		1			1
Cooks	9	7		7			7
Domestics	5	2	1	1			2
Totals	16	10	1	9			10

TABLE No. 45. Showing by Occupations, Number Wanted and Number Placed, According to Locality and Duration of Positions Offered, Year Ending June 30, 1922.

MODESTO OFFICE.

Occupation	Number wanted	Number placed			Duration of positions offered, in days		
		Total	In town	Out of town	1 or less	2 to 7	8 and over
MALES.							
Cooks	17	11	.....	11	.....	1	10
Couples (male half)	3	.....	.....	.....	.....	.....	.....
Dishwashers	6	6	3	3	.....	.....	6
Farm hands	71	57	.....	57	.....	9	48
Fruit and berry pickers	26	22	.....	22	.....	8	14
Hay hands	193	170	.....	170	6	41	123
Irrigators	9	9	.....	9	.....	4	5
Laborers:							
Building construction	70	68	1	67	2	.....	66
Private homes	31	31	31	.....	25	3	3
Vineyard	19	17	.....	17	.....	10	7
Wholesale and retail	33	36	11	25	10	3	23
Milkers	9	4	.....	4	.....	.....	4
Peach thinners	95	85	.....	85	.....	28	57
Sack buckers	10	4	.....	4	.....	.....	4
Sack sewers	18	9	.....	9	.....	.....	9
Teamsters	19	8	.....	8	.....	1	7
Miscellaneous skilled, N. E. S.	9	9	1	8	.....	1	8
Miscellaneous unskilled, N. E. S.	15	8	8	.....	5	1	2
Totals	653	554	55	499	48	110	396
FEMALES.							
Cooks	3	2	.....	2	.....	.....	.....
Couples (female half)	3	1	.....	1	.....	.....	1
Housekeepers	2	1	1	.....	.....	.....	1
Totals	8	4	1	3	.....	.....	1

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PART II

REPORT

of the

California Highway Commission

a subdivision of the

DEPARTMENT OF PUBLIC WORKS

of the

STATE OF CALIFORNIA

to accompany the

FIRST BIENNIAL REPORT

of that department

NOVEMBER 1, 1922

NEWELL D. DARLINGTON
CHARLES A. WHITMORE
GEORGE C. MANSFIELD
California Highway Commission

AUSTIN B. FLETCHER
State Highway Engineer

THOS. E. STANTON
Assistant State Highway Engineer

ROY A. MURRAY
Secretary



CALIFORNIA STATE PRINTING OFFICE
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ILLUSTRATIONS.

Frontispiece—A State Highway in Humboldt County.

PLATE I. State Highway, Ventura County from Point Mugu southerly, showing rugged nature of country.

PLATE II. State Highway, Ventura County, Point Mugu, showing proposed location.

PLATE III. State Highway, Ventura County, showing proposed location.

PLATE IV. State Highway, Ventura County, showing proposed location.

PLATE V. State Highway, Mariposa County, between Mariposa and Briceburg, graded roadway under construction.

PLATE VI. State Highway, Mariposa County, between Mariposa and Briceburg, steam shovel at work.

PLATE VII. State Highway, Siskiyou County, typical construction scene.

PLATE VIII. State Highway, Siskiyou County, concrete base under construction.

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STATE OF CALIFORNIA

DEPARTMENT OF PUBLIC WORKS

CALIFORNIA HIGHWAY COMMISSION

NEWELL D. DARLINGTON, Chairman
CHARLES A. WHITMORE
GEORGE C. MANSFIELD

AUSTIN B. FLETCHER ..... State Highway Engineer
THOS. E. STANTON ..... Assistant State Highway Engineer
CHARLES C. CARLETON ..... Attorney
ROY A. MURRAY ..... Secretary

HEADQUARTERS OF THE COMMISSION: FORUM BUILDING, SACRAMENTO

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(Equipment)
H. E. WARRINGTON ..... ASSISTANT HIGHWAY ENGINEER
(Bridges)
ALLAN J. WAGNER ..... ASSISTANT HIGHWAY ENGINEER
(General Field Inspection, Construction and Maintenance)
W. LEWIS CLARK ..... ASSISTANT HIGHWAY ENGINEER
(General Field Inspection, Construction and Maintenance)
F. H. JOYNER ..... ASSISTANT HIGHWAY ENGINEER
(General Field Inspection, Construction and Maintenance)
W. S. CARUTHERS ..... ASSISTANT HIGHWAY ENGINEER
(Special Investigations and Reports)
C. S. POPE ..... ASSISTANT HIGHWAY ENGINEER
(Testing and Research)
W. J. GOUGH ..... EQUIPMENT ENGINEER
(General Field Inspection)
A. W. McCURDY ..... OFFICE ENGINEER

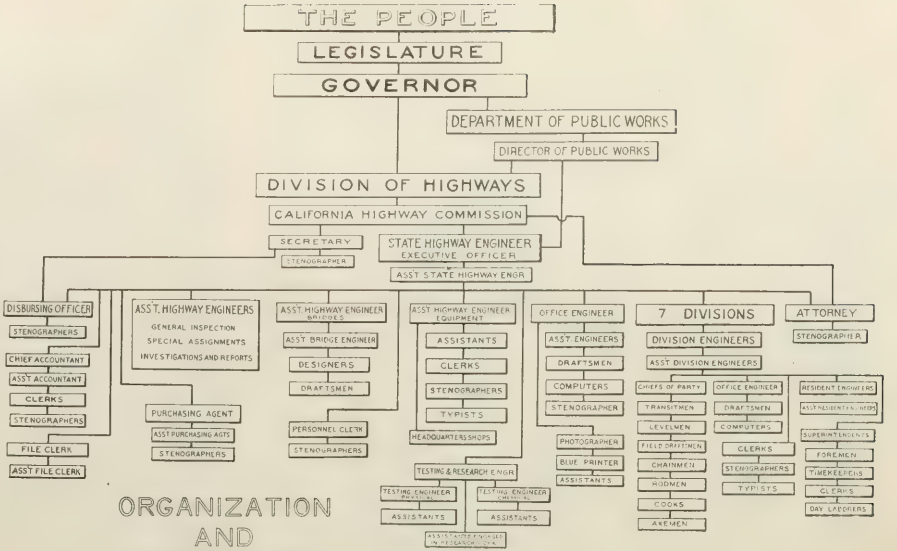
LOWELL R. SMITH ..... PURCHASING AGENT
HERMAN B. WEAVER ..... CHIEF ACCOUNTANT

DIVISION OFFICES

Division
I. FRANCIS G. SOMNER, Division Engineer ..... Willits
II. T. A. BEDFORD, Division Engineer ..... Dunsmuir
III. GEORGE R. WINSLOW, Division Engineer ..... Cal. Fruit Building, Sacramento
IV. JNO. H. SKEGGS, Division Engineer ..... Flood Building, San Francisco
V. LESTER H. GIBSON, Division Engineer ..... Union National Bank Building, San Luis Obispo
VI. J. B. WOODSON, Division Engineer ..... Rowell Building, Fresno
VII. W. W. PATCH, Division Engineer ..... Pacific Finance Building, Los Angeles

PAST MEMBERS OF THE CALIFORNIA HIGHWAY COMMISSION

Name	Residence	Date of appointment	Termination of membership
Burton A. Towne	Lodi	August 2, 1911	Resigned January 15, 1914
Charles D. Blaney	Saratoga	August 2, 1911	Resigned March 1, 1917
Charles F. Stern	Eureka	January 15, 1914	Resigned December 21, 1918
Henry J. Widenmann	Vallejo	March 1, 1917	Died October 6, 1918
Emmett Phillips	Sacramento	December 21, 1918	Died June 18, 1919



ORGANIZATION AND ACTIVITIES 1922

BIENNIAL REPORT

OF THE

CALIFORNIA HIGHWAY COMMISSION

NOVEMBER 1, 1922.

INTRODUCTORY.

The two years since the 1920 biennial report of the California Highway Commission have witnessed the greatest construction activity since the inception of work on the state system in 1912. This activity has not been confined to the building of new highways alone but has included a substantial beginning on a program of widening and thickening of main trunk highways. This was contemplated when the Commission adopted the unit type of construction by which it provided for a large mileage of usable roads so designed that their carrying capacity could be increased to keep pace with the demand of increasing traffic without loss of original investment.

Certain very definite reasons made it advisable, in the opinion of the Highway Commission, to undertake a large building program during this period. The registration of motor vehicles in California has increased over 1700 per cent since the first state highway bond issue was voted in 1910, and the demand for additional improved highways was increasing in intensity. The peak of excessively high building costs, that followed the war, passed and prices showed a sharp decrease. Contractors were eager for work. Unemployment was prevalent, and the fact that highway work employed a large volume of unskilled labor and was distributed over the entire state made it particularly desirable to undertake a large amount of highway construction.

Fortunately the electors of the state, by the enactment of Constitutional Amendment No. 9 at the previous November election, had provided a flexible rate of interest on state highway bonds which formerly had been difficult to sell on a fluctuating and uncertain bond market at the fixed interest rate of 4½ per cent. Under the authority of this measure the state was able to offer bonds at the market rate and thus was able to proceed with highway construction without interruption.

EXTENT OF ACTIVITY.

The extent of the road building activity of the past two years will be realized when it is stated that in November, 1920, there were 28 contracts and day labor jobs under way on the state highway system involving 280 miles. On July 1, 1922, there were 152 contracts and day labor jobs with a total of 1063 miles. During the two year period 600 miles of state highway have been completed and 89 miles of the highway widened and thickened.[1]

[1]The mileage of state highways completed during the period includes 135 miles previously reported as having been graded only.

COST OF COMPLETING HIGHWAY SYSTEM.

While the great activity in highway construction during the past two years has given the state the service of a large new mileage of improved road, it has also brought California face to face with the problem of refinancing its highway system.

On July 1, 1922, the amount of State Highway bond money left in the treasury plus $16,000,000 in unsold bonds amounted to $23,066,-027.30.

At the present rate of expenditure, this money will either be spent or obligated before the end of 1923. Accordingly the people of California must either refinance the work or be prepared to see a cessation of highway construction at the close of the coming year.

The highway problem is so intimately connected with the fortune and the social and material well being of every county and every community in the state that its solution is one of the most important issues before California. Owing to the very large sum involved the problem is more perplexing than it has ever been in the history of California.

MONEY NEEDED.

How great an amount of money could be advantageously spent upon California's road system may be gleaned from a consideration of the mileage now in the system and the character and cost of the portion that has been improved as compared with the mileage yet to be improved.

The figures are as follows:

Total mileage in the state highway system	6,400
Completed mileage under bond issues (approximate)	2,500
Mileage still to be improved	3,900

(Exclusive of graded roads included in the improved mileage above, but some of which are yet to be paved or otherwise further improved.)

Table showing mileage of bond issue roads constructed or improved by the California Highway Commission:

Earth and gravel	791 miles
Asphalt macadam	64 miles
Topeka on macadam	16 miles
Portland cement concrete bases	1,567 miles
Asphalt surface on concrete base	108 miles
Miscellaneous	10 miles
Total	2,556 miles

The cost of the completed bond issue roads has averaged approximately $20,000 per mile.

The average cost per mile of improving the remaining roads in the California state highway system, however, will probably be not less than $25,000 and may be considerably more than this amount depending entirely upon the class of improvement adopted.

Most of the work to date on the system has been in the valley or hill sections of the state where the grading was comparatively light and pavement costs were relatively low, due to close proximity to rail facilities.



Plate I. State Highway, Ventura County from Point Mugu southerly showing rugged nature of country.



Plate II. State Highway, Ventura County. Point Mugu, showing proposed location.

By far, the greater part of the grading yet to be done is in mountainous country. To grade the Feather River highway only 12 feet to 14 feet wide is estimated to cost not less than $30,000 per mile. Grading and graveling along the coast in Humboldt and Del Norte counties, grading and paving the Skyline Boulevard, grading and graveling the highway along the coast in Monterey and San Luis Obispo counties, and grading and paving along the coast between Oxnard and San Juan Capistrano in Ventura, Los Angeles and Orange counties will average in excess of $50,000 per mile.

At $25,000 per mile the cost of improving 3900 miles will amount to very nearly $100,000,000, but this amount does not represent the total expenditures that must be made in California's highway system. It represents simply an estimate of the cost of improving to average specifications of past years the unimproved portions of the present state highway system, and the reconstructing of the old county-built macadam roads in Los Angeles, San Joaquin, Sacramento and several other counties, which have become a part of the state highway system.

To this must be added the cost of widening and thickening approximately 1200 miles of the present system and the elimination of grade crossings. These two latter items will cost about $35,000,000 additional.

Work in sight at the present time will, therefore, cost not less than $135,000,000 to complete. Credited against this estimate of $135,000,000 are funds remaining in the $40,000,000 bond issue, Federal Aid funds that will be available under future Congressional appropriations, and allotments to projects now under way but not completed

It should be noted that the above statement includes only items involving capital expenditures. Money for maintenance must be provided outside of this sum.

THE DEMAND FOR NEW ROADS.

Everywhere in the state, cities and counties are asking the inclusion in the state highway system of a large mileage of highway not now a part of the system, but for the inclusion of which very valid arguments are offered. The counties also are showing an increasing unwillingness to construct bridges on state highways, and the time appears to be not far off when bridge construction must be undertaken by the state along with the construction of the roadbed proper.

NEW FINANCIAL POLICY ESSENTIAL.

It is obvious that California is facing the expenditure of many millions of dollars on highway work, in addition to the $68,368,240[1] already spent. It is equally obvious that the amount involved is so large that the problem of distributing the burden of highway construction costs between this generation and succeeding generations and between the general taxpayers and the users of the road offers difficulties of large proportions to the people of California. The time has come when the hit-and-miss, happy-go-lucky plan under which the road work in California has been financed in the past must give way to a carefully thought out and scientifically planned policy of highway financing.

[1]Expenditures to July 1, 1922, including all items.



Plate III. State Highway, Ventura County, showing proposed location.



Plate IV. State Highway, Ventura County, showing proposed location.

METHODS.

There are three methods of financing highway construction.

1. Construction on a pay-as-you-go plan.
2. Construction on a bonding or deferred payment plan.
3. Construction on a plan based in part on direct payments and in part on bonds.

THE PAY-AS-YOU-GO PLAN.

The discussion of the relative merits or demerits of such a plan will of necessity center about the amount of money that is to be raised, the ability of the state to raise it, and the further question of the extent to which one generation should fasten an indebtedness upon succeeding generations.

It is the opinion of the Highway Commission that $12,000,000 represents approximately the amount of construction that can be undertaken by the highway organization in a year of normal conditions, and that a much larger program is likely to result in loss of efficiency in the work. In this connection it is instructive to note that the average annual expenditure since the state highway work started in 1912 is $6,800,000. The highest expenditure for any one year was $14,144,742, and lowest expenditure was $594,110. These figures cover, however, the war period and the year following the close of the war, when highway work in California and elsewhere largely marked time.

Taking the sum of $12,000,000 as a basis from which to figure, the problem presents itself somewhat as follows: It may be expected that about $2,000,000 will be received as the state's share of the Federal Aid Highway Appropriation (in 1923 the amount will be $1,641,000; in 1924, $2,134,000; and in 1925, $2,462,000), and the remaining $10,000,000 must be raised otherwise.

It is apparent that this money must be obtained either by increasing the revenue derived from motor vehicles or from the general tax of the state or both. Inasmuch as organizations of motor vehicle owners have gone on record against any plan of highway taxation that would place the burden of original construction on motor vehicle owners it is extremely doubtful if any plan intended to place the sole burden of road improvement on motor vehicles would receive serious consideration. The $10,000,000 would therefore have to be taken from the general fund of the state. Such a plan would result in the saving of interest charges which under the bonding plan would have to be paid out of the general fund.

THE BONDING PLAN.

The second method of highway construction is the bonding or deferred payment plan, the method that has thus far been adopted in California in constructing its highway system.

The advantage of the bond plan is that it makes funds immediately available for highway construction. The disadvantage is the increased cost of the road due to interest charges. Credited against this interest cost must be the service that the road will give for an estimated period of years between the date of its actual construction under a bond issue



Plate V. State Highway, Mariposa County, between Mariposa and Briceburg, graded roadway under construction.

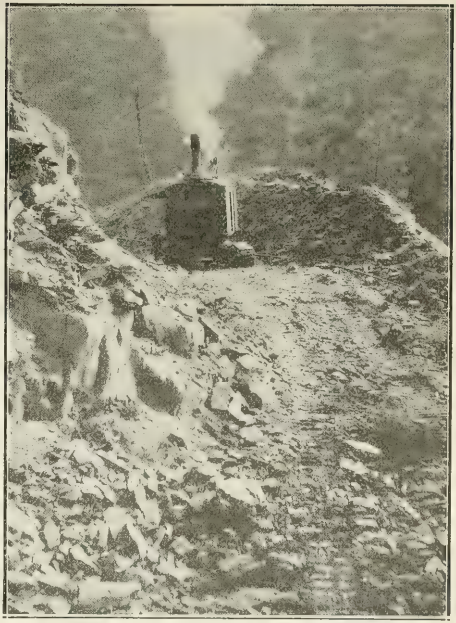


Plate VI. State Highway, Mariposa County, between Mariposa and Briceburg, steam shovel at work.

and the date of its probable construction under a pay-as-you-go plan. It is needless to add that California's highways have demonstrated an earning capacity far beyond the annual interest, bond refunding, and maintenance charges for each year.

In the question of a bond issue is involved the mooted question of the proper division of road costs between this and succeeding generations.

The generally accepted rule governing such distribution is that where a debt is passed from one generation on to another, sound assets equal in amount to that debt should also be passed on to the paying generation.

An analysis of highway financing in California will show that this has been done. Such misleading expressions as "long term bonds for short term roads" as applied to California highways and the highways of other states where road improvement has been carried on to any great extent are due to a misconception in the popular mind as to what a highway is. The surface is confused with the whole road.

ANALYSIS OF COST OF ROAD PARTS.

There is need to educate the public mind as to the component parts of the road, that people may know that the surface pavement is but a part and in fact the least permanent part of an improved road. The public needs to be informed that the pavement is always liable to show distress under excessive traffic, and that the really permanent portions of a highway are, the graded road bed, which usually improves with years under traffic; and the drainage structures.

Then, too, the pavement itself rarely becomes a total loss since, generally, it may be incorporated in the reconstructed pavement. In California hardly a section can be found where a pavement slab, weakened by unforeseen traffic, will not show a salvage value of from 75 to 90 per cent of its initial cost if it is made a part of a thicker and wider roadway.

Due regard to good engineering and good business in road construction will maintain a ratio between the cost of the pavement and the more permanent portions of an improved highway that will assure to future generations assets equaling in value and generally far exceeding the indebtedness they will be called upon to pay.

THE ILLINOIS PLAN.

Before closing the discussion of the second or bonding plan, the Illinois bonding plan is interesting to note:

The people of the State of Illinois in 1918 voted a $60,000,000 state highway bond issue. These bonds are of the serial type, payable within twenty years. Both the principal and interest are calculated to be entirely met with motor vehicle license fees, without recourse to general taxation, hence throwing the entire burden on the road users.

THE THIRD PLAN.

The third plan of highway financing contemplates a large annual revenue supplemented by a bond issue, and it is this plan that seems best suited to meet California's need today.

Advocates of this plan in California would place the burden of original primary construction upon the general taxpayers through a

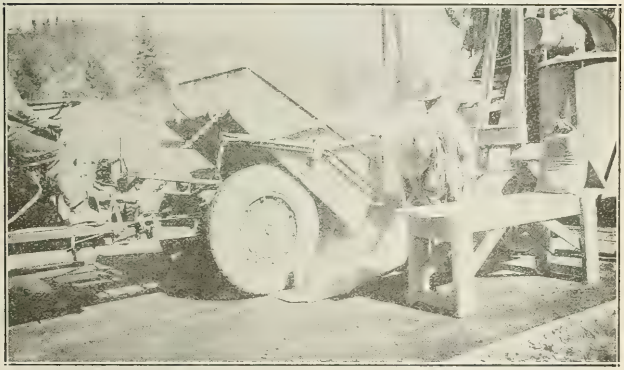


Plate VII. State Highway, Siskiyou County, typical construction scene.

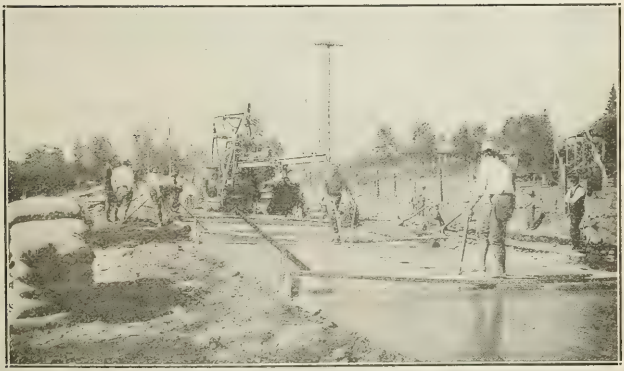


Plate VIII. State Highway, Siskiyou County, concrete base under construction.

bond issue. The burden of maintenance, of widening and reconstruction to accommodate increased traffic would be placed upon the users of the road.

The question of the extent to which the use of revenues shall be specified and limited is one for legislative determination. The necessities, however, of the California highway system would practically assure the distribution of revenues for some years to come substantially in accordance with the method outlined above.

MORE MONEY FROM ROAD USERS.

The Highway Commission has for over two years urged the adoption of measures that would place a larger share of highway costs upon highway users. Specific recommendations to accomplish this have been embodied in proposed legislation for a gasoline tax and for an increase and equalization in motor vehicle fees.

GASOLINE TAX.

The gasoline tax is now in successful operation in 17 states. It should be noted that the tax is ordinarily in addition to personal property taxes and the usual motor vehicle fees. The advantage of the gasoline tax is that it automatically distributes itself in proportion to road use; it can be collected from about six distribution companies and the cost of collection will be negligible; it will bring a large new revenue into the state from out-of-state cars that are attracted to California by the state's highway system, and which now enjoy the state's roads without contributing either to the cost of their construction or their upkeep.

There were approximately 350,000,000 gallons of gasoline used in California in 1921 of which 90 per cent was used in motor vehicles. It is the opinion of this Commission that a gasoline tax for road purposes should be levied only against gasoline used in motor vehicles and in the bill introduced in the 1921 session of the legislature, a simple method for exempting non-highway used gasoline was devised.

The need of the state highways is so great that the entire fund derived from such a source should be devoted to the state highways. For the next five years the entire amount so received can be expended in widening and thickening present highways and unless a larger tax is imposed than has heretofore been considered, additional revenues for these purposes will be needed.

MOTOR VEHICLE FEES.

In addition to the gasoline tax, an increase in motor vehicle fees is desirable not only as a revenue measure, but to equalize motor vehicle charges as between light passenger machines and the heavier duty trucks.

At the present time, California taxes motor vehicles upon a horsepower basis with the very nominal surcharge of $5 and $10 for trucks. Under this plan an undue share of road maintenance falls upon the light passenger machine with its high horsepower capacity installed to give it speed. On the other hand the greatest injury to the highway

Plate IX. Placer County, 4000 sheep on Auburn-Verdi road, September 14, 1922.

comes from the truck, the horsepower installation of which is approximately that of the light car, but whose weight and impact on the road is infinitely more damaging.

INCREASE FEES WITH LOADS.

This Commission would recommend that the basis of motor vehicle fees be changed from the present basis of a horsepower tax with a nominal surcharge for trucks to a horsepower and gross laden weight basis. It is the opinion of the Commission that only a nominal increase should be made in the tax on horsepower but that a substantial fee should be charged on the basis of weight, the fee again increasing substantially as the load increases. To lessen impact damage, the Commission is also of the opinion that the use of pneumatic tires on trucks should be encouraged by making a substantial differentiation in the weight fee for trucks equipped with pneumatic tires as against those equipped with solid tires.

CHARGES IN OTHER STATES.

In making these recommendations, the Highway Commission fully recognizes that motor transportation is a proper, legitimate and essential development of the country's transportation system. At the same time a comparison between charges levied upon trucks and commercial vehicles in California and similar charges in nearly every other state of the Union shows that California is substantially lower in its scale of license fees than other states having improved roads and in fact many of the *unimproved road states* derive greater revenues from the commercial users of the highways than does California. This comparison clearly reveals that the changes suggested by this Commission impose no undue hardship or unfair charge upon the trucking industry.

The above plan which would make the traffic that has created the necessity for wider and thicker roads pay the cost of such improvement will also free the general taxpayers of a burden, which if they should be called upon to pay would increase their highway taxes by many millions of dollars.

COUNTIES WILL SHARE.

In this connection it should be noted that motor vehicle fees are shared with the counties and accordingly the counties would be the beneficiary with the state from increased revenues that would come from this source.

Motor vehicle moneys are used for maintenance. If any surplus exists, such surplus can well be used for widening and thickening highways.

FEDERAL AID FUNDS.

Consideration of the financing of the highways must of course take into account funds derived from the United States Treasury. To date California has received $10,846,453.10 of these federal funds.



Plate X. State Highway, Santa Clara County, showing widened and thickened highway.

The federal funds apportioned to California up to June, 1919, were taken into consideration by the framers of the $40,000,000 bond act. In the budget upon which this act was based, allotments totaling $44,688,675 were made to various projects with $40,000,000 in bonds to meet these budget allotments. It was understood that the additional $4,688,675 would come from federal funds and from a small balance from the previous bond issue.

HOW MONEY HAS BEEN USED.

The Highway Commission has used such moneys as have come to the state from federal aid sources in excess of the $4,688,675 obligated in the $40,000,000 bond act in making up deficits occasioned by increased building costs and heavier specifications, and in certain work of an imperative and emergency character, such as widening and thickening portions of highways, that had they not been protected would have been destroyed under traffic. It was necessary also to use some of this money to float bonds, with the alternative of involving the state in damage suits from contractors running far into the hundreds of thousands of dollars, at a period when contracts were under way and bonds suddenly became unsalable because of a low and rigid interest rate. However, the use of this money has been so safeguarded that despite increased building costs, heavier specifications, emergency work, and such unforeseen costs as floating bonds unmarketable at par, the funds of the Highway Commission will assure meeting every budget obligation.

FLEXIBLE FUND NEEDED.

It is the opinion of the Highway Commission that in the future federal aid funds should not be budgeted, but should be left to give some flexibility to highway financing.

While congress has definitely committed itself only to federal aid appropriations up to and including the year 1925, the United States Bureau of Public Roads estimates that the construction of highways included and accepted as a part of the federal aid system or as it is more generally termed the "seven per cent system" will take twenty years. It would seem that continuous federal aid can be expected as long at least as the accepted federal road system is in process of construction.

FOREST HIGHWAY MONEYS.

In addition to the so-called federal aid moneys, Congress has also appropriated moneys to aid in the construction of the main highways traversing or leading into the national forests. California has been allotted this year $1,460,871 from this fund known as the Forest Highway Fund. This fund is in addition to the Forest Development Fund, intended for the development of roads and trails within the national forests.

DIFFERENCES OVER POLICY.

Some difference of opinion has developed relative to the expenditure of the forest highway funds in California, the Highway Commission refusing to approve projects outside of the state highway system. This



Plate XI. State Highway, Sonoma County, showing concrete shoulders and roadway ready for asphalt surface.



Plate XII. State Highway, Sonoma County, laying asphalt between concrete shoulders.

refusal is based upon the fact that there are 1000 miles of state highways within the national forests in California, and that these highways are inadequately financed.

The Commission does not believe that new road obligations should be assumed when funds are not available to fulfill obligations that already exist, particularly when the new obligations have regard to roads that the people of California have not considered of sufficient importance to include in the state highway system. In this stand, the Highway Commission has been supported by the United States Bureau of Public Roads.

The Highway Commission has regarded these forest moneys as a special fund created for a special purpose and not to be considered as a part of the budget.

BUDGET OBLIGATIONS.

In the expenditure of the $40,000,000 bond funds, the Commission early adopted the policy that it would consider as binding the budget prepared by the proponents of the bond issue, and later ratified by the state legislature, although the budget itself was not made a part of the text of the bond issue. It was the opinion of the Commission that one road should not be robbed to build another. Strenuous efforts to force the abandonment of the budget were steadfastly resisted by the Commission. Despite the abnormal cost conditions, on November 1, 1922, there was a sufficient sum available to meet every budget obligation.

SEVEN RECOMMENDATIONS.

The California Highway Commission has reached certain definite conclusions relative to highway financing. These may be summarized as follows:

1. The demand for roads is so insistent that the public will not be content to await their construction on the slow process of a pay-as-you-go plan. Correlated with this is the demonstrable proposition that improved roads pay their own way with a handsome return on the investment, and hence an investment in good roads is a paying venture for the people of the State.
2. While another bond issue appears to be imperative, the users of the roads should be asked to bear a larger share of the highway burden than has been placed upon them in the past.
3. Future bond issues should not contemplate providing funds for the completion of the entire system. The public should realize that the completion of the state highway system is many years in the future and that as California grows, its road system must grow with it. Disappointment can only follow any bond issue which the people are asked to vote with the promise that it will be the last one.
4. The preferable method is to ascertain the amount of work that can be economically and efficiently undertaken by the California Highway Commission in any one year, and under normal building conditions. With this ascertained, the work should then be financed for a period of not less than five years.
5. Such a plan would require a rigid budgeting of the funds of a bond issue. Some financial flexibility is absolutely necessary in the conduct of the work. This can be secured if federal funds are left unbudgeted.
6. The gasoline tax and an increase and equalization of the motor vehicle fees offer a practical and fair method for imposing a larger share of highway costs upon highway users.
7. The legislature should definitely and rigidly refuse to designate roads as state highways unless at the same time finances for their improvement and maintenance are provided; nor should any roads be included in a bond issue unless a definite allotment for the construction of these roads is made.

REGULATION OF TRAFFIC.

No less important but somewhat less perplexing than the question of highway finances is that of the traffic regulation on the roads.

It is the opinion of the Highway Commission that the present maximum weight of 30,000 pounds permitted upon the state highways should be decreased to a maximum permissible gross weight of 22,000 pounds. This latter weight will permit the operation of the five-ton truck and its load.

The Commission believes that the following load limits of some of the other states will justify the statement that in limiting loads to 22,000 pounds California will be imposing no unusual condition or undue hardship upon the trucking industry:

Vermont 12,500 pounds; Colorado 16,000 pounds; Maine 18,000 pounds; Alabama, Maryland, New Hampshire and Ohio 20,000 pounds; Oregon, Utah and West Virginia 22,000 pounds.

In fact, California, Michigan and New Jersey, each with a 30,000 pound limit, have the highest weight limits prescribed in the Nation. (*Engineering News Record* statistics, September, 1921.)

Experience has demonstrated that the mere passage of a regulatory law is useless unless machinery is set up for its enforcement. The Highway Commission recommends the establishment of an adequate force of state motor police to enforce traffic laws on state highways. It is the opinion of the Commission that such officers should operate under the direction of the Highway Commission for the reason that the body charged with the responsibility of maintaining highways should be vested also with power to adequately protect them.

THE "MARYLAND PLAN."

The California Highway Commission would also recommend that there be written into the law of California by the next legislature the so-called "Maryland Plan."

This plan has been found the most effective method yet devised for stopping overloading, inasmuch as under it, the operator of a truck found with an overload can be forced to remove it before proceeding farther on the highway. Once forced to leave a portion of his load by the roadside, there to incur the risk of damage through the elements or loss by theft, and the further expense of sending a truck back for a small cargo, operators are careful to avoid future overloading.

It is the opinion of the Commission that the above recommendations with possibly amendments of a minor character will meet with the approval of the responsible element of the trucking industry. This element constitutes the great majority of those engaged in the industry. It is the outlaw operator who has no regard for anything but the profits promised on the one load that he is hauling who must be controlled in California.

SPECIFIC RECOMMENDATIONS.

Recommendations for traffic regulation may be summarized as follows:

1. The maximum permissible weight on state highways should not exceed 22,000 pounds.

2. An adequate force of state motor police be authorized for the enforcement of traffic laws on state highways.

3. The above police to be under the authority of the State Highway Commission, the body responsible for the protection and maintenance of highways.

4. Where portable scales reveal that a truck is overloaded, traffic officers be authorized to demand the removal before the truck proceeds on the highway; the so-called Maryland plan.

CONSTRUCTION PROBLEMS AND POLICIES.

In view of the fact that the past few years have constituted a transition period in California's highway history, it would indeed be strange if there had not been manifested a keen interest and criticism of types of road construction and engineering and administration policies.

The fact should not be forgotten that the highway transportation system of the state and nation is undergoing just such a change as the railroads experienced.

Under the traffic that they themselves created the railroads passed from a period of light construction to a period of heavy construction; from the 40 pound rail to 110 pound rail; from single track to the double track; from the C. P. Huntington engine, which today looks like a toy, to the giant Mallets.

COMPARATIVE FIGURES.

In 1910 when the first state highway bond issue was voted in California the total registration of motor vehicles was 44,142 and in 1922 to date is in excess of 816,000. If figures were available for the two years in motor vehicle miles or in ton miles, the comparison would be even more astounding.

The problem before the Highway Commission was and has been to develop a type of road that would give a serviceable mileage to the state; that would take care of traffic increasing in an almost unbelievable manner; and that could be widened and thickened as the volume of traffic requires without the loss of the original investment.

The success with which this difficult problem was met constitutes a triumph of the engineering department of the California Highway Commission that has won for the department an enviable position in engineering councils the world over.

OLD AND NEW ROADS.

Beginning with the slab fifteen feet wide and four inches thick, the concrete roads of California were progressively bettered as traffic increased. The minimum thickness was increased to five inches with greater thickness where subgrade conditions demanded it.

Steel reinforcement has been used in increasing quantities. Superelevation has taken the place of the flat curve. Roads have been widened to the extent that finances permitted; the edge of the road, always a weak spot, has been thickened and strengthened.

The traffic has become so enormous now, however, that the Highway Commission desires to repeat its warning of four and two years ago, that the state must proceed to widen and in many places thicken its main highways. Unless approximately 1200 miles of main state highways are widened and thickened within the next five years, the loss through traffic impact and traffic congestion will be very great.

CAN DELAY NO LONGER.

As the Commission pointed out in its last biennial report this work should be carried on in advance of actual deterioration of the roadbed. Funds for this purpose were refused by the last legislature. Limited in funds the Highway Commission has exerted every effort to carry on this work where emergency conditions existed during the past two years. However, the work can not be carried on indefinitely unless funds for this special purpose are provided. Given these funds the loss to the state of its original investment will be very small. Denied them, the destruction of hundreds of miles of roads can be expected. Those in charge of financing the state highway system face a heavy responsibility in this matter, a responsibility that can not be avoided for another two years.

PLAN IS READY.

In this regard the Highway Commission, through its engineering department, has evolved a highly successful and economical plan for widening and thickening highways.

Where the old pavement base is still in fair condition, it is being widened to 20 feet by the addition of Portland cement concrete shoulders 2.5 feet wide, 7 to 8 inches thick, and surfaced with asphaltic concrete 2½ to 3 inches in thickness. Where the old base is badly cracked and has seriously deteriorated a complete new pavement not less than four inches in thickness is being constructed on top of the old base, making a total thickness of not less than eight inches.

The soundness of this plan can not be successfully attacked.

The Highway Commission has done all that it can do. The plan has been devised; its success has been demonstrated; the whole question is now one of funds. The responsibility rests with the legislature and the Governor to give the Highway Commission these funds.

VARIOUS ROAD TYPES.

While the prevailing type of road constructed in California has been of the cement concrete base type, the Highway Commission is strongly of the opinion that there is no one universal type of road.

The type of improvement to be selected for any road depends primarily upon subgrade conditions, the probable traffic to which the particular road will be subjected and the amount of money available for its construction.

The Highway Commission has in a large number of instances called for bids on alternate specifications of cement concrete and asphaltic concrete. In many instances asphaltic macadam has been laid. In other instances the improvement has consisted simply of grading and graveling roads.



Plate XIII. State Highway, Los Angeles County, slope paving.



Plate XIV. California State Highway Commission's road exhibit at State Fair, 1922.

It is the opinion of the Highway Commission that pavement should not be undertaken on mountain roads except under the most exceptional conditions until these roads have been widened to a minimum of 21 feet on fills and 18 feet in cuts. Even then the wisdom of paving a mountain road is doubtful unless it is found practically impossible to maintain the gravel surface under the traffic it is called upon to bear.

CONSTRUCTION PROBLEMS NOW DEFINED.

In the construction of highways the road builders of today enjoy a great advantage over the builders of the earlier period in that sufficient time has elapsed to develop the weak points in highways. Problems involved in construction are more clearly defined now than they were a few years ago.

A notable contribution toward better highways was the study of the California highway system by the United States Bureau of Public Roads in 1920. This study, which was the most intensive investigation of highways ever undertaken, developed that 87½ per cent of the paved highways of California were in good serviceable condition. Pavement constituting 12½ per cent of the entire mileage was designated under six classes varying from a condition where travel was somewhat impeded to one where the road was considered impassable. *The noteworthy fact was that of 12½ per cent, which constituted the impaired highway, 70 per cent was on adobe soil.*

BATTLING WITH THE ADOBE.

The problem of conquering the adobe is accordingly one of the big problems before the road builders of California as well as the builders of other states.

In conjunction with the United States Bureau of Public Roads the California Highway Commission has undertaken a large number of experiments dealing with the treatment of adobe subgrades. In some sections the subgrade has been treated with asphaltic oil below the concrete slab. In other places the adobe has been treated with lime. In still others gravel and sand have been used. On one section of the Rio Vista–Fairfield road, cement was broadcasted into the adobe subgrade. The success or failure of these various methods of treating adobe subgrades can not be foretold but must await the test of time and traffic.

An interesting development of the Pittsburg test road was the relative immunity of its subgrade from saturation both from rain and from flooded ditches. There the adobe subgrade was prepared in six-inch layers and subjected to heavy rolling. It is believed that this offers a suggestion for making the adobe subgrade more impervious to water than it has been in the past.

The treatment of adobe soil constitutes but one of many experiments that are in progress on California highways.

OTHER EXPERIMENTS.

Various sorts of asphalt pavement have been laid to see if a type could be developed which under actual road conditions would secure an increased degree of rigidity, thus lessening the corrugation difficulty.

These same experiments seek to ascertain some method of treating asphaltic surfaces to make them less susceptible to skidding.

Laboratory experiments have been carried on for several years to determine the resistance of asphaltic road materials to alkali. These experiments indicate that where alkali is active by reason of the presence of water, asphaltic roads are less susceptible to alkali damage than is cement concrete.

The Pittsburg tests demonstrated the changes in a concrete slab due to climatic conditions are greater than heretofore supposed. Near Fairfield the Highway Commission is laying a section with the so-called pre-cast slab type. These slabs are cast at a central station under uniform casting and curing conditions, and later transported by truck to the road and derricked into place. This process, if successful, will be invaluable for desert construction where water and materials are all inaccessible.

The Pittsburg tests also emphasized the fact known to road builders that impact is the chief factor in road destruction. The Highway Commission has grappled with the problem of reducing impact to a minimum by eliminating unevenness in the road as far as it is possible so to do.

Impact has been found particularly destructive at the edges of roads and at the junction between two slabs. By widening roads and by thickening the edge, the destructive effect of traffic blows on the edge can be and is being overcome. The method of lessening impact at the junction of slab, where unevenness of surface is difficult to prevent, is harder of solution. Experiments are now being conducted in tying slabs together by the use of steel dowels, extending from one section of highway into the adjoining slab.

Reference has already been made to the various types of roads constructed in California, which afford in construction costs and maintenance charges, a check upon the relative cost of the service they provide.

CONVICT LABOR ON STATE HIGHWAYS.

During the past two years, convict labor has been used on the state highways to the maximum extent that it has been possible so to do. In the early months of this period, the use of such labor was made particularly desirable by the shortage of free labor. It is the belief of the Commission, however, that even under normal labor conditions the value of convict work on highways to the state and to the convicts themselves is such that all available labor of this kind should be employed.

There are certain difficulties inherent in this work but these can be overcome when to firm control is added kindliness of treatment and generous attention to physical comforts.

COST AS COMPARED WITH FREE LABOR.

With the resumption of normal cost conditions during the latter part of the biennium, the difference that had hitherto existed between the cost of free and convict labor on state highways has been materially reduced. During the period of 1919 and 1920, the cost of convict and free labor in the same part of the state averaged $2.06 per day and $5.50 per day, respectively. The average cost for 1921 and up to and

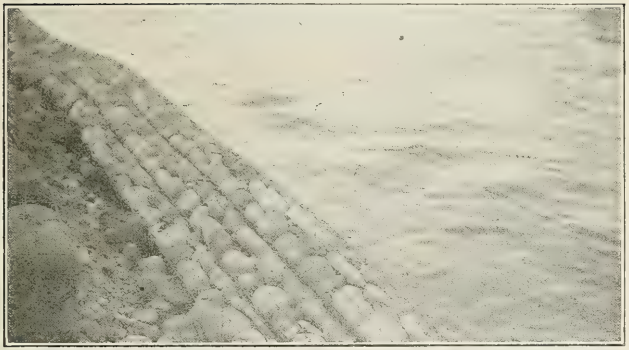


Plate XV. Showing method of bank protection adjacent to State Highway Bridge over the San Gabriel River in Los Angeles County.



Plate XVI. Bank protection to protect State Highway Bridge over San Gabriel River in Los Angeles County.

including October, 1922, showed the average daily cost of convict labor to be $2.30 and of free labor $4.50. In this connection, however, it should be remembered that convict labor is used in isolated and remote sections where free labor costs would run above the average.

The increase in the cost of convict labor in the latter period is accounted for by the fact that the convict camps were located in more remote places than in the earlier period, and the cost of taking in supplies was accordingly greater.

EXCELLENT ROADS BUILT BY CONVICTS.

The state is securing excellent roads from convict labor. Experience has shown convicts work best on original construction and that they are apt to lose interest if assigned to the more monotonous work of reshaping or widening a road already constructed. Accordingly, these men have been concentrated on sections where first construction is under way. A total of 132 miles of state highway has been built by convicts.

SUCCESS AND SAFETY OF THE WORK.

For obvious reasons, convict labor has been employed in remote mountain districts as the remoteness of the work increases the difficulty of escape and thus discourages such attempts.

Experience has also shown that civilian residents of the sections in which these men are employed have little to fear from the proximity of convict camps. In the past two years there have been 92 escapes from the convict camps. Of these escapes 60 men have been captured. Remembering that 1005 convicts have been employed on highways during this same period, the number of escapes is exceedingly small.

Equally important as the saving to the state by convict labor is the value of the work to the convicts themselves. This labor affords an opportunity for men convicted of crime to step gradually from prison to free life. The eagerness with which convicts seek this work and their general good behavior in camp reflects the worthwhileness of the work to the men.

FACTORS THAT LIMIT CONVICT EMPLOYMENT.

There are certain factors that limit the number of convicts that can be employed on state highways. These may be summarized as the need of the two state prisons for labor within their own walls; the number of prisoners who are physically fit for heavy manual labor; the prison records of the men as indicating the safety with which they can be allowed to come in contact with civilians; the ability of the penitentiaries to supply full crews for camps, as experience has shown that it is unwise to mix free and convict labor in one camp; and the amount of work in remote sections that the State Highway Commission can undertake.

In only one instance has there been evidence that convict labor on highways was depriving free labor of employment that it desired. In this instance a free labor camp was immediately organized.

The success of the use of convict labor has been made possible by the cooperation of the members of the State Board of Prison Directors,

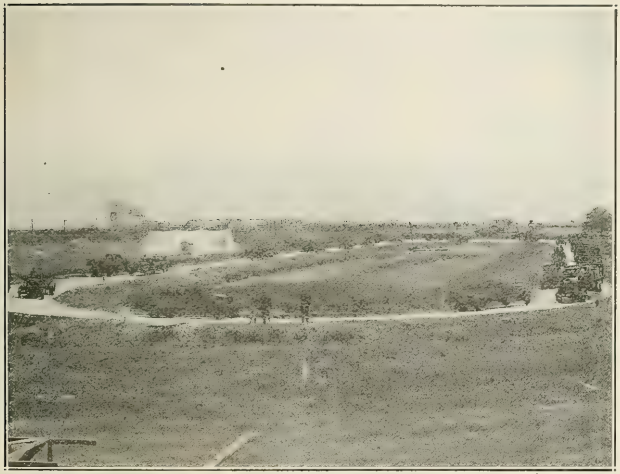


Plate XVII. Pittsburg Test Highway, showing special highway built for testing purposes.

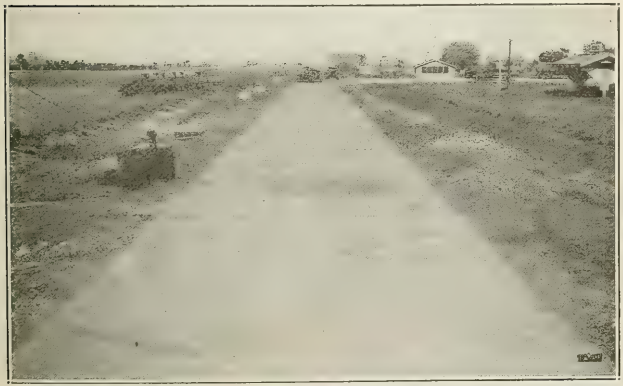


Plate XVIII. Pittsburg Test Highway, showing block markings for recording data.

James A. Johnston, warden of San Quentin State Prison, and J. J. Smith, warden at Folsom.

The Highway Commission believes that the policy of employing the maximum available convict labor in highway work should be continued, not alone because of its saving to the state, but also because of the saving in human values that constructive employment in an out-of-prison environment makes possible.

CONTRACT AND DAY LABOR JOBS.

In pursuance of its policy of letting all work wherever possible by contract, the Commission during the past two years has awarded contracts amounting to $18,500,000. Day labor jobs undertaken during the same period aggregated $4,700,000, and were undertaken only where special reasons existed for their construction by state forces.

A number of conferences have been held with the Contractors' Association, and as a result, agreement as to a number of disputed points relative to the conduct and supervision of the work have been amicably adjusted. The Commission wishes to express its appreciation of the fair and helping attitude of contractors generally toward the work; it has been the effort of the Commission and the members of the Department to cooperate with the contractors on the basis of mutual fairness and helpfulness.

THE PITTSBURG TEST ROAD.

The Highway Commission participated in a series of road tests instituted by the Columbia Steel Company at Pittsburg, California, to which reference has already been made. Without elaborating upon the value of technical information that these tests developed, it is sufficient to say that the tonnage carried on this test road developed beyond question that the highways built under California specifications afford a traffic service that makes the investment a most profitable one.

Once more it is proved that California's policy of building the roads to suit the traffic and without "over designing" them is the right plan, economically. The easy way would have been to have made the pavement slabs "over massive" ten years ago but it would have been a wasteful policy.

TESTS TO BE CONTINUED.

Through the courtesy of the Columbia Steel Works, it has been possible for the Highway Commission and the United States Bureau of Public Roads to obtain the use of the Pittsburg tract for further tests. In these new tests, different types of road sections will be installed.

These tests are of great value inasmuch as they afford road authorities opportunity to test out various theories concerning road construction, and to obtain "hurry-up" information, impossible of attainment if results had to be developed upon highways built for the use of ordinary pleasure and commercial traffic.



Plate XIX. Pittsburg Test Highway, showing loaded trucks.

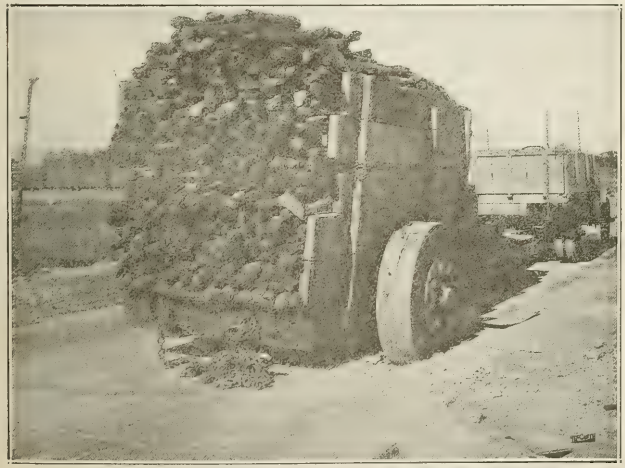


Plate XX. Pittsburg Test Highway, showing 50-ton load.

MAINTENANCE OF STATE HIGHWAYS.

No less important than the construction of highways is their maintenance. With the increasing mileage of improved highways, their increased age, and the enormous traffic they are called upon to bear, the problem of proper maintenance is one that calls for the best thought of both highway engineers and administrators.

Eternal vigilance is the price of good roads.

Quick perception of where repairs must be made and early repairs means not only a saving of roads but a saving of large sums in maintenance costs.

MAINTENANCE SYSTEM.

The maintenance system of the California Highway Commission is based upon constant inspection. Each of the seven divisions of the state has maintenance and patrol men who are on constant duty. In addition to this, three assistant engineers, attached to headquarters, working out from headquarters and reporting directly to the chief engineer and through him to the California Highway Commission, report upon the condition of the highways. They render a detailed report upon the condition of every section of the road, and these reports in their original form are submitted and studied both by the engineering department at headquarters and by the members of the Commission. Where criticism is voiced, the report is sent to the division engineer and his views are obtained and submitted to the chief engineer and to the Commission. This system of inspection has proven very effective in maintaining the state highways in proper condition. The importance of a careful study of inspection reports can not be over emphasized.

OLD COUNTY HIGHWAYS.

One of the biggest problems of maintenance has been the old oiled macadam roads, originally built by the counties, and taken over by the state. Many of these roads require reconstruction, but capital funds for such reconstruction have not been available. The result has been that the cost of maintenance has been excessive, and the condition of the roads at that far from satisfactory. With the reconstruction of these roads, one of the big maintenance problems of the state will have been solved.

The same is also true with roads constructed by the state which are showing signs of weakness under the present heavy traffic. Maintenance costs will run high on these roads until the widening and thickening operations already started are completed.

PROTECTING BRIDGES AGAINST FLOODS.

A maintenance problem that assumed serious proportions during the winter of 1921–1922 was the protection of bridges against floods. Bank protection work hastily thrown in prevented the loss of a number of bridges in southern California. Apparently, bank protection work of a permanent nature will be necessary on a number of rivers in southern California and on the Salinas river in northern California.

MAINTENANCE OF SHADE TREES.

The Pittsburg tests revealed that the paved surface of a road was subject to changes due to the heat of the sun to a greater extent than had hitherto been supposed. These tests explained the fact observed all over the state highway system that shade was a very effective agent in road maintenance. The planting of trees along the highways by communities has been made possible by the agreement of the Highway Commission to maintain these trees, and by the purchase of lands by the Highway Commission, on which the State Forestry Board is maintaining a state nursery. Viewed simply from the point of view of highway maintenance and without regard to the beautification of highways, the wisdom of the expenditure of maintenance money to secure better shaded highways is fully justified.

MISCELLANEOUS HIGHWAY MATTERS.

While major matters concerning California's highway system have been discussed in some detail, the Commission desires to call attention to some further matters of importance in state highway affairs:

GRADE CROSSINGS.

Since the inception of its work the Highway Commission has thus far eliminated 163 grade crossings with railroads. There are now in California over 250 grade crossings on the state highway system, exclusive of industrial spur tracks. Traffic on the highways has reached the point where the complete elimination of grade crossings seems desirable. By the installation of automatic warning lights, the Highway Commission has attempted to reduce the hazard of these crossings. It is true that an overwhelming proportion of accidents are due to the carelessness of the drivers, but the protection of drivers against themselves and the protection of the persons who may be riding with careless drivers apparently necessitates the early separation of grade crossings. Funds to carry on this work should be specifically provided either by legislative enactment or by the inclusion of the needed amount in a bond issue.

SURPLUS WAR MATERIALS AND THEIR USE.

During the biennium, the California Highway Commission was apportioned much surplus war material by the federal government. This material is of varying value and usefulness. Its greatest value lies in the trucks received. Thus far a total of 884 trucks have been apportioned to California by the War Department.

The policy of the Commission has been to share the benefits of this war material with the counties as far as it is possible to do so without depriving the state of equipment that it needs.

Under the law, the Commission can not divest itself of the title to this equipment. By leasing trucks to counties at a nominal rental of $1.00 per year, however, the law has been complied with and trucks put in use that otherwise would have remained idle in the Commission yard. Thus far, three trucks have been allotted to each county in the state.

A further distribution to the counties is proposed with the arrival of another assignment of government trucks.

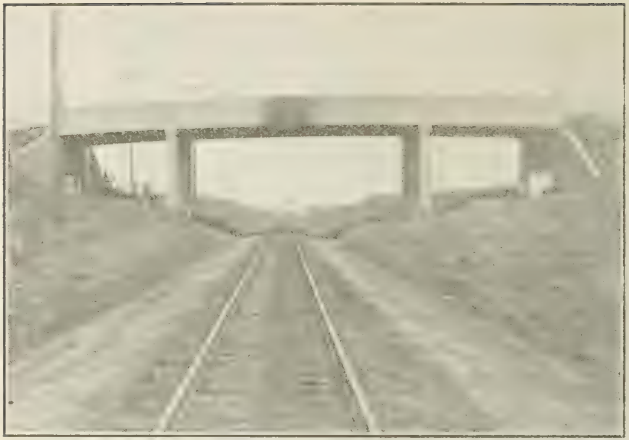


Plate XXI. State Highway, Stanislaus County, showing Riverbank overhead crossing, Atchison, Topeka and Santa Fe Railway.



Plate XXII. State Highway, Placer County, Auburn-Verdi road grade crossing through snow sheds, Southern Pacific Railroad.

HIGHWAY BEAUTIFICATION.

The plan devised by the Highway Commission three years ago for the beautification of highways by systematic and properly designed tree planting is progressing in an exceedingly satisfactory manner. Many communities have undertaken the beautification of the highways in their vicinity. The Highway Commission desires to express its appreciation of the cooperation extended to it by the State Board of Forestry and by the Highway Tree Planting Committee.

ROADSIDE ADVERTISING.

The Commission during the past two years has consistently adhered to its policy of refusing to allow the state highways to be used for advertising purposes. While successful in keeping the highway right of way free from advertising signs, the work of the Commission has been nullified in many instances by adjoining property owners who permit the erection of advertising signs immediately across the line from the highway. It would seem that the creation of a public sentiment against the nightmare of futuristic advertising that litters up the landscape and renders unsightly the vicinity of state and county highways might be a matter worthy of the attention of newspapers, women's clubs and civic bodies generally.

TRAFFIC CENSUS.

The California Highway Commission is now engaged with the United States Bureau of Public Roads in a complete traffic census of the state highway system, the cost of which will be equally shared. This study should give an approximately correct estimate of the volume of traffic on the state highways, the tonnage the highways carry, the peaks and the depressions in the traffic load. Its value in estimating the service to which a road will be subjected will be immediately apparent to all students of highway matters. Most counties having improved systems are cooperating in this work by taking a traffic census on important county thoroughfares.

THE SEVEN PER CENT SYSTEM.

In accordance with the Federal Highway Act approved on November 9, 1921, the California Highway Commission has indicated to the United States Bureau of Public Roads the system of roads to which it will confine federal funds. Under the law, the use of federal aid moneys is confined to seven per cent of total road mileage in any state. This road mileage in California from the best figures obtainable totals approximately 70,000. This state is accordingly confined to 4900 miles or 1500 miles less than the mileage in the state highway system.

Although the federal highway act does not require that the roads contained in the seven per cent system be a part of the state highway system, the California Highway Commission has designated no roads outside of the present highway system as a part of this seven per cent system, except where the United States Bureau of Public Roads requested the inclusion of short stretches of roads needed to establish a connection with the seven per cent systems of Oregon and Nevada.



Plate XXIII. Luther Burbank planting first tree on the State Highway between Santa Rosa and Petaluma, March, 1921.

These connections were made a part of the federal system, but with a very definite understanding that no money would be expended upon them by the Highway Commission until they were made a part of the state highway system either through act of the legislature or by direct enactment of the people.

THE PROBLEM OF THE SMALL MUNICIPALITY.

There is an insistent demand from a number of the smaller and poorer municipalities of the state for aid in financing the highways through their limits. Nearly all of these municipalities have shown a willingness to help themselves as far as they can, but the problem of building a highway through their city is often beyond their means. The lack of sufficient valuation of property abutting on the highway prevents the improvement being charged to such property. Where the matter was acute, the Highway Commission has assisted in the improvement, generally by constructing the portion of the road in the less improved sections of the city, leaving it to the city to construct in the portion where there is a larger improvement. There are, however, a number of other municipalities which have asked for such assistance, and where some measure of state asistance is warranted. Lack of available funds has prevented such cooperation.

As a general rule it is the belief of the Commission that the cities should be left as in the past to improve the streets through the city designated as a part of the state highway system. The fact that the city authorities must surrender jurisdiction over a street that the Highway Commission improves makes it unwise for the State Highway Commission to invade the limits of an incorporated town. Again experience has shown that insistence by the Highway Commission upon an improvement of a city street in a number of instances has launched municipalities upon a much needed campaign of general street betterment. But there are exceptions to this rule. Small municipalities which for one reason or another have included large areas in their incorporated limits, and which find themselves with insufficient taxable property to improve the highway through their limits must have help. It can come from no other source but the state.

CAMPING SITES.

The large and increasing volume of recreational travel on the state highways is bringing to the front a new problem, that of ways and means of caring for this travel. The problem of sanitation is in many places already perplexing authorities. With this large travel the fire hazard to forest and field has also increased.

Apparently the state and forestry officials will be forced eventually to concentrate camping on the more largely traveled routes at selected camp sites.

As far as it has been able to do so without expenditure of funds, the Commission has attempted to anticipate this need, and to provide sites that later may be utilized for camping. In this same line of endeavor it has attempted to prevent the destruction of the natural forest along the state highways, and has secured and assisted in securing for the state, places of particular interest along the highways. As an instance of

this, through the right of way agreement with the Albion Lumber Company and the Pacific Coast Redwood Company, a considerable acreage of beautiful forest ideally adapted to camping has been secured on the Navarro highway in Mendocino County.

By a very slight change in routing, the Highway Commission was also able to secure ownership of the Kelly Hot Springs in Modoc County. These boiling sulphur springs will always prove an attractive feature to travel in northeastern California, and their full enjoyment is now assured to the traveling public for all time.

The Highway Commission has worked hand in hand with the Save-the-Redwoods-League in the preservation of redwoods along the state highways.

By insistence that the natural forest along the highway in the section from Trinidad to Orick north of Eureka be preserved, the Highway Commission was deeded a right of way 80 to 100 feet wide with a fee to all the timber. This grant was generously made by the Lagoon Lumber Company.

Conferences and discussions have been had with United States Forestry officials of the Western Division, in an effort to work out some cooperative plan for installing camp sites on state highways in national forests. The importance of this work is mutually recognized, but insufficient funds upon both the part of the Highway Commission and the Forestry Service has prevented suggested plans from taking definite shape.

In this same connection the Commission is of the opinion that comfort stations should be erected particularly along desert roads.

AN INTERNATIONAL ROAD.

One of the big routing problems on the California highway system is that through the shifting sand hills between Yuma and Holtville. This section is now traversed by a plank road. The final solution of the problem appears to be to locate the road south of and away from these shifting sand dunes. To do this, however, would require that for a distance of approximately 15 miles, the state highway be built in Mexican territory.

Through United States Senator Hiram W. Johnson the Highway Commission has taken up with the State Department the matter of establishing a neutral zone for highway purposes. While giving encouragement to the idea that such a zone may eventually be established, the State Department is of the opinion that the matter must lie dormant until governmental conditions in Mexico become more settled.

THE SNOW PROBLEM.

Increasing travel upon the roads requires that they be kept open either through the winter or for a much longer period than has hitherto been the practice. Following the heavy snowfall which closed the Ridge Route last winter, arrangements were made by the California Highway Commission to keep snow plows available there to prevent the necessity of again closing the road because of snow.

In the Sacramento River Canyon the heavy travel has occasioned a demand for an all-year route. A snow plow accordingly will be kept in service there.

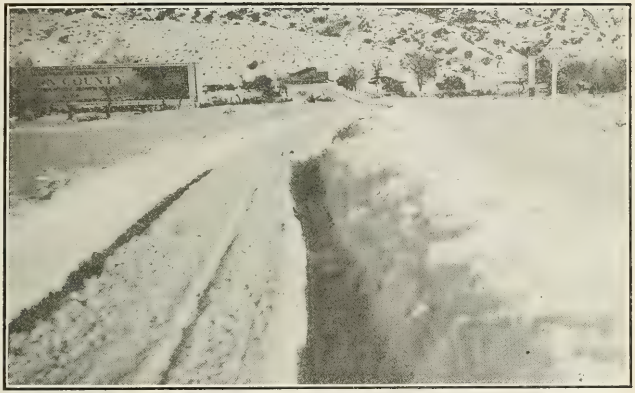


Plate XXIV. State Highway, Los Angeles County, showing snow conditions on Ridge Route.



Plate XXV. State Highway, Los Angeles County, showing difficulties of motoring through snow on Ridge Route.

It would seem that the time is not far distant when mountain roads will be kept open as long as there is sufficient travel to justify the expense.

This development is of further importance inasmuch as if the highway snow plow proves a success, mountain roads may be routed over higher elevations, at a saving of millions of dollars in construction costs.

ALEXANDER SUIT.

Following the decision of the Highway Commission locating the route for the portion of the state highway between Long Beach and Seal Beach, Scott Alexander, a property owner in that vicinity, brought a suit in the Superior Court of Los Angeles County, alleging that the route chosen by the Commission contravened the requirements of the state highway bond measure. The Commission answered that it deemed the location selected by it to be the most practical and economical. The court held that the choosing of the route rested entirely within the discretion of the Commission, that it would not interfere unless bad faith was shown and that plaintiff failed to establish that. Accordingly, the court ordered a judgment of nonsuit against Mr. Alexander.

BOND DISCOUNT LITIGATION.

Action was brought in the United States District Court at Los Angeles, by S. H. Mitchell, a resident of Arizona, and directed against Governor Stephens, members of the Board of Control and Commissioners Darlington and Whitmore, having as its ostensible purpose to force these officials and others to return to the state approximately $225,000 of federal aid money expended in making up discounts on bonds sold at a time when bonds were unsalable by reason of a low interest rate.

The bonds were sold upon a plan pronounced legal by Attorney General Webb, and sanctioned by State Treasurer Friend W. Richardson and State Controller John S. Chambers.

When the bond market collapsed in the fall of 1920, the State Highway Commission had a large number of contracts under way. Either highway work had to be stopped or contractors had to be paid. If the work was stopped, contractors openly stated that damage suits would be filed running into huge sums. The action of the state authorities in preventing this disaster was both good business and good sense. Recognition of this fact was given by the legislature of 1921 which amended the law to allow the state to sell bonds at their market value.

IN APPRECIATION.

The Highway Commission desires to express its appreciation of the helpful counsel which it has uniformly received from Governor William D. Stephens. His interest in highways has been as broad as California itself and has included every county and every community in the state. Words but perfunctorily express the interest that he has shown in the work, an interest entirely divorced from any consideration other than the proper progress of the work.

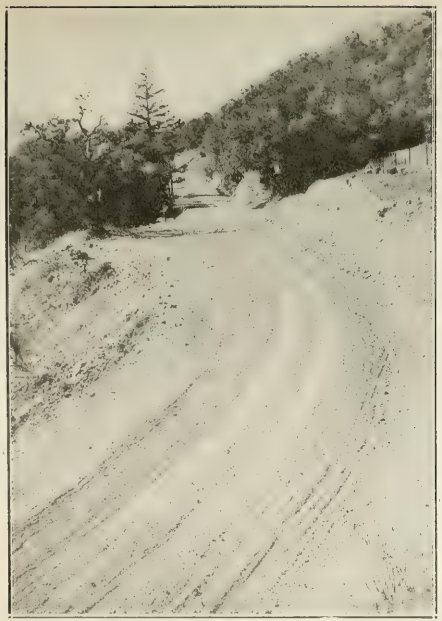


Plate XXVI. State Highway, Mendocino County, showing graded roadway.

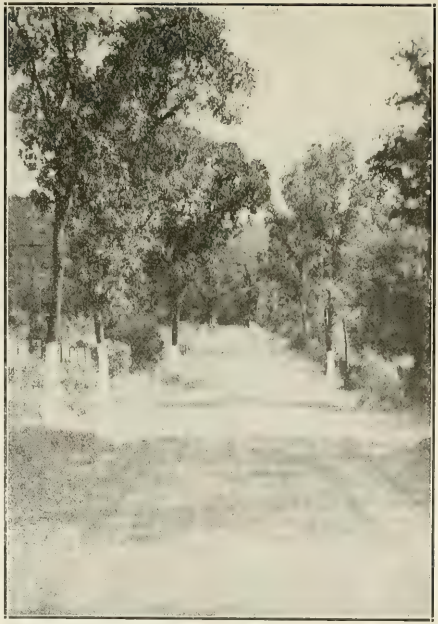


Plate XXVII. State Highway, Mendocino County, showing gravel surfaced roadway.

The Commission also desires to express its gratitude for the loyal and able support given it by A. B. Fletcher, chief engineer of the Highway Commission, and the members of the engineering and accounting departments; to C. C. Carleton, attorney for the Commission, and the members of the legal department; and to Roy A. Murray, secretary to the Commission, his predecessor John F. Galvin, and the employees of the secretary's office.

The Commission also desires to express its appreciation of the support given to it by the supervisors of California both through their associations and individually. The supervisors were chief factors in blocking the efforts of a powerful lobby to enact legislation at the 1921 session of the legislature that would have proven most inimical to the road interests of California. The keen interest of supervisors in highway affairs and their accurate knowledge of local conditions has made the cooperation of these officials of great help to the California Highway Commission. The same helpful cooperation has been extended by the county engineers.

The Commission feels that California can rightly take pride in the high personnel of the men and women employed in these various departments.

Grateful appreciation is also extended for the cooperation and assistance rendered California by the United States Bureau of Public Roads, both through Thos. H. MacDonald, chief of the bureau, and through L. I. Hewes, deputy chief engineer, and C. H. Sweetser, district engineer.

As far as the California highway system is concerned, and the manner in which the highway work is conducted, the Commission closes this report with the following excerpt from a public statement made by Governor William D. Stephens:

> "We must not forget that in ten years time California has created a road system that challenged and received the admiration of the world. We should not be forgetful of the fact that this system of highways has been so laid out that it serves today not only the two large cities of the state but in addition 66 per cent of the population of California, not including San Francisco and Los Angeles, are directly served by state highways. We should not be unmindful of the economic value of these highways, and should appreciate the importance of the economic service of these roads, a service estimated by the Bureau of Public Roads at $20,000,000 in 1920 on a total expenditure of $42,000,000. Nor should we be forgetful of the fact that California's highway system, involving as it does the expenditures of many millions of dollars, has been constructed without a breath of scandal or a suspicion of graft. The highways of California are today making the lives of our people infinitely more happy, and are making our state the playground of the nation.
>
> I strongly feel that the good road forces of the state should join hands and in the words of former Secretary of Agriculture Meredith in transmitting the report of the United States Bureau of Public Roads on the California highway system, this state should 'continue the program of highway development upon which such splendid advancement has already been made.'"

CALIFORNIA HIGHWAY COMMISSION.

N. D. Darlington, Chairman.
Chas. A. Whitmore.
George C. Mansfield.

Appendix A.

REPORT OF STATE HIGHWAY ENGINEER TO CALIFORNIA HIGHWAY COMMISSION.

November 1, 1922.

To the California Highway Commission,
Sacramento, California.

INTRODUCTORY.

Gentlemen: As in the last biennial report, a series of appendices has been prepared for inclusion in this report, compiled chiefly by the several department heads at the headquarters office, which cover completely the varied activities of the Commission's work since June 30, 1920.

Unless otherwise explained, the statistics in all of the appendices relate only to the biennial period ending June 30, 1922.

The outstanding event in state highway activities during the biennial period in 1921–1922 was the adoption by the people of the State of California at the general election held November, 1920, of a constitutional amendment permitting a flexibility of interest rate in the $40,000,000 bonds provided by the constitutional amendment adopted at the special election of July 1, 1919, such rate at no time, however, to exceed 6 per cent per annum.

This has enabled the State Highway Finance Board to fix from time to time a rate of interest for blocks of bonds placed on the market which accorded with the current interest rates. The bonds were thus made salable without difficulty.

During the last biennium, therefore, state highway work has proceeded in a continuous and systematic manner, and in such measure as the Commission, after consideration of prevalent costs of labor and material, has deemed prudent.

These bond sales, supplemented by moneys received from the United States government in reimbursement to the state on federal aid projects and by contributions from counties to finance the construction of certain county bridges, have enabled the Commission to carry on state highway construction during the years 1921–1922 in much greater volume than in any other biennium since the Commission was organized.

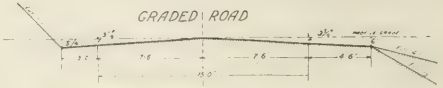
On June 30, 1922, the total expenditures from the state highway fund amounted to $51,589,127.89, and of this amount $16,590,331.38 was paid out after June 30, 1920.[a]

Likewise the total expenditures from the motor vehicle fund amounted to $11,902,862.76, of which $6,122,311.84 was disbursed between the dates of June 30, 1920, and June 30, 1922.[a]

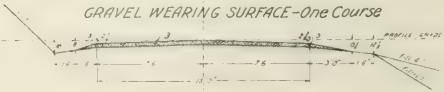
[a]For detailed account of this disbursement see Appendix E.

TYPICAL CROSS SECTIONS

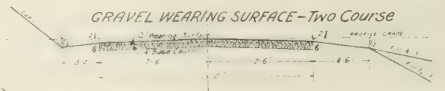
GRADED ROAD



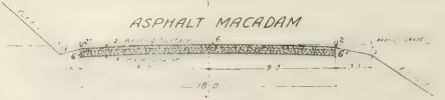
GRAVEL WEARING SURFACE—One Course



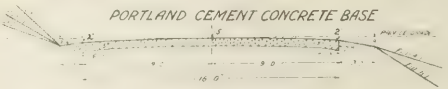
GRAVEL WEARING SURFACE—Two Course



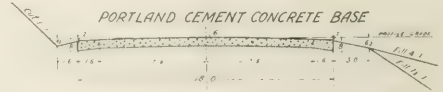
ASPHALT MACADAM



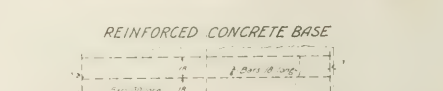
PORTLAND CEMENT CONCRETE BASE



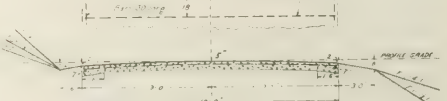
PORTLAND CEMENT CONCRETE BASE



REINFORCED CONCRETE BASE



ASPHALT CONCRETE



MILEAGE OF STATE HIGHWAYS UNDER MAINTENANCE BY THE CALIFORNIA HIGHWAY COMMISSION, JUNE 30, 1922.

Mileage of Bond Issue Roads Constructed or Improved by the California Highway Commission.	Miles	Div. I	Div. II	Div. III	Div. IV	Div. V	Div. VI	Div. VII
Earth	378.89	48.09	63.22	126.38		8.92	92.54	39.24
Earth (Oiled)	11.15						9.96	1.19
Gravel Surface	401.03	164.01	195.11	20.00	15.05	1.02	5.84	
Asphalt Macadam	64.12	7.73	17.64	18.50		1.89	18.36	
Topeka on Macadam	16.44				16.44			
Portland Cement Concrete (Plain)	996.06	24.90	88.66	206.64	134.88	177.21	132.51	231.26
Portland Cement Concrete (with oiled surface)	570.61	4.06	3.23	139.60	55.94	76.28	135.65	155.84
Topeka Surface on Portland Cement Concrete	93.37			14.60	49.91	5.81	6.93	16.12
Asphalt Concrete on Portland Cement Concrete	14.67				10.04			4.63
Asphalt Concrete (Base and Surface)	.91							.91
Bridges	4.13	.72		3.38				.03
Plank Road	5.36							5.36
Total	2556.74	249.51	367.86	529.60	282.26	271.13	401.80	454.58
Mileage of Bond Issue Roads taken over but not rebuilt (Includes County Built Roads)								
Gravel	4.41				4.41			
Asphalt Macadam	166.57			94.42	5.42	9.72		57.01
Portland Cement Concrete (Plain)	15.00							15.00
Portland Cement Concrete (with oiled surface)	16.76			.45				16.31
Asphalt Concrete (Base and Surface)	13.94			.68	2.67	10.59		
Bridges	.53			.53				
Total	217.21			96.08	12.50	20.31		88.32
Special Legislative Act Roads Under Maintenance, but not improved under Bond Issues (not including Mother Lode Highway)	807.68		55.00	597.52	23.87	3.09	79.00	49.20
Built by U. S. Government (Taken over for maintenance)	12.93		12.93					
GRAND TOTAL	3594.56	249.51	435.79	1223.20	318.63	294.53	480.80	592.10

The foregoing figures do not include unaccepted contracts incomplete on June 30, 1922, at which time the following mileages of road were under contract let and in progress:

State Highway Under Construction and In Progress, June 30, 1922.

	Miles
Portland cement concrete base	193.08
Portland cement concrete base, second story	12.38
Asphalt macadam	97.21
Asphalt concrete pavement	31.73
Asphalt concrete surface on concrete base	89.52
Gravel surface roads	157.68
Graded roads	454.00
Portland cement concrete shoulders	27.49
Total	1,063.09

The following table shows the total quantities of grading and pavement dealt with since the beginning of the work:

	1912-1916 (incl.)	1917-1918	1919-1920*	1921-1922*	Totals
Grading, cubic yards	6,750,000	2,339,000	1,579,800	4,566,800	15,235,600
Concrete base and concrete shoulders, cubic yards	882,300	252,900	165,900	423,700	1,724,800
Asphalt concrete base and top, tons	.....	.....	.....	82,800	82,800
Asphalt concrete surface and Topeka surface, square yards	477,200	31,700	130,200	1,060,300	1,699,400
Asphalt macadam, square yards	233,600	.....	196,100	689,200	1,118,900

*Quantities to June 30, 1920, and June 30, 1922.

WORK TO BE DONE.

As nearly as can be ascertained, in the absence of many miles of surveys not yet made, the state highway system (bond issue roads only) includes a total of about 5560 miles. As already shown, work has been completed or is now under construction by the combined efforts of the state and the counties on 3136.05 miles of the system, leaving on June 30, 1922, 2423.95 miles on which no work has been done to date. These roads or sections of routes are shown below. The sections may be identified on the map accompanying this report, marked "Appendix R."

Portions of System Upon Which No Work Has Been Done, June 30, 1922.

County	Route	Section	Termini	Miles
Mendocino	1	B	Hopland to 2⅞ miles north	2.6
Humboldt	1	G	Fortuna to Loleta	3.9
Humboldt	1	I	Arcata to Mad River	4.0
Humboldt	1	J	Station 490+00 to 655+00 across Big Lagoon	3.0
Humboldt	1	K	Orick to Del Norte County line	14.7
Del Norte	1	A	Humboldt County line to Wilson Creek	13.8
Del Norte	1	CDE	Crescent City to Oregon line	43.0
Tehama	3	D	Los Molinos to Red Bluff	1.0
Siskiyou	3	B	Gazelle to Yreka	17.6
Sacramento	4	A	Galt to southerly boundary	1.9
Alameda	5	B	Castro Valley road to Hayward	0.5
Yolo	6	C	Sacramento River to end of paving West Sacramento	0.6
Los Angeles	9	B	La Canada to Pasadena	3.5*
Monterey	10	B-C	Long Valley road to easterly boundary	17.5
Fresno	10	ABC	Monterey County line to Coalinga	22.2
Kings	10	C	1 mile north of Lemoore to Hanford	9.4
Tulare	10	CDE	Visalia to Three Rivers	27.1*
El Dorado	11	D-E	Placerville to Sportsman Hall	7.4
Imperial	12	A	Westerly boundary to Myers Creek	5.7
Lake	15	B-C	Upper Lake to Colusa County line	32.6
Colusa	15	BCDE	Lake County line to Williams	34.4
Sutter	15	A	Meridian to Sutter City	8.1
Yuba	15	A-B	Marysville to easterly boundary	
Nevada	15		Yuba County line to Placer County line	81.6
Placer	15		Nevada County line to Route 37 near Cisco	
Mariposa	18	EFG	Briceburg to El Portal	16.7
Shasta	20	A	Trinity County line to Tower House	8.5
Trinity	20	A	2 miles south of Weaverville to Weaverville	2.5
Trinity	20	B	Shasta County line to Tom Long Gulch	11.0
Trinity	20	C	Burnt Ranch to Humboldt County line	12.0§
Trinity	20	F	Helena to Douglas City	21.0
Humboldt	20	A-B	Arcata to Redwood Creek	25.0
Butte	21	B-C	Oroville to Plumas County line	37.0
Plumas	21	ABC	Butte County line to Quincy	48.0
Santa Clara	22	A	Junction Route 32 at San Felipe to San Benito County line	0.6
San Benito	22	B	Santa Clara County line to Hollister	7.5
Los Angeles	23	F	Palmdale to Lancaster	7.9
Kern	23	BCDEFG	Mojave to Inyo County line	57.8
Inyo	23	GHIJKLM	Kern County line to Independence	74.0
Inyo	23	C	Fish Springs School to S.E. cor. S. 33, T. 8 S., R. 33 E.	11.7
Mono	23	D-E	Magee Creek to Deadman Creek	16.9
Mono	23	I	Dogtown to Bridgeport	6.6
San Joaquin	24	B	Lodi to Clements	12.3*
San Bernardino	26	A-B	San Bernardino to 0.29 miles north southerly boundary	12.1*
Riverside	26	B	Beaumont to Banning	3.0*
Imperial	26	AHG	3.2 miles south of Trifolium Canal to Imperial	21.1
Imperial	27	C-D	El Centro to East High Line Canal	15.8
Imperial	27	A	New County Well to County Well	9.4
Imperial	27	B	Through Yuma Indian Reservation	8.2
Shasta	28	A	Redding to 2.3 miles south of Ingot	25.7
Shasta	28	D-E	Burney to Lassen County line	28.5
Lassen	28	A-B	Shasta County line to Modoc County line	30.0
Modoc	28	A	Lassen County line to Adin Summit	13.0
Tehama	29	A	Red Bluff to Paynes Creek	22.0

*Improved county road.
§Built by Forest Service.

County	Route	Section	Termini	Miles
Tehama	29	B	Paynes Creek to eleven miles east	11.0‡
Plumas	29	A	Chester Grade to Lassen County line	9.0
Lassen	29	A	Plumas County line to Coppervale	9.0
Lassen	29	CDE	Johnstonville to Nevada State line	49.0
San Bernardino	31	DEF	Victorville to Barstow	36.5
Santa Clara	32	A	Gilroy to San Felipe	9.9
Madera	32	A	Merced County line to Route 4 near Califa	15.7
Kern	33	A	San Luis Obispo County line to Junction pumping station	15.5
Kern	33	C	Hart Station to Wasco	19.0*
Kern	33	D	Wasco to Famosa	7.5
Sacramento	34	B	Route 4 near Arnold to Clay	9.3‡
Placer	37	ABCDEFGH	Nevada County line (Auburn to Summit)	53.2
Nevada	37	ABCDE	Placer County line to Sierra County line	31.6
Sierra	37	A	Nevada County line to Nevada State line	12.5
Placer	38	B-C	Tahoe City to Nevada County line	14.0
Nevada	38	A	Placer County line to Route 37 at Truckee	0.8
Fresno	41	A-B	General Grant National Park to Kings River Canyon	14.5
Fresno	41	C	Lockwood Creek to Boulder Creek	6.0
San Bernardino	43		Deep Creek to Metcalf Creek	14.0
Del Norte	46	A	Route 1 near mouth of Klamath River to Humboldt County line	9.0
Humboldt	46	ABC	Del Norte County line to Siskiyou County line	53.0
Siskiyou	46	A	Humboldt County line to Happy Camp	50.0‡
Glenn	47	A	Orland to Butte County line	10.3
Butte	47	A	2½ miles N.W. of Chico to Chico	2.5
Mendocino	48	ABC	McDonalds to Flynn Creek	41.0
Lake	49	A	Na a County line to Lower Lake	21.5
Napa	49	A	Calistoga to Lake County line	10.7
Yolo	50	A	Rumsey to Lake County line	10.6
Lake	50	A	Yolo County line to Lower Lake	15.0
Sonoma	51	B	Beltane to Shellville	12.5
Marin	52	A	Alto to 0.3 mile easterly	0.3
Marin	52	A	Belvedere Crossing to Tiburon	1.7
Solano	53	A	Fairfield to Denverton	8.9
Amador	54	A	County line near Michigan Bar to Drytown	10.7
San Mateo	55	ABCD	Sneath road to Santa Clara County line	33.1
San Mateo / Santa Clara / Santa Cruz	55	E	San Mateo County line to common corner to San Mateo, Santa Clara and Santa Cruz counties	3.7
Santa Clara / Santa Cruz	55	A-B	Common corner to San Mateo, Santa Clara and Santa Cruz counties to Route 5 near Glenwood	17.8
Monterey	56	ABCDEFGH	Carmel to Monterey County line	82.2
San Luis Obispo	56	A	San Simeon to 6 miles north	6.2
Santa Barbara	57	B	Buckhorn Creek to 2nd crossing Cuyama River	16.3
San Luis Obispo	57	B	2nd crossing Cuyama River to 3rd crossing Cuyama River	12.8
Santa Barbara	57	C	3rd crossing Cuyama River to 4th crossing Cuyama River	15.6
San Luis Obispo	57	C	4th crossing Cuyama River to Kern County line	9.8
Kern	57	A	Westerly boundary to Maricopa	11.05
Kern	57	BCD	Maricopa to Bakersfield	35.3*
Kern	57	EFGHIJKL	Bakersfield to Freeman (via Walker's Pass)	86.9
Kern	58	ABC	Mojave to San Bernardino County line	34.7

‡Under construction by Forest Service.
‡Partially improved county road.
*Improved county road.

County	Route	Section	Termini	Miles
San Bernardino	58		Kern County line to Needles (via Barstow)	201.0
Los Angeles	59		Lancaster to Baileys	34.0
Ventura	60	A	Oxnard to Hueneme road	8.6*
Ventura	60	A	Hueneme Road to Point Mugu	4.0
Ventura	60	A	Big Sycamore Creek to Los Angeles County line	4.0
Los Angeles	60	A	Ventura County line to easterly boundary Malibo Ranch	19.4
Los Angeles	60	CDE	Santa Monica to Orange County line	49.8
Orange	60	ABC	Los Angeles County line to San Juan Capistrano	26.5†
Los Angeles	61		La Canada to Mount Wilson road (via Arroyo Seco)	25.0
Los Angeles	62		Azusa to Pine Flats in San Gabriel Canyon	28.0
Inyo	63	ABC	Big Pine to Mono County line	38.6
Mono	63	A	Inyo County line to Oasis	2.0
Riverside	64		Mecca to Blythe	100.0
			Total	2423.95

*Improved County Road.
†6.9 miles in incorporated cities.

Taking certain significant periods into consideration, namely, the pre-war years, the years of the war, and those since the armistice, brings out some interesting facts as shown by the figures below:

Average Contract Prices, [3]1912-1916 (Inclusive).

Year	Grading[1] (per cu. yd.)	Concrete, including all materials (per cu. yd.)	Sand, delivered (per ton)	Broken stone and gravel, delivered (per ton)	Cement, delivered (per bbl.)	Concrete,[2] exclusive of materials (per cu. yd.)
1912	$0 39	$5 82	[4]	[4]	$1 61	[4]
1913	0 46	5 91	$0 56	$0 58	1 65	$2 56
1914	0 51	6 75	0 54	0 85	1 70	3 03
1915	0 45	6 26	0 58	0 76	1 74	2 84
1916	0 37	6 37	0 60	0 76	1 80	2 90
Average[5]	$0 49	$6 35	$0 56	$0 78	$1 70	$2 92

Average Contract Prices, [3]1917 and 1918.

Year	Grading[1] (per cu. yd.)	Concrete, including all materials (per cu. yd.)	Sand, delivered (per ton)	Broken stone and gravel, delivered (per ton)	Cement, delivered (per bbl.)	Concrete,[2] exclusive of materials (per cu. yd.)
1917	$0 73	[6]$8 03	$0 66	$0 86	$1 80	$4 17
1918	0 78	[6]10 51	1 05	1 28	2 20	5 53
Average[5]	$0 74	$8 67	$0 76	$0 96	$1 90	$4 51

Average Contract Prices, [3]1919 and 1920 (to June 30, 1920).

Year	Grading[1] (per cu. yd.)	Concrete, including all materials (per cu. yd.)	Sand, delivered (per ton)	Broken stone and gravel, delivered (per ton)	Cement, delivered (per bbl.)	Concrete,[2] exclusive of materials (per cu. yd.)
1919	$0 96	$13 08	$1 10	$1 33	$2 64	$6 37
1920	1 10	[3]16 25	1 23	1 41	2 68	7 64
Average[5]	$1 01	$14 82	$1 17	$1 37	$2 66	$7 00

Average Contract Prices, [3]1921 and 1922.
(Costs are from June 30, 1920, to June 30, 1921, and June 30, 1921, to June 30, 1922.)

Year	Grading[1] (per cu. yd.)	Concrete, including all materials (per cu. yd.)	Sand, delivered (per ton)	Broken stone and gravel, delivered (per ton)	Cement, delivered (per bbl.)	Concrete,[2] exclusive of materials (per cu. yd.)
1921	$0 94	$17 34	$1 74	$2 09	$3 39	$7 97½
1922	0 71	14 29	1 47	1 77	3 10	5 01
Average[5]	$0 78	$15 75	$1 63	$1 94	$3 23	$6 96

[1]Includes all classifications.
[2]This is the item upon which the contractors bid in most cases; the state supplies the materials.
[3]Only a six-month period, January 1, 1920, to June 30, 1920.
[4]In 1912 the contractors in all cases except one furnished the concrete aggregates.
[5]Weighted average.
[6]In 1917 and 1918 the paving concrete was enriched from 1:2½:5 mixture to 1:2:4. In the prices stated, allowance has been made for this change.

These data show that during the war period the earthwork cost about 51 per cent and the concrete about 37 per cent more than during the pre-war period and that during the last biennium the earthwork has cost 60 per cent and the concrete 132 per cent more than they averaged to cost before the war.

It is also worth while to note that before the war the cost of cement delivered averaged $1.70 per barrel, and that during the last biennium the average delivered price has been $3.23 per barrel, or an increase of 81 per cent; also, that the labor, hauling and manipulation cost of the concrete shows an advance during the same interval from $2.92 to $6.96 per cubic yard, or 137 per cent.

It is true that cost of construction was on the upward trend in 1919, the year after the armistice, nevertheless, the fact that such cost would continue to increase for several years thereafter and that the subsequent decline would be very slow was not expected when the budget was prepared on the basis of which the $40,000,000 bond issue was voted in 1919. With the hope that costs might more nearly have returned to normal before any appreciable expenditures had been made out of this last bond issue the estimates were based very largely on pre-war costs. The rapid advance in unit costs since that date, however, and the very slow subsequent decline, if any, in such costs, have resulted in such a decided increase in the total cost of construction that bond moneys voted to date will not begin to be sufficient to make it possible to complete the system. Many of the roads provided for in the bond issues will remain but half completed when the $40,000,000 bond funds are completely exhausted.

There is an urgent necessity for widening and thickening the paving on the main highways of the state. This widening and thickening will require such a large expenditure of money that it will not be possible to provide for any new construction from the funds derived from motor vehicle license fees or other means of taxation, other than bond issues, for years to come.

It would therefore appear that if the state highway system is to be carried to completion the only solution is another bond issue at an early date, or failing that, large legislative appropriations of moneys from the general fund.

HIGHWAY COSTS AND ADMINISTRATION EXPENSE.

The table following shows the expenditures for state highway purposes from the beginning of the work to June 30, 1922.

The table also segregates these expenditures into the following items: Highways; Equipment and Stores; Engineering and Inspection in Connection with Contracts; Preliminary Surveys; Administration Expense at Division Offices and Administration Expense at Headquarters Office.

It is interesting to note that by June 30, 1922, of the total expenditure 88.17 per cent had been used for direct highway costs and equipment, while at the date, December 31, 1914, only 80.75 per cent went for such purposes.

The table also shows that the administration expense of the work (both headquarters and divisions) by June 30, 1922, had been reduced from 6.23 per cent to 4.68 per cent.

EXPENDITURES BY THE CALIFORNIA HIGHWAY COMMISSION TO JUNE 30, 1922.*

	Total to June 30, 1922		July 1, 1921-June 30, 1922		July 1, 1920-June 30, 1921		Jan. 1, 1919-June 30, 1920		Jan. 1, 1917-Dec. 31, 1918		Jan. 1, 1915-Dec. 31, 1916		Mar. 1 1912-Dec. 31, 1914	
ITEM	AMOUNT	PER CENT	AMOUNT	PER CENT	AMOUNT	PER CENT	AMOUNT	PER CENT	AMOUNT	PER CENT	AMOUNT	PER CENT	AMOUNT	PER CENT
Highways	57,119,[illegible].93	83.972	15,319,363.95	86.530	6,9[illegible],390.74	78.841	9,806,330.75	82.932	8,365,652.43	84.697	11,157,095.96	87.423	5,496,091.50	78.436
Equipment, Plants & Stores	2,856,[illegible].68	4.199	646,177.77	3.650	2[illegible]7,927.55	2.906	588,793.86	4.980	304,532.27	3.083	366,736.60	2.874	162,044.63	2.313
Total	59,976,137.61	88.171	15,965,541.72	90.180	7,[illegible],317.[illegible]	81.747	10,395,124.61	87.912	8,670,184.70	87.780	11,523,832.56	90.297	5,658,136.13	80.749
Engineering and Inspection in connection with contracts	2,340,053.00	3.440	518,7[illegible].81	2.930	219,127.1[illegible]	2.477	319,433.69	2.702	333,183.69	3.373	588,000.60	4.607	361,585.11	5.160
Preliminary Surveys	2,520,440.77	3.705	574,518.40	3.245	308,703.45	3.489	484,903.83	4.100	352,783.71	3.572	248,778.10	1.949	550,763.26	7.860
Administration Expense at Division Offices	2,006,650.77	2.949	363,051.42	2.051	370,917.7[illegible]	4.192	433,712.14	3.668	334,987.18	3.392	244,858.18	1.919	258,124.15	3.684
Administration Expense at Headquarters Office	1,180,320.86	1.735	282,3[illegible]1.22	1.594	185,361.36	2.095	191,378.89	1.618	186,086.18	1.883	156,732.19	1.228	178,461.02	2.547
Total	8,046,465.40	11.829	1,738,593.87	9.820	1,084,1[illegible]9.61	12.253	1,429,428.55	12.088	1,207,040.76	12.220	1,238,369.07	9.703	1,348,923.64	19.251
GRAND TOTAL	68,022,603.01	100.000	17,704,135.59	100.000	8,847,427.60	100.000	11,824,553.16	100.000	9,877,225.46	100.000	12,762,201.63	100.000	7,007,059.67	100.000
FUNDS FROM WHICH EXPENDITURES WERE MADE:														
First State Highway Fund and Premiums	18,002,129.00		- - -		- - -		- - -		212,866.05		10,866,139.13		6,923,123.82	
Second State Highway Fund	14,876,882.42		1,037,125.36		86,013.38		6,212,777.84		7,540,965.82		- - -		- - -	
Third State Highway Fund	18,710,116.47		10,649,408.82		4,817,783.80		3,242,923.85		- - -		- - -		- - -	
Motor Vehicle Fund	11,902,862.76		3,708,906.72		2,413,405.12		2,276,298.60		1,775,609.97		1,644,806.50		83,835.85	
Federal Aid	3,586,827.31		2,254,615.01		1,272,640.54		- - -		59,571.76		- - -		- - -	
Contribution by Counties	943,785.05		54,079.66		257,584.66		91,652.87		289,111.86		251,356.00		- - -	
Total	68,022,603.01		17,704,135.59		8,847,427.60		11,824,553.16		9,877,225.46		12,762,201.63		7,007,059.67	

* Exclusive of Legislative appropriations for special surveys (Chapter 746, Statutes 1917 and Chapter 888, Statutes 1921) and of salaries of members of California Highway Commission and the highway engineer.

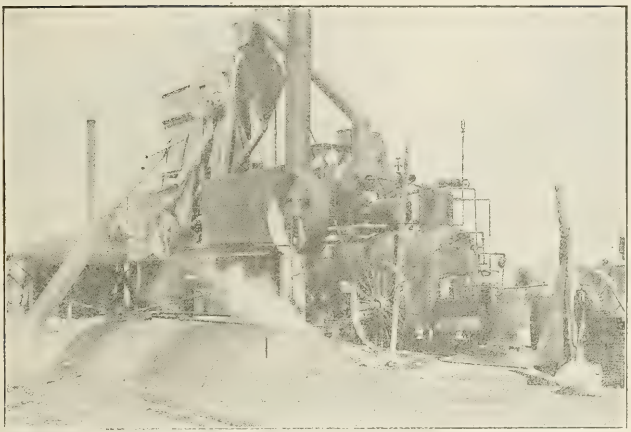


Plate XXVIII. State Highway, asphalt plant in operation, Colorado Desert, Imperial County.

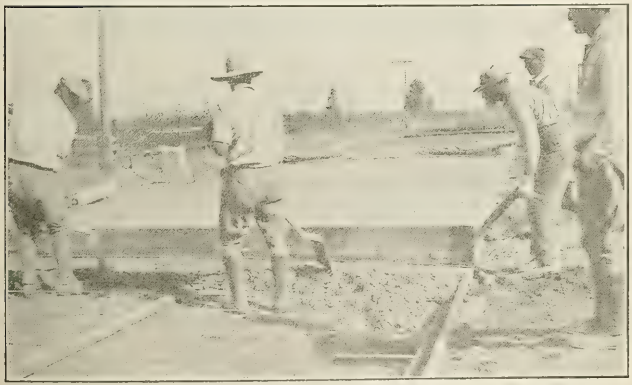


Plate XXIX. State Highway, Merced County, showing thickening or second story work.

In like manner the preliminary survey percentage was reduced from 7.86 per cent to 3.70 per cent on June 30, 1922, and the engineering and inspection expense from 5.16 per cent to 3.44 per cent.

It will be noted that during the last biennium when the construction work has proceeded at a more uniform rate than was possible during the previous years a stabilization of the organization not possible in previous years resulted, and the administration expense was reduced to 3.64 per cent, this notwithstanding the fact that during the last two years the Commission has participated in much research and special investigational work, such as the Pittsburg test highway, traffic regulation and traffic census, (more fully described hereafter) the cost of which special work is charged against the cost of administration and not as a direct highway construction charge.

THICKNESS OF CONCRETE BASE.

Early in the report a table is given showing the several types of work in the state highway system. It is shown there that of 1968.45 miles of paved road 1706.47 miles have been constructed with a Portland cement concrete base.

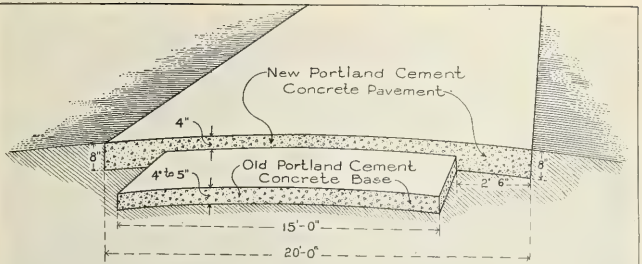
As was pointed out in the 1920 report of the California Highway Commission, in the California work there is no such thing as a *concrete road* as the term is technically understood. The roads are not like, or have they ever been intended to be like, the concrete roads of the East and the Middle West. There a heavy concrete pavement, often as thick as eight inches, is laid as the ultimate road. The concrete is mixed very rich in cement and the concrete is intended to remain without surface of any sort, the concrete itself to serve as a wearing surface.

At present on the California state highways, no Portland cement concrete bases are being constructed less than five inches in thickness and the thickness is increased to six inches and sometimes to an even greater thickness where subgrade conditions are particularly adverse.

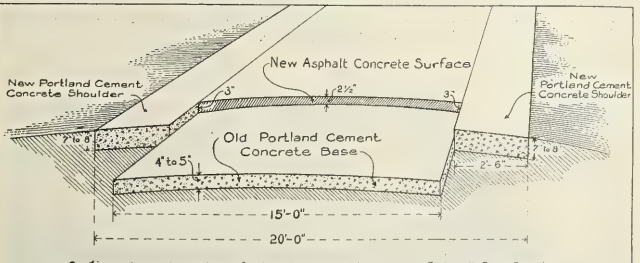
However, even though it is and always has been the intention of the California Highway Commission that the four- and five-inch Portland cement concrete bases should be ultimately surfaced with an asphalt surfacing, when the funds therefor became available, nevertheless, it is a fact that under California climatic conditions and where the subgrade conditions are good the five-inch Portland cement concrete and in many cases even the four-inch Portland cement concrete bases have stood up for many years under heavy traffic without serious depreciation. In fact, many of the sections of four-inch base built from seven to nine years ago are in such good condition today that an expensive thickening program is not justified until some of the later constructed sections in the more heavily traveled districts are widened and thickened.

In 1912 there were fewer than 100,000 motor vehicles in the state, whereas, the records of the Motor Vehicle Department show more than 816,000 to date for 1922.

Even though the earlier built pavements have stood up remarkably well under the heavy increase in traffic, nevertheless, they were not originally constructed to stand the traffic which they are called upon to bear today and are rapidly getting in such condition that extensive reconstruction will be necessary, unless funds are provided at an early date for widening and thickening.



Section showing method of improving old 15 foot Portland Cement Concrete Base, by widening to 20 ft and adding a 4 in. Portland Cement Concrete slab on top of the old base.



Section showing method of widening and thickening of old 15 foot Portland Cement Concrete Base, by addition of 2½ foot by 7 inch to 8 inch Portland Cement Concrete Shoulder and 2½ inches to 3 inches of Asphalt Concrete Wearing Surface

It was the hope of the Commission that a gasoline tax would be adopted at the last session of the state legislature, thus providing funds for a comprehensive program of widening and thickening the main trunk line highways of the state. Owing to the failure of the legislature, however, to pass any remedial measures of this nature, the Commission has been unable, during the past two years, to carry on more than a very limited widening and thickening program.

In Appendix P is a table showing all of the work of this nature which has been done to date on the state highway system.

There is an imperative need for augmented motor vehicle funds, or perhaps better, for a new fund such as might be created by a gasoline tax, which can be devoted exclusively to the work of widening and thickening the 15-foot bases.



Plate XXX. State Highway, Los Angeles County, showing widening and thickening of old concrete base.

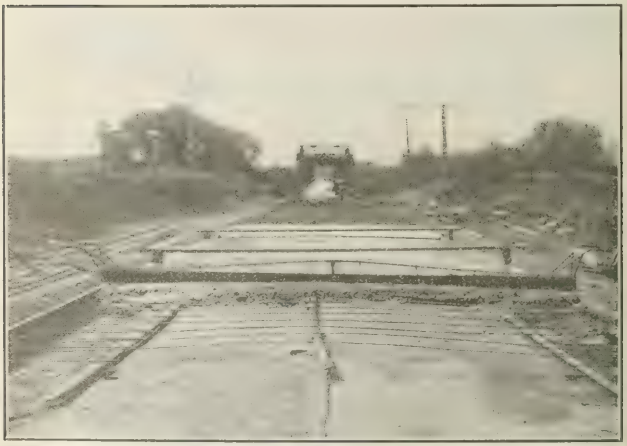


Plate XXXI. State Highway, San Benito County, showing widening and thickening of old concrete base.

NEW BUILDINGS.

In Appendix D will be found a description of the new repair shops and testing laboratory erected during the past year at headquarters in Sacramento.

The large number of motor trucks and other surplus war equipment received from the United States government have made it necessary to provide extensive storage facilities in Sacramento and also shop facilities for repairing and overhauling this equipment.

The chemical testing laboratory, which up to 1921 was under the direction of the State Purchasing Agent, was as a result of the organization of the Department of Public Works, placed under the jurisdiction of the Division of Highways.

The large number of physical tests being carried out at the California Highway Commission physical testing laboratory, together with the work of the chemical testing laboratory, made it necessary to erect adequate quarters for the conduct of this work and a new testing laboratory building has been recently completed which will be fully equipped to handle all of the needed tests and analyses.

The blueprinting and photostating departments are likewise housed in the testing laboratory building.

EXPERIMENTAL AND RESEARCH WORK.

As in previous years, the Commission has conducted and has participated in much experimental and research work during the past two years.

Special research work is being carried on throughout the United States on a much more extensive scale at the present time than ever before in the history of highway building and just as California has always been to the front in her road construction program so has the Commission taken a leading part in the research work conducted by state and governmental organizations.

PITTSBURG TEST HIGHWAY.

The most extensive work of this nature conducted by the California Highway Commission, in cooperation with the United States Bureau of Public Roads, is the test highway at Pittsburg, California. This highway was built in 1921 by the Columbia Steel Company of Pittsburg for the purpose of testing to destruction, if possible, sections of Portland cement concrete base constructed under varying specifications for thickness, cross-section and reinforcement.

The work was taken over in 1922 by the United States Bureau of Public Roads and the California Highway Commission as a cooperative project and all traffic tests were completed on July 27, 1922.

A detailed report giving the results of the tests is now in preparation and it will be published at an early date. It is therefore not necessary at the present time to go into a more lengthy discussion of this test.

SUBGRADE TREATMENT.

Special subgrade treatment has been carried on through a section of adobe country in Solano County, between Denverton and Rio Vista, the object of the test being to determine, if possible, an economical method

of treating adobe so as to eliminate the swelling and the plastic condition of that kind of soil when saturated with moisture and the subsequent shrinkage and cracking when dried out. The plan was to mix with the soil Portland cement, hydrated lime, limestone dust, and asphaltic oil in varying proportions.

The work was started in November, 1921, four sections of cement mixture being partially completed before the wet weather compelled the suspension of work.

On account of the partial completion only of this portion a complete new start was made when the work was again taken up in the spring of 1922.

Eleven 500-foot sections and one 380-foot section were treated as follows:

Section 1,	Station 177+50	to	182+50,	1:10 cement mixture	12" depth
Section 2,	Station 182+50	to	187+50,	1:20 cement mixture	12" depth
Section 3,	Station 194+00	to	199+00,	1:10 cement mixture	6" depth
Section 4,	Station 212+00	to	217+00,	1:20 cement mixture	6" depth
Section 5,	Station 217+00	to	222+00,	1:20 hydrated lime	12" depth
Section A,	Station 248+50	to	253+00,	1:10 cement mixture	6" depth
Section B,	Station 253+50	to	258+50,	1:20 cement mixture	6" depth
Section C,	Station 258+50	to	263+50,	1:20 cement mixture	12" depth
Section D,	Station 263+50	to	267+30,	1:10 cement mixture	12" depth
Section 6,	Station 268+00	to	273+00,	1:20 limestone dust	12" depth
Section 7,	Station 273+00	to	278+00,	No foreign substance	
Section 8,	Station 278+00	to	283+00,	60% asphaltic oil	12" depth

It was necessary to select segregated sections, as there was no stretch of road which would permit of continuous sections. The work done late in 1921 consisted of four sections of cement mixtures, located between Stations 248+50 and 267+30, a total length of 1880 feet.

Heavy adobe soil was found in the above locations. This soil was turned up with a heavy 5-disc plow, drawn by a 75 horsepower tractor, later superseded by a 60 horsepower tractor. The plowing was followed by a spike-tooth harrow and roller to break up the clods.

Sections 6, 7 and 8 were continuous, and were the first to be worked. These sections broke up in hard lumps, as this grade stood over the winter and was well compacted by rains and traffic, and had to be plowed 6 times and harrowed 8 times, the operation of plowing and harrowing being done separately after the first time over it.

Sections 1 and 2 were then plowed, and the soil turned up damp; these two sections were then left to dry out, and sections 3, 4 and 5 were plowed, then sections 1 and 2 turned over again.

Sections 1, 2, 3, 4 and 5 were then plowed and harrowed three more times to a width of 21 feet and a thorough pulverization ($\frac{1}{4}$"-$\frac{1}{2}$") of the soil was secured.

The cement, hydrated lime and limestone dust were spread by hand. The asphaltic oil was spread with a 500-gallon capacity oiler, using a pressure spray, and was applied cold.

The oil was hauled from Garfield station on the San Francisco and Sacramento Railway, a distance of approximately three and one-half miles.

After the cement, hydrated lime and limestone dust had been spread, these sections were plowed and harrowed three times and a very



Plate XXXII. State Highway, Solano County, subgrade treatment adobe soil, cement mixture 1 part to 20, six inches deep.

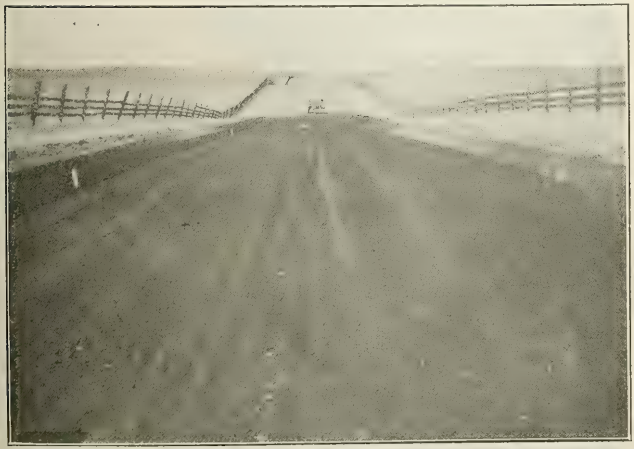


Plate XXXIII. State Highway, Solano County, subgrade treatment, showing oil mixed with adobe soil, twelve inches deep.

thorough mixing of the cement, hydrated lime and limestone dust with the soil was secured. After every second application of oil, section 8 was plowed and harrowed three times in all, the oil being thoroughly mixed with the soil at the rate of 5 gallons per square yard.

The sections then were shaped and rolled dry. The contractor next proceeded to water and roll sections 5, 6 and 7, and place his header boards and build the subgrade.

The oil section worked up well and formed a very solid subgrade. The plain adobe section, 7, showed a great many cracks after watering and rolling. The limestone section, 6, showed numerous surface checks to a depth of one-half inch. The hydrated lime section, 5, showed numerous fine checks after watering and rolling.

The cement sections placed in 1921 were fairly free from checks between Stations 258+50 and 267+30. From stations 248+50 to 258+50, there were numerous checks from $\frac{1}{2}$" to 1" deep.

After the subgrade was treated as above described a Portland cement concrete slab 18 feet wide and 5 inches thick was constructed thereon. Observations will be taken from time to time on the action of the pavement constructed over the treated and untreated sections, to ascertain the benefit, if any, of such special subgrade treatment.

PRECAST SLAB.

Another experimental section of highway is now under construction in Solano County from Suisun easterly. A portion of this section will be constructed of precast slabs. These slabs, of varying dimensions, are now being cast in a casting yard in the city of Suisun. As soon as they have cured sufficiently the slabs will be transported to the site of the work and installed.

EXPANSION JOINTS.

On another portion of the same section the concrete is being cast in place with expansion joints. Steel dowels will be placed connecting the sections of pavement at the expansion joints on a portion of the work and on the remainder these dowels will be omitted. The object of this experiment is to determine whether installation of the dowels at expansion joints will prevent the tendency of the adjoining slabs to buckle, thus making the pavement rough for traffic.

WILLITE.

Some experimental work has been done in connection with the construction of a patented pavement, known as Willite. The proponents of this patented pavement claim that by the addition of a certain small percentage of copper sulphate to an asphaltic mixture the mixture is toughened and rendered more stable than is standard asphaltic concrete, Topeka or sheet asphalt mixture, thus enabling a poorly graded mixture of sand and rock or a mixture of very fine blow sand and asphalt to be used where better materials can not be secured economically.

As some of the state highways in California must be built across desert sections where the importation of road building materials is very expensive and where the local materials are relatively inferior, it was felt

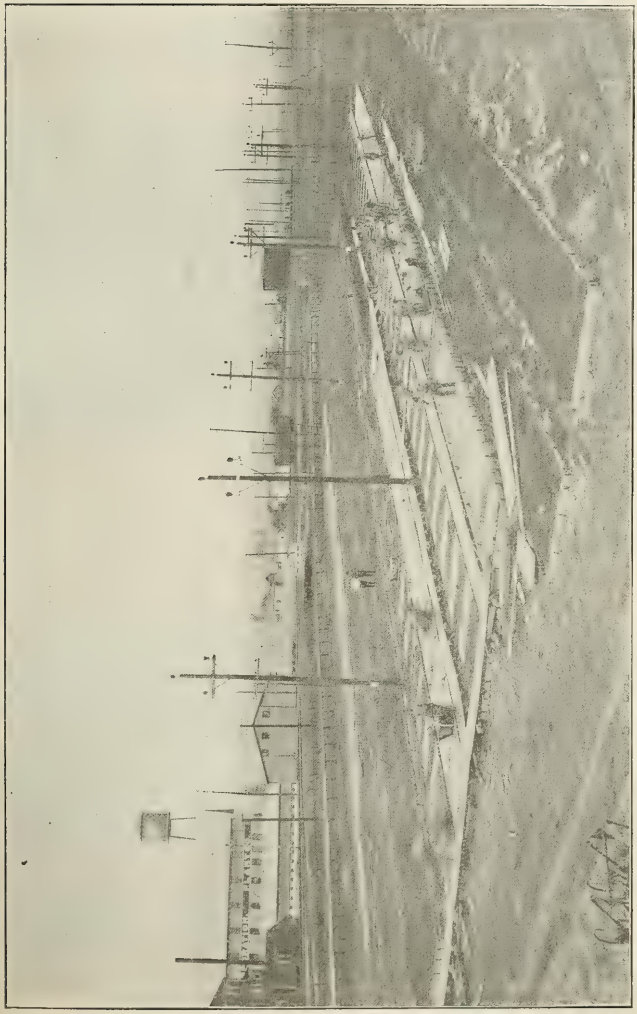


Plate XXXIV. State Highway, precast slab construction, showing casting yard at Suisun, Solano County.

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that the investigation of a pavement designed to overcome the peculiar difficulties encountered under such conditions was justified.

A contract was entered into for the construction of a ten-mile section in Imperial County from the Highline Canal east of Holtville, easterly, under the Willite specifications, and this work is now under construction.

Some two years ago, a short section, approximately one mile in length was constructed in the same locality under the same specifications. Some pavement has likewise been laid in the same locality without the copper sulphate, but with the use of a harder asphalt.

To date, no advantages have been noted in the pavement built under the Willite patent, which would indicate that this type of pavement has any superiority over the standard asphalt mixture properly constructed with the same aggregates.

Two short sections of Willite surfacing on Portland cement concrete base have been constructed, one section in Tulare County west of Visalia, and one section on the Ridge Route, near Castiac, in Los Angeles County. Results there, however, do not indicate any advantage in this type which would justify further experimentation with the Willite type of pavement.

ALKALI SOILS.

Experiments have been continued also at the testing laboratory to ascertain the action of the alkali soils encountered on the routes of the state highway in California, on two sections of state highway in Los Angeles and Kern counties, between Lancaster and Mojave. Where alkali was apparent in the soil the subgrade was treated with a light grade of asphaltic oil.

MAINTENANCE.

In Appendix O will be found a detailed statement of the expenditures for maintenance, together with an analysis of the expenditures.

There were on June 30, 1922, approximately 3595 miles of highway, both graded and paved, under maintenance by the California Highway Commission, an increase during the last two years of 490 miles. These highways then had been under the jurisdiction of the Commission and under maintenance by the Commission an average of 5.06 years.

A total to June 30, 1922, of $10,882,426.94 had been expended on general maintenance and for resurfacing, widening and thickening during the entire period that these roads have been under maintenance, or an average expenditure of $597.84 per mile per year. Of the total mileage approximately 1968.45 miles are paved and have been under maintenance an average of 4.13 years.

The greater part of the 15-foot by 4-inch concrete base was built during the first three or four years of state highway construction.

An analysis of the maintenance expenditures on these early built roads shows a very low expenditure for the length of time they have been in use.

In 1912, the first year of construction, contracts were let for approximately 100 miles of 15-foot by 4-inch concrete base roads.

On June 30, 1922, these roads had been under traffic an average of 8.22 years. There has been a total expenditure of $348,991.29 for



Plate XXXV. Precast slab construction at Suisun, Solano County.

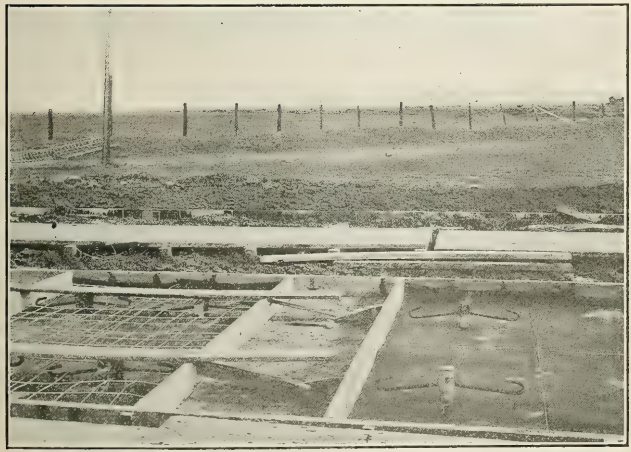


Plate XXXVI. Precast slab construction at Suisun, Solano County.



Plate XXXVII. State Highway, Sonoma County, completed concrete base.



Plate XXXVIII. State Highway, San Benito County, showing concrete mixer in operation for widening and thickening old concrete base.

maintenance and replacements of the pavement itself throughout this entire period, or approximately $3,551.71 per mile. The average expenditure for maintenance and replacements of the pavement base and surface has been $432.05 per mile per year.

The above figures are exclusive of widening and thickening expenditures. Twenty-one and ninety-eight hundredths miles or 22.37 per cent of the above 100 miles constructed in 1912 have been widened and thickened.

The lowest cost per mile per year has been in Placer County, between the southerly boundary and Lincoln. On this section an average of but $227.07 has been expended per mile per year for maintenance and replacements of both base and surface during the period of 8 years that this road has been under maintenance.

FEDERAL AID HIGHWAY WORK.

Following is a table showing federal aid apportionments to California to date:

FEDERAL AID ALLOTMENTS.

$75,000,000 Fund.

Fiscal year ending June 30, 1917	$151,063 92	
Fiscal year ending June 30, 1918	302,127 84	
Fiscal year ending June 30, 1919	456,167 23	
Fiscal year ending June 30, 1920	609,699 32	
Fiscal year ending June 30, 1921	763,668 88	
Sub-total		$2,282,727 19

$200,000,000 Fund.

Fiscal year ending June 30, 1919	$1,524,248 30	
Fiscal year ending June 30, 1920	2,286,372 45	
Fiscal year ending June 30, 1921	2,291,006 63	
Sub-total		6,101,627 38

$75,000,000 Fund.

Fiscal year ending June 30, 1922	$2,462,098 53	
Sub-total		2,462,098 53
Total to 1922		$10,846,453 10

$190,000,000 Fund.

Fiscal year ending June 30, 1923	$1,641,399 02	
Fiscal year ending June 30, 1924 (estimated)	2,133,818 72	
Fiscal year ending June 30, 1925 (estimated)	2,462,098 53	
Sub-total		6,237,316 27
Total federal allotments to California other than Forest highways		$17,083,769 37

FOREST HIGHWAY FUND.

Total apportionment to California under the Federal Aid Act approved November 9, 1921		$1,460,871 00
Deductions by United States Government:		
10 per cent overhead	$146,087 00	
10 per cent contingencies	146,087 00	
Total deductions		292,174 00
Net amount available for construction		$1,168,697 00

Apportionment not yet made under act approved June 19, 1922.

RECORD OF FEDERAL AID PROJECTS, JUNE, 30, 1922.

Project No.	Contract No.	Road	From	To	Length	Type	Project Estimate Approved	Total Estimated Cost	Amount Requested	Plans & Est. Approved by Sec. Int.	Project Agreement Executed	Amount Recommended	Miles Constructed. 1916	1917	1918	1919	1920	1921	1922	Date of Completion	Approximate Project Cost per Mile of Road Before Completion	Reimbursements
1	117		Beresford	Hudson City	4.28	6" Fr. Concrete Base	11-15-16	66,103.72	41,000.00		3-29-17	15,523.82	1.0	3.24				4.04		8-10-21	3,452.04-22	10,357.12
2	150		Beresford	Hudson City		6" Fr. Concrete Base & Surf.		130,000.00			10-20-19	49,000.00								8-10-21	31,000.00	
3			Springfield	Santa Fe Crossing			Withdrawn															
4	118		Springfield Boundary	Tabor	10.53	Gravel Surface Macadam	11-15-16	86,814.21	34,000.00		11-21-16	34,044.50	1.5	1.65						7-26-17	2,326.38-22	34,044.50
5			Dimock	Scotland			Withdrawn															
6			Hiawatha	Kenyon			Withdrawn															
7	111-Sda-1-4		Across Sacramento River at	Salt Creek	10.71	Gravel	11-15-16	90,000.00	90,000.00	6-14-18	6-26-18	100,044.04				11.9	4.04			7-21-20	1,224,047.46	103,334.04
8	111-Sda-2-3		Tower Corner	Hudson	10.00	Gravel	11-20-17	90,000.00	90,000.00													
9	111-Fri-3-6-7		Douglas City	Argot Ranch	10.47	Grading		104,784.20	104,784.20	4-1-19	6-2-19	110,492.15				4.6	6.80			10-1-20	12,140.567.21	119,696.36
10	111-Fri-2-3		White Bar Creek	Tabor	11.40	Gravel																
11	111-Tri-2-3		Burnt Ranch	White Bar Creek	15.63	Gravel		164,437.72	164,437.72	5-4-21	6-28-21	233,156.36						1.5	2.2	12-18-20	11,529.18	11,529.18
12	111-Tri-3-4		Eastern Boundary	Eastern Boundary	11.02	15 ft. Concrete Base	7-18-18	97,000.00	97,000.00	5-4-21	6-28-21	97,000.00				1.4	10.86	10.13		3-24-20	7,000.00	97,000.00
13	111-Mad-3-4		Alta Summit	Trinity	10.00	Gravel	6-1-18	90,000.00	90,000.00	3-25-19	4-8-19	90,384.14								3-24-20	11,538.46	123,334.14
14	111-Tri-1-2		Chaparral	Old Lewiston School	10.00	Gravel	6-1-18	90,000.00	90,000.00	3-25-19	4-8-19	90,384.14				1.1	3.07			6-24-22	11,538.46	123,334.14
15	111-Mar-1-2		Merced	Easterly Boundary	14.85	15 ft. Concrete Base	4-1-19	291,000.00	291,000.00	5-13-19	8-7-19	133,333.42				2.5	4.35				11,538.46-12	133,334.14
16	111-Sis-1-4-5 & C		Kay Ranch	Liebre Mountain	17.4	20 ft. Concrete Base	4-26-19	434,139.96	211,119.10	6-7 -19	8-29-19	155,194.66				17.62				11-18-19	11,370,053.48	136,464.64
17	111-Sis-2-3		Arcata	Cattle Creek Summit	25.00	Grading	5-9 -19	309,487.00	309,487.00													
18	111-Mad-1-2 & H		Arnold	Cattle Creek Summit	24.17	Grading		298,221.66	82,728.83	5-23-19	8-1 -19	76,473.46	3.0	20.6	.30					11.27	11,370,660.02	61,943.94
19	111-Mon-2-F		King City	So. Fork Salinas River	1.02	Bridge & 15 ft Conc. Base	5-31-19	304,842.00	157,031.00														
20	111-4-1		Across Salinas River	Stee. Bridge & Conc. Approaches	.00	Steel Bridge & Concrete Approaches	4-29-19	385,450.00	141,701.72	6-18-19	9-11-19	142,701.72		4.5		4.5			45	6-16-22	11,150,978.23	135,475.48
21	111-Mad-1-2		Freshwater Lagoon	Orick	2.80	Grading		43,000.00	25,000.00	6-3 -19	8-1 -19	19,735.76				2.8				7-8 -20	11,130,147.43	19,735.76
22	111-Mad-1-2																					
23	060		I-5-A-1-2	East Chester Side	Chester Creek	9.73	24 ft. Concrete Base	5-29-19	241,000.00	127,901.00	6-4 -19	8-14-19	119,566.92				1.7	5.6	.43		10-15-22	11,211,511.53	106,482.77
24	111-Sha-1-2		Shasta	Forks	7.04	15 ft. Conc. Base & Asph. Surf.	6-27-19	142,000.00	71,441.70														
25	111-Sha-3-4		Shasta	Forks	7.43	15 ft. Concrete Base		143,000.00	71,441.70	10-8 -19	1-17-20	71,603.48				8.3	3.43	1.98		12-15-22	10,839,752.05	63,457.13
26	111-Mad-1-2		Modoc	Easterly Boundary	9.73	Grading	6-2 -19	110,428.00	86,252.00	6-10-19	8-29-19	58,984.24				9.3	1.43			7-31-20	10,877,568.05	58,984.24
27	111-Lak-1-2		Eastern Boundary	Lakeport	7.00	Grading	6-5 -19	110,000.00	90,000.00	6-10-19	8-29-19	58,984.24				.7	6.30			11-15-20	10,919,744.04	58,984.24
28	111-Sis-3-4 & B		Southerly Boundary	Cosca Creek	8.19	16 ft. Concrete Base	6-7 -19	167,000.00	83,627.50	8-13-19	10-13-19	83,440.70					7.19			12-1-20	10,739,813.46	78,805.38
29	111-Sol-1-2		Russell Ranch	Forks Easterly Boundary	1.89	16 ft. Concrete Base	6-7 -19	39,000.00	19,500.00	8-13-19	10-13-19	19,500.00					1.89			12-1-20	10,739,813.46	19,500.00
30	111-Lak-2-A		Lakeshore Boulevard	South Sherman Bay	5.33	20 ft. Conc. Base & Tank Surf.	6-14-19	94,248.72	47,112.70	6-16-19	10-14-19	50,037.42					1.9	3.33			5-4 -20	10,480,743.86	31,026.56
31	111-Mon-2-3		Salinas	Prunedale	9.78	15 ft. Conc. Surf. & Conc. Shldrs.	6-14-19	142,000.00	71,000.00	6-16-19	10-14-19	70,844.62						9.78		12-20-20	10,739,813.46	70,844.62
32	111-Sha-2-4		Divide	Orcutt	3.86	15 ft. Concrete Base	8-16-19	68,380.00	47,691.00	8-19-19	11-19-19	42,586.98				.9	2.96			8-3 -20	10,839,199.82	39,371.20
33																						
34	111-Ker-4-5		Southerly Boundary	2.3 So. of Rose City	10.73	20 ft. Concrete Base	8-11-19	334,150.00	166,600.00	8-19-19	11-18-19	154,777.30								Oct. 1922	10,481,553.52	154,777.30
35	111-Ker-1-2-3		Kern River	Northerly Boundary	10.00	20 ft. Concrete Base	8-11-19	334,150.00	166,600.00	8-19-19	11-18-19	154,777.30					1.1	11.6	.73			10,481,553.52	154,777.30
36	111-Sis-1-2		Siskiyou	Northerly Boundary	2.60	16 ft. Conc. Surface	8-16-19	43,000.00	21,500.00	8-19-19	11-19-19	19,360.39									10,839,199.82	19,360.39
37	111-Mad-2-3		Lone	Jackson	10.74	Grading	7-10-19	91,940.00	39,990.00	9-1-19	12-16-19	38,314.29					5.09	5.65			10,839,199.82	38,314.29
38	111-Tri-3-4 & B		Trinity Boundary	Scorva			Withdrawn															
39																						
40	111-Sha-1-B		Cashion Creek	Crescent City	4.58	Grading	10-11-19	37,510.00	18,755.00	10-24-19	1-17-20	18,568.35					2.58	1.02		10-15-22	10,481,553.52	7,947.93
41	111-Sha-2-A		Shasta	Dunsmuir	17.44	15 ft. Concrete Base	10-11-19	143,000.00	71,500.00	11-5 -19	3-20-20	71,603.48								12-15-22	9,992,784.05	63,457.13
42	111-Sha-B-Hyl.36-Hum		Mt. Shasta Hyl. 36-Hum	Newport	7.10	Grading	11-5 -19	90,000.00	90,000.00	11-14-19	2-16-20	99,199.82				7.1				12-15-22	9,992,784.05	99,199.82
43	111-Sis-1-2-3		Pine Valley	Cashen Ranch	4.61	Grading	11-5 -19	90,000.00	90,000.00	11-14-19	2-16-20	99,199.82				4.6	2.11			4-5 -22	9,987,070.74	99,199.82
44	111-D-2-10-F		Cashere Ranch	Tecate Divide	13.80	Grading	11-5 -19	236,105.00	113,052.86	11-15-19	3-18-20	112,384.85				10.2	3.6			3-3 -22	9,786,285.04	106,680.76
45	111-D-2-10-F		Tecate Divide	Mt. Laguna		Surfacing	Withdrawn															
46	111-Sha-1-2		Old Base School	Nurse Road	12.00	15 ft. Concrete Base	11-14-19	172,000.00	86,000.00	11-15-19	2-20-20	85,452.89				6.5	5.5			6-28-22	9,987,070.74	85,726.10
47	111-Mad-1-2		Modoc	Eastern National Forest	7.74	Grading	11-14-19	110,000.00	110,000.00	11-15-19	2-20-20	109,452.89				7.74	2.26			6-28-22	9,987,070.74	109,452.89
48	111-Mad-1-2		Mt. Shasta	Mt. Shasta	14.33	15 ft. Concrete Base	11-25-19	197,000.00	173,000.00	11-26-19	2-20-20	170,307.76				4.33	10.0			7-31-22	9,987,474.71	170,307.76
49																						
50	111-Sha-2-A & B		2.3 Mi. S. of Ingot	Montgomery Creek	16.83	Grading	1-9-20	153,490.00	77,828.00	6-8 -21	10-13-21	161,707.61					9.13	1.5		7-8 -22	9,987,280.97	1,304.68
51	111-Sha-3-A & B		Tule Rush	Northerly Boundary	14.86	15 ft. Concrete Base	12-20-19	348,495.00	174,248.28	8-25-20	8-24-20	177,694.73				3.12	11.74				9,987,280.97	158,319.83
52	111-Sha-3-B		Ash Hollow	Red Bluff			Withdrawn															
53	111-Mad-1-2		El Portal	Yosemite National Park	1.30	Grading	4-29-20	21,000.00	20,000.00	5-3 -20	8-20-20	19,000.00				1.30				Sept. 1922	9,988,280.97	19,131.64
54	111-Tri-3-B		Weaverville	Junction	10.73	15 & 18 ft. Concrete Base	4-16-20	284,000.00	142,000.00	4-27-20	8-20-20	141,263.41				8.18	1.83			8-20-22	9,988,280.97	141,263.41
55																						
56	111-Mon-2-C		Redwood Creek	Three Crosses			Withdrawn															
57	111-Mon-2-D & E		Three Crosses	Dry Creek			Withdrawn															
58	111-Sie-1-B		Sierra National Forest	4 Mi. N. of Bridgeburg	2.72	Grading	2-15-20	641,927.00	198,140.00	2-16-20	4-26-22	181,805.03									8,707,254.97	
59	111-Sie-1-2		Sierra National Forest	Dinkey	9.28	Grading		48,200.00	30,160.40	2-16-20	4-26-22	29,239.74				.1	7.99			12-11-22	8,744,494.71	70,547.00
60	111-Sol-1-2		Southerly Boundary	Los Olivos	8.09	16 ft. Concrete Base	3-10-20	196,000.00	98,000.00	4-7 -20	6-29-20	97,539.00									8,707,254.97	
61																						
62	270		17-D-Cr.-5-A	Glenwood	8.53	16 ft. Concrete Base	3-10-20	135,663.00	67,831.50	4-7 -20	9-8 -20	68,373.07				1.7	3.83	8.0		12-11-22	8,747,492.18	53,106.12
63	271		17-Fre-10-F	Myrtle Road	5.07	16 ft. Concrete Base	3-5 -20	139,756.70	74,878.35	4-16-20	6-29-20	110,644.74					6.57			9-28-22	8,431,817.64	80,855.13
64	272		17-D-Cr.-10-C	Alpine	6.09	15 ft. Concrete Base	3-10-20	141,715.00	70,300.00	5-4 -20	9-8 -20	80,855.13									8,431,817.64	
65	111-D-2																					
66	111-Mad-1-D-F		Forsythe Creek	Outlet Creek	17.00	16 ft. Bit. Macadam Pavement	3-10-20	404,825.40	229,410.70	5-3 -20	9-8 -20	220,631.92									8,130,690.89	

* Balance available based on "Amount recommended" in Project Agreement unless otherwise noted.
* Final Voucher, "Balance available" based on this ground.
* Total does not include amounts shown for Projects 54, 83, 144, 154, 184, 474, 1041.

Project No.	Contract No.	Road	From	To	Length	Type	Project Agreement Approved	Total Estimated Cost	Amount Requested	Plans & Est. Preliminary Stat. Engr.	Project Agreement Executed	Amount Recommended	Miles Constructed 1916	1917	1918	1919	1920	1921	1922	Date of Completion	Expenditures Fiscal Years to 6-30-1922 Inc. 1917 Balance Available	Unobligated
53		41-Wta-15-F	4 Mi. S. of Brieeberg	Clearing House			Withdrawn															
54		41-Wta-16-F	Clearing House	El Portal			Withdrawn															
55	229	41-Sis-115-D	Lipton	The Willows	4.59	15 ft Concrete Base	4-23-20	132,637.35	61,316.67	6-4 -20	9-8 -20	59,756.74						2.59	2.00	4-28-22	8,9.0 784.32	17 751.34
56		41-Sis-3-E	Easterly boundary	Redding			Withdrawn															
57		41-Sis-4-C	Red Bluff	Northern boundary			Withdrawn															
58	279	8-S.B.-2-B & D	Los Cruces	Cave	14.64	15 & 20 ft Concrete Base	5-25-20	440,814.00	220,407.00	5-27-22	6-22-22	202,800.00							8.00	3.00		7,770,104.10	81 .35.75
59		8-S.B.-3-A	Cave Rohlen	Murrieta River			Withdrawn															
60	300	41-Mod-20-D	Tioga Pass Road	Virginia Creek	13.43	Grading	7-13-20	161,670.00	80,835.00	5-14-21	8-4 -22	73,441.56						12.76				76,318.39
61	382	111-Bat-1-A	Feather River Bridge	.mi	.250	Steel Bridge	7-13-20	295,400.00	147,700.00	5-13-21	6-29-21	92,242.15						9.5	3.5	5-2 -22		75,000.39
62		111-Sis-15-D	Ruckersville Canal	Yuba City			Withdrawn															
63		41-Ala-10-B	Easterly boundary	1 Mi. N. of Lerwood			Withdrawn															
64		111-Sis-2A-A	Goodyears Bar	Downieville			Withdrawn															
65	200	41-Ker-2-A	Southerly boundary	Bakers	16.36	15 ft. Concrete Base	5-31-20	541,414.28	270,707.14	6-18-21	6-29-21	237,814.11						14.28	4.08	5-14-22	1,102,679.59	132,679.59
66	284	111-Ker-3-A	Easterly boundary	Bakers	5.66	Grading	5-31-21	94,222.50	47,111.25	6-18-21	8-4 -22	41,415.89						5.66		5-25-22	1,102,643.64	10,434.36
67	284	111-Ker-4-A	Bakers	Easterly boundary	9.44	Grading	5-31-21	157,030.00	78,515.00	4-8 -21	5-24-22	69,002.90						9.44		5-25-22	1,102,643.64	10,434.36
68	248 Est.	1-D.B.-1-B	Kilaco Creek	Last Chance Creek	3.10	Grading, Gravel Surface	4-20-21	118,715.00	59,357.50	4-1 -21	6-22-22	39,284.67						3.10		10-12-22	7,282,199.32	24,000.93
69	284	111-Ker-2-A & B	Southerly boundary	Grass Valley	14.70	15 ft. Bituminous Macadam	5-31-21	323,400.00	161,700.00	6-1 -22	6-29-22	147,000.45						.4			7,1.8,181.81	27,220.64
70	284 & 303	1-Ker-15-A	6 Mi N. of Girard	Easterly boundary	13.06	Grading, Gravel Surface	4-20-21	287,115.00	143,557.50	5-12-21	6-22-22	130,598.21						7.5	5.3		6,838,911.45	43,222.13
71	284	1-Ker-16-A	Girard	Citrus	5.40	Grading, Gravel Surface	4-20-21	118,800.00	59,400.00	6-4 -22	6-22-22	54,000.00						5.4			6,838,911.45	43,222.13
72	284-286	41-Lak-3-A	2 Mi. Lake Co. Line	Ukiah	.35	Steel Truss Bridge	4-20-21	115,500.00	57,750.00	6-4 -22	6-22-22	52,522.65						875	.525	6-6 -22	6,941,525.99	22,909.34
73	273	111-Sis-4-C & D	Bridge Across Sac Rvr	Gravel Bridge	.09	Steel Bridge	4-13-21	145,200.00	72,600.00	5-7 -22	6-22-22	48,789.45						965	.25	5-1 -22	8,199,137.34	38,137.44
74	241 & 175	4-Col-1-A	4 Mi. N. of Santa Maria	Durham River	11.36	Grading, Gravel Surf.	4-5 -21	201,294.00	100,647.00	4-22-22	6-6 -22	89,737.79						2.0	2.46	5-24-22	6,958,911.64	76,893.68
75	268 & 340	1-Mad-1-A	Red River	Trinidad	5.08	Grading, Gravel Surf.	4-20-21	89,408.00	44,704.00	5-28-22	6-28-22	39,744.04						b	2.54		6,838,911.64	43,222.13
76	329	111-Sol-3-B	Dunnigan	New York	11.00	15 ft. Concrete Base	5-2 -21	435,600.00	217,800.00	6-7 -22	6-29-22	193,600.00							5.50		6,252,013.62	42,911.96
77	329	111-Sol-2-A	Easterly boundary	Rio Vista	10.00	Grading, Gravel Surface	5-2 -21	157,000.00	78,500.00	6-7 -22	6-29-22	69,777.84							5.00		6,252,013.62	42,911.96
78	340	1-Sac-20-C	Elk Grove	South of Navarro River	11.27	Grading, Gravel Surface	4-25-21	176,850.00	1.8,425.00	6-4 -22	6-14-22	1.0,093.37									6,958,644.88	
79	302	41-Ala-3-B	Melrose River	1 Mi. N. Chapman Ranch Sta	11.00	Grading, Gravel Surface	4-20-21	171,600.00	85,800.00	6-1 -22	6-17-22	80,086.80						11.0	1.38	6-6 -22	6,958,644.88	24,167.84
80	317	41-Sha-26-A	Montgomery Creek	Burney Creek	10.11	Grading, Gravel Surface	6-20-21	157,758.00	1.8,879.00	6-23-22	11-1 -22	70,373.43									5,239,134.51	14,886.11
81	317-A-420	41-Sha-27-A	1 Mi. So. of Montgomery	Shasta Reservoir	10.00	Grading, Gravel Surface	6-20-21	156,000.00	78,000.00	6-23-22	11-1 -22	69,555.40									5,239,134.51	40,907.53
82	310	41-Sis-2-A	Shasta	2 Mi. E. of Edgewood	6.45	15 ft. Bituminous Macadam	6-6 -21	84,987.00	42,493.50	6-7 -22	6-29-22	37,905.74									5,240,749.31	
83	309	41-Ker-23-B	2nd St.Parallel South	Bakersfield	11.66	Grading	8-6 -21	118,125.00	59,062.50	8-7 -21	8-3 -22	52,776.91						7.0	4.66		5,240,192.39	
84	339	111-Sis-31-C	Durham	Victorville	15.74	15 ft. Bituminous Macadam	10-24-21	315,780.00	157,890.00	10-5 -22	6-28-22	140,508.91									5,301,983.43	
85	341	111-Sol-3-A & B	6 Mi. W. of San Lucas	Paso Robles	9.78	Grading, Gravel Surface	10-24-21	196,000.00	98,000.00	10-5 -22	6-29-22	113,332.39									5,366,649.17	
86	349	111-Sol-4-A & C	Paso Robles	Merced Co. Line	16.04	Grading, Gravel Surface		321,440.00	160,720.00													
87	349	111-Sol-5-A	Creek Boulevard	Northerly Boundary	3.06	Grading, Gravel Surface	11-29-21	61,281.00	30,640.00	12-23-22	6-26-22	34,193.96									5,240,192.39	
88	319	19-S.B.-33-A	Northerly Boundary	Basalt Road	5.30	Grading, Gravel Surface	11-23-21	129,822.00	64,911.00	12-23-21	5-13-22	46,280.64									5,184,068.70	
89	313	19-Mod-32-A	Alta	Belcebeda Crossing	2.49	Grading, Gravel Surface	1-10-22	61,425.00	30,712.50													
90	325	41-Ala-9-A	Cypress River	Beckers Creek	6.09	Grading, Gravel Surface	9-23-21	204,263.00	102,000.00	2-23-22	5-1 -22	89,515.74									5,239,133.92	
91	350	111-Ria-20-B	Dunnigan	Cranston	17.04	16 ft. Concrete Base	9-23-21	387,270.75	193,635.37	2-23-22	6-22-22	169,187.15									5,241,366.80	
92	351	111-Ria-21-B	Esro	Iaria			Withdrawn															
94	357	41-Tul-10-F	Three Rivers	Sequoia National Park	5.85	Grading	3-27-22	142,180.80	84,341.62	6-23-22												
95	357	4-Sco-10-A	San Lucas	2.34 Mi.E.	10.50	Grading, Gravel Surface	9-3 -22	179,256.00	94,338.64	5-3 -22												
96	357	41-Ker-25-B	San Emigdio	Valley School	12.22	16 ft. Concrete Base	9-3 -22	282,282.00	141,141.00	5-3 -22												
97	361	1-Lak-15-A	Westerly Boundary	Upper Lake	8.98	Grading, Gravel Surface	5-29-22	198,398.58	111,699.50	5-14-22												
98	359	111-Sis-29-C	Bassler	Whitewater	12.30	16 ft Concrete Base	4-24-22	356,953.30	221,743.56	4-25-22	6-26-22	182,031.70									634,330.19	
99	362	41-Lak-2-A	2.25 Mi. N. of Upper Lake Village	Stoneyate Cloverdale Siding	3.56	20 ft. Concrete Base	6-13-22	197,367.50	84,132.16	5-3 -22												
100	371	41-Mer-32-A	Westerly Boundary	Salt Lick Creek	5.35	16 ft. Concrete Base	4-25-22	218,336.15	128,937.47	6-15-22												
101		19-S.B.-55-A & B	Basalt Road	Half Moon Bay Road	13.46	Grading, Gravel Surface	5-18-23	347,000.00	304,700.00													
102	373	111-Sis-34-A & B	Shasta River	Yreka	19.72	16 ft. Concrete Base		473,280.00	236,640.00													
103		111-Tri-57-A-B-C	Auburn	Folsom	10.00	18 ft. Concrete Base		577,500.00	288,750.00													
104		1-Mar-1-J	Trinidad	Freshwater Lagoon	19.53	Grading, Gravel Surface	6-28-22	211,905.00	141,000.00													
104-A	377	1-Mar-1-J	Trinidad	Freshwater Lagoon	16.53	Grading, Gravel Surface		439,433.35	294,961.69													
105		41-Sac-8-F	Cottonwood Creek	First Crossing Kern River	6.16	Grading		393,800.00	196,400.40													
106		41-Mat-7-A-B-C & D	Half Moon Bay	4 Miles So	8.00	Grading		393,600.00	196,800.00													
107		111-Yos-1A-B-1	End of Chester Grade	6 Mi. N.of County Hwy.	11.36	Grading		274,125.00	162,062.75													
TOTALS					929.77*			22,697,471.77*	11,317,440.75*			7,919,023.81	2.5	4.29	3.0	78.92	143.36	168.47	80.37			3,868,987.82

a Balance available based on "Amount Recommended" in Project Agreement unless otherwise noted.
* Final Section. "Balance Available" based on this amount.
Total does not include amounts shown for Projects 84 85 144 154, 184, 47A 184A.

At the time the last biennial report was written $8,384,354.57 had been apportioned to California under the Federal Aid Highway acts of 1916 and 1919.

The Third Federal Highway Act was adopted by the Sixty-seventh Congress in 1921 and under this act $75,000,000 was appropriated for co-operative work with state highway departments as in the previous acts, and an additional $15,000,000 for the survey, construction, reconstruction and maintenance of forest roads and trails. This act was approved November 9, 1921 (S. 1072).

Of the $15,000,000 appropriated for work on forest roads and trails it was provided that a portion should be expended under the direct supervision of the Secretary of Agriculture in the survey, construction, reconstruction and maintenance of roads and trails of primary importance, for the protection, administration, and utilization of the National Forests, or when necessary, for the use and development of resources upon which communities within or adjacent to the National Forests are dependent to be apportioned among the several states, Alaska and Porto Rico, by the Secretary of Agriculture, according to the relative needs of the various National Forests, taking into consideration the existing transportation facilities, value of timber, or other resources served, relative fire danger, and comparative difficulties of road and trail construction.

It was further provided that the balance of the appropriation for forest road work should be expended by the Secretary of Agriculture in the survey, construction, reconstruction and maintenance of forest roads of primary importance to the state, counties and communities within, adjoining or adjacent to the National Forests, and that such balance should be prorated and apportioned by the Secretary of Agriculture for expenditures in the several states, Alaska and Porto Rico, according to the area and value of the land owned by the government within the National Forests therein as determined by the Secretary of Agriculture from such information, investigation, sources and departments as the Secretary of Agriculture might deem most accurate.

The fund set aside to be expended under the direct supervision of the Secretary of Agriculture on roads and trails of primary importance for the protection, administration and utilization of the National Forests or for the use and development of the resources thereof is known as the "Forest Development Fund" and the fund to be expended on roads of primary importance to the state, counties and communities within, adjoining or adjacent to the National Forests is known as the "Forest Highway Fund."

Before moneys are expended from the "Forest Highway Fund" the approval of the State Highway Commission must be secured.

Under the 1921 act there has been apportioned to California from the forest highway fund the sum of $1,460,871. Of this amount $292,274 has been reserved by the government to cover overhead and contingencies, making a net amount available for forest highway construction in California of $1,168,697.

On June 19, 1922, the fourth Federal Aid Act adopting a three-year program for federal aid was approved. This act made $50,000,000 immediately available for the fiscal year ending June 30, 1923, and committed the government to subsequent appropriations of $65,000,000 for

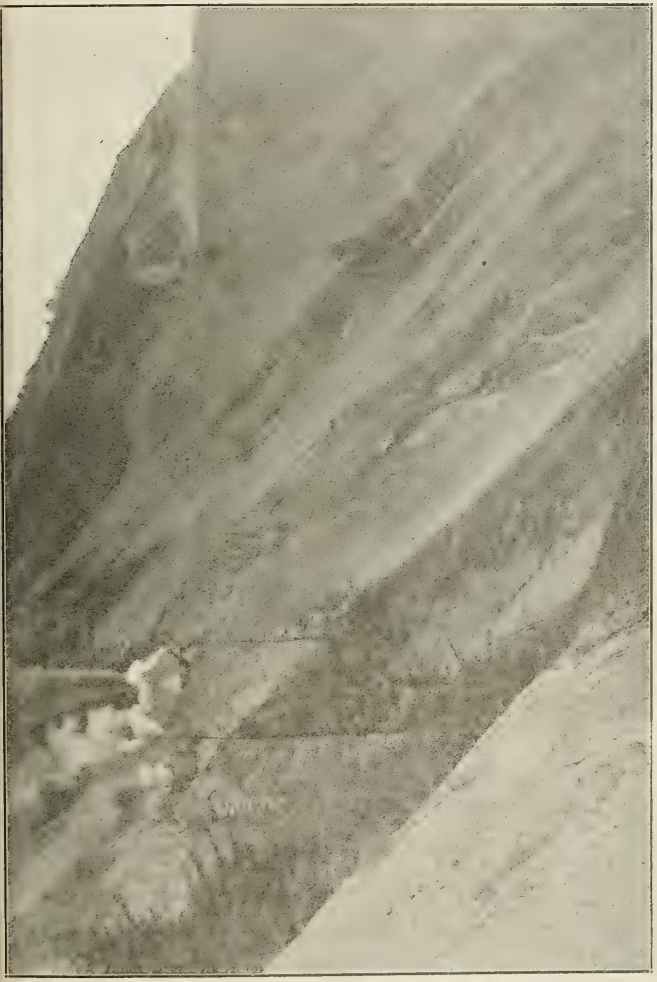


Plate XXXIX. State Highway, Del Norte County, steam shovel in operation on heavy construction.

the fiscal year ending June 30, 1924, and $75,000,000 for the fiscal year ending June 30, 1925, or a total of $190,000,000 for the three-year period.

Federal aid apportionments to California for 1923 and estimated apportionments for 1924 and 1925 are given in the previous table.

This last act likewise contained additional appropriations for forest highway work for the fiscal year 1924 and 1925.

GRADUATED SCALE OF FEDERAL AID. FOR THE PUBLIC-LAND STATES.

The acts of 1916 and 1919 provided for cooperation by the government at not to exceed 50 per cent of the cost of the work.

Most of the western states have within their boundaries large areas of unappropriated government lands from which the states derive no revenue with the result that such states are unable to raise as much revenue for highway construction purposes in proportion to the total area of the state as is possible in states where there is no public land. Congress recognized this unfairness and in the Federal Highway Act of 1921 what is known as the "Graduated Scale of Federal Aid for the Public-Land States" was adopted.

The act provided that the United States government should pay not to exceed 50 per cent of the total estimated cost of projects, except that in the case of any state containing unappropriated public lands exceeding 15 per centum of the total area of all lands in the state, the share of the United States payable under the act on account of such projects should not exceed 50 per centum of the total estimated cost, plus a percentage of such estimated cost equal to one-half of the percentage which the area of the unappropriated public lands in such state bears to the total area of such state.

Under this provision California is only required to pay 40.68 per cent of the cost of work done under Federal Aid Highway Projects, the government providing the remaining 59.32 per cent.

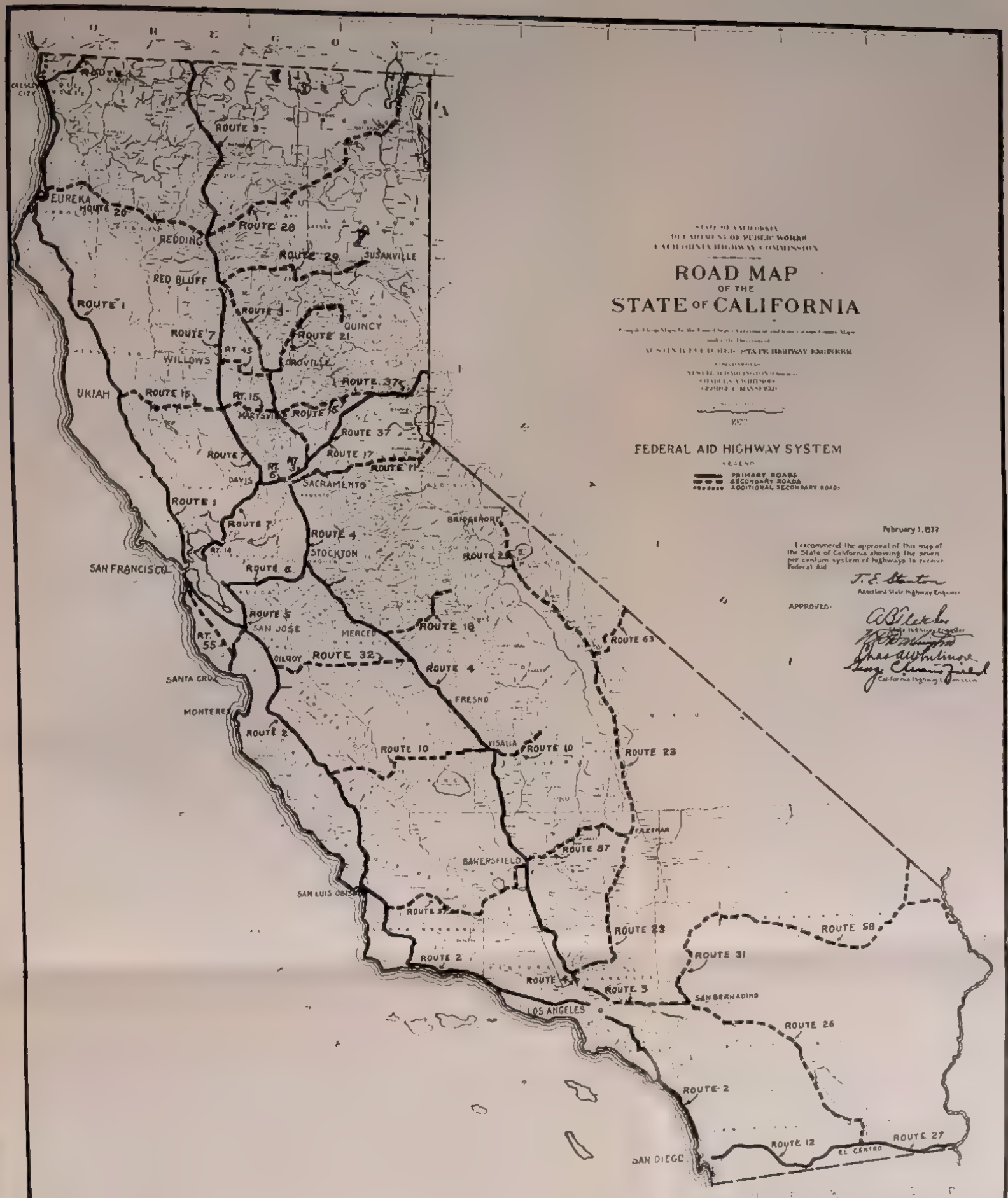
The last Federal Act of 1922 contains the same provisions relative to the graduated scale of federal aid.

SEVEN PER CENT SYSTEM.

The Federal Aid Act of 1921 likewise provided that before any projects could be approved in any state such state through its State Highway Department should select or designate a system of highways not to exceed seven per centum of the total highway mileage of such state, as shown by the records of the State Highway Department thereof at the time of the passage of the act, and that upon this seven per cent system all federal aid apportionments should be expended.

The act further provided that the highways in the seven per cent system to receive federal aid should be divided into two classes, one to be known as "Primary or Interstate Highways" and not to exceed three-sevenths of the total mileage to receive federal aid, and the other, which should connect or correlate therewith, to be known as "Secondary or Inter-County Highways," and which should consist of the remainder of the mileage which would receive federal aid.

Under the provisions of the above section of the Federal Aid Act of 1921, the California Highway Commission on February 2, 1922, ap-


OREGON
ROUTE 3
ROUTE 9
EUREKA
ROUTE 20
REDDING
ROUTE 28
ROUTE 29
SUSANVILLE
RED BLUFF
ROUTE 1
ROUTE 3
QUINCY
ROUTE 7
ROUTE 21
WILLOWS
RT 45
OROVILLE
ROUTE 37
UKIAH
ROUTE 15
RT 15
MARYSVILLE
ROUTE 15
ROUTE 37
ROUTE 7
RT 5
ROUTE 17
ROUTE 11
DAVIS
SACRAMENTO
ROUTE 1
ROUTE 7
ROUTE 4
BRIDGEPORT
RT 14
STOCKTON
ROUTE 25
SAN FRANCISCO
ROUTE 8
ROUTE 5
SAN JOSE
MERCED
ROUTE 18
ROUTE 63
RT 55
GILROY
ROUTE 32
ROUTE 4
SANTA CRUZ
FRESNO
MONTEREY
ROUTE 2
ROUTE 10
VISALIA
ROUTE 10
ROUTE 23
TAFT
ROUTE 87
BAKERSFIELD
SAN LUIS OBISPO
ROUTE 33
ROUTE 23
ROUTE 58
ROUTE 31
ROUTE 2
ROUTE 3
SAN BERNARDINO
LOS ANGELES
ROUTE 26
ROUTE 2
ROUTE 12
ROUTE 27
EL CENTRO
SAN DIEGO
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
CALIFORNIA HIGHWAY COMMISSION
ROAD MAP
OF THE
STATE OF CALIFORNIA
AUSTIN H. PETERSON, STATE HIGHWAY ENGINEER
1922
FEDERAL AID HIGHWAY SYSTEM
LEGEND
PRIMARY ROADS
SECONDARY ROADS
ADDITIONAL SECONDARY ROADS
February 1, 1922
I recommend the approval of this map of the State of California showing the seven per centum system of highways to receive Federal Aid
T. E. Stanton
Assistant State Highway Engineer
APPROVED:
A B Fletcher
Chas. H. Whitmore
George Chamberlain
California Highway Commission

proved a map of the State of California showing the seven per cent system of highways to receive federal aid and recommended such system to the Secretary of Agriculture.

The total highway mileage of the State of California was determined by the Commission to have been 70,000 miles at the time of the adoption of the Federal Aid Act. Of this mileage three per cent or 2100 miles could have been designated as primary roads and four per cent or 2800 miles as secondary roads, making a total seven per cent system of 4900 miles. The Commission designated 2014.9 as primary roads and 2432.7 as secondary roads, a total of 4447.6 miles. Twenty additional miles were added to the secondary roads on August 31, 1922, making a total designated mileage in the seven per cent system at the present date of 2014.9 miles primary roads and 2452.7 miles of secondary roads, or a total of 4467.6 miles, leaving 85.1 miles still to be designated in the primary system and 347.3 miles in the secondary system.

SEVEN PER CENT FEDERAL AID HIGHWAY SYSTEM.

Primary Roads.

Route	Description	Length, miles
1	Oregon line to San Francisco	410.0
2	San Francisco to San Diego	499.0
3-7-6	Oregon line to Sacramento	295.6
4	Sacramento to Los Angeles	357.4
12-27	San Diego to Yuma	170.6
14-7-3 17-37	San Francisco to Verdi	198.0
5	San Jose to French Camp	84.3
	Total mileage primary roads	2,014.9

Secondary Roads.

9–26	Los Angeles to El Centro via San Bernardino	203.2
31-58	San Bernardino to Needles via Barstow	240.0
	Needles to Arizona line at Mellen	16.0
	Route 58 near Goffs to Nevada line	25.0
63	Big Pine to Oasis	38.6
	Oasis to Nevada line	4.4
29	Red Bluff to Susanville	107.5
21	Richvale Junction to Quincy	93.4
3	Roseville to Red Bluff	116.9
23	Saugus to Bridgeport	330.1
55	Skyline Boulevard	62.1
5	San Jose to Santa Cruz	33.1
32	Gilroy to Califa	83.5
18	Merced to Yosemite National Park via El Portal	70.5
15-17	Ukiah to Cisco	165.0
28	Redding to Alturas	157.7
	Alturas to Oregon line	35.0
20	Redding to Route 1 via Weaverville	161.6
45	Willows to 3 miles north of Biggs	32.2
11	Sacramento to Nevada line via Placerville	107.9
10	San Lucas to Sequoia National Park via Visalia	149.0
57	Santa Maria to Freeman via Bakersfield and Walker's Pass	200.0
1	Crescent City to Oregon line (via Coast)	20.0
	Total mileage secondary roads	2,452.7

Summary.

Total length primary roads	2,014.9 miles
Total length secondary roads	2,452.7 miles
Total length of system	4,467.6 miles

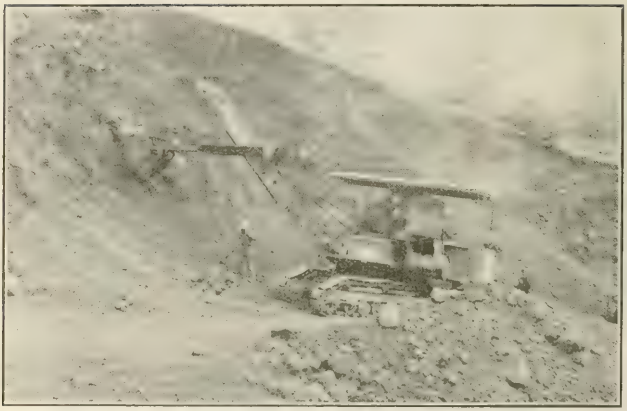


Plate XL. State Highway, Monterey County, showing gas shovel in gravel pit.

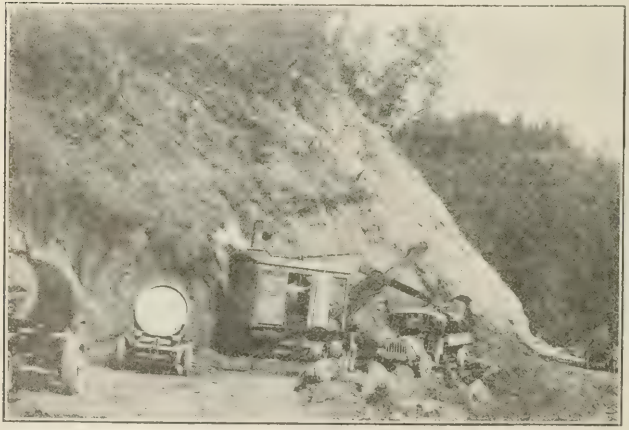


Plate XLI. State Highway, Mendocino County, steam shovel in operation.

The seven per cent roads have been confined by the California Highway Commission entirely to the state highway system of the state, except in three or four cases where it was necessary to add a small mileage outside of the state highway system in order to make a connection with the seven per cent system of an adjoining state.

As there are over 6400 miles of road in the state highway system and only 4900 miles can be designated in the seven per cent system as roads to receive federal aid, it is apparent that for some time to come the seven per cent system will have to be confined to the state highway system.

The seven per cent system adopted by the California Highway Commission has been approved by the Secretary of Agriculture.

FOREST HIGHWAY SYSTEM.

While the Federal Aid Act does not require that the roads improved from the forest highway fund shall be confined to the seven per cent or to the state highway system, nevertheless, inasmuch as projects under this fund are referred to the State Highway Commission for approval, and also, inasmuch as it was felt by the Highway Commission that when the people of the state voted bond issues designating certain roads of the state to be included in the state highway system, such roads were considered as of primary importance to the state, counties and communities, and also, inasmuch as the funds provided for these roads to date are far insufficient to complete the system through the National Forests, the Commission has consistently refused to approve the allotment of any forest highway funds to any projects not on the state highway system, until the roads on the state highway system in and adjacent to the National Forests have been improved.

On February 7 and 8, 1922, a conference was had in San Francisco between officials of the Federal Forestry Service, U. S. Bureau of Public Roads and the California Highway Commission, relative to application of the forest highway funds allotted to California under the 1921 Federal Aid Act.

It was determined that $1,168,697 would be available from the forest highway fund for construction work in California.

In order to demonstrate the fact that there was sufficient work to be done on the state highways of California in and adjacent to the National Forests to absorb all of the forest highway funds which might be allotted for several years to come, the Highway Commission submitted the following list of projects under the seven per cent system on which expenditures might be made to advantage from the forest highway fund:

Crescent City to Oregon line	$200,000 00
Redding to Alturas	200,000 00
Red Bluff to Susanville	200,000 00
Feather River Route	400,000 00
Auburn to Nevada line	200,000 00
Mariposa to El Portal	400,000 00
Cuyama Road	200,000 00
Viejas Grade to Pine Valley	200,000 00
Placerville to Lake Tahoe	200,000 00
Big Pine to Oasis	200,000 00
Kern River to Walker Pass	200,000 00
Trinity River Road	200,000 00
Total	$2,800,000 00

Under date of February 8, 1922, E. A. Sherman, associate forester, acknowledged receipt of the above list of projects and advised that, if the Secretary of Agriculture placed upon the Forest Service the responsibility for the expenditure of the forest highway fund, he would recommend that favorable consideration be given to specific projects, as follows:

Crescent City to Oregon line	$200,000 00
Redding to Alturas	200,000 00
Red Bluff to Susanville	200,000 00
Cuyama Road	292,500 00
Big Pine to Oasis	123,697 00
Big Bear Project in San Bernardino County	152,500 00
Total	$1,168,697 00

Or the amount available for such construction in California as of that date.

It will be noted that the forester added $152,500 for construction on what is known as the "Big Bear project" in San Bernardino County, and also added $92,500 to the Cuyama road.

The Commission accepted the addition of the Big Bear project inasmuch as this project was on a portion of the state highway system, and therefore did not materially depart from the attitude of the Commission that all such moneys should be expended on the state highway system, but preferably on the seven per cent system. Exception was taken, however, to adding $92,500 to the Cuyama project, because of the fact that this $92,500 had been previously pledged by the Forest Service from the forest moneys appropriated under previous Federal Aid acts and it was felt that the Forestry Service should not default on such commitments from previous appropriations and charge this amount against the 1921 allotment. At a subsequent conference the Forestry Service agreed to this viewpoint.

At a conference between the U. S. Bureau of Public Roads and the District Forester in San Francisco on March 28, 1922, the District Forester stated that he was willing to approve the following program, and also to recommend an additional allotment to the Cuyama project of $92,500 from other funds, if the California Highway Commission would approve of an allotment of $168,697 from forest highway funds to the Big Bear Valley project in fulfillment of the Forest Service commitment to cooperate with the state on the construction of that project. The program was as follows:

Project	Forest highway funds.
Crescent City-Oregon Line	$200,000 00
Redding-Alturas	200,000 00
Red Bluff-Susanville	200,000 00
Cuyama	200,000 00
Auburn-Verdi	200,000 00
Big Bear Valley	168,697 00
10 per cent overhead	146,087 00
10 per cent reserved for contingencies	146,087 00
Total	$1,460,871 00

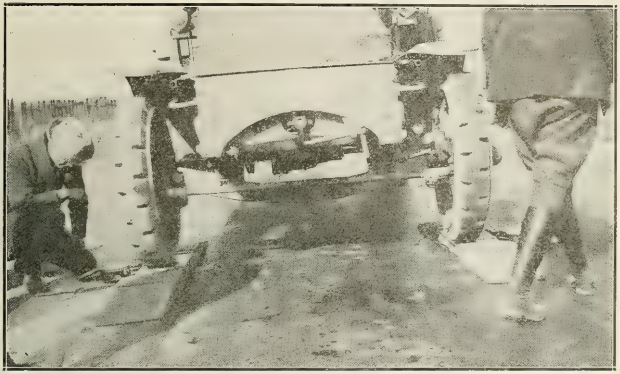


Plate XLII. State Highway, method of weighing loaded trucks with Berry scales.

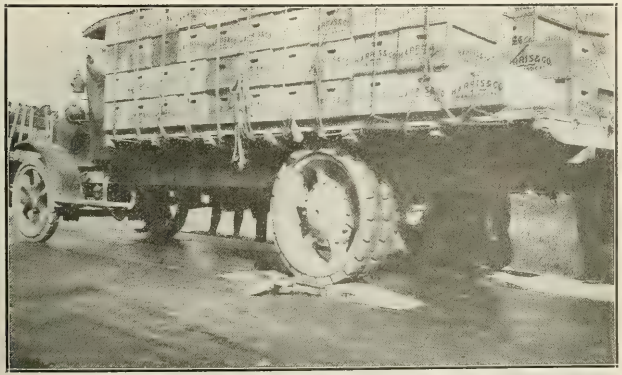


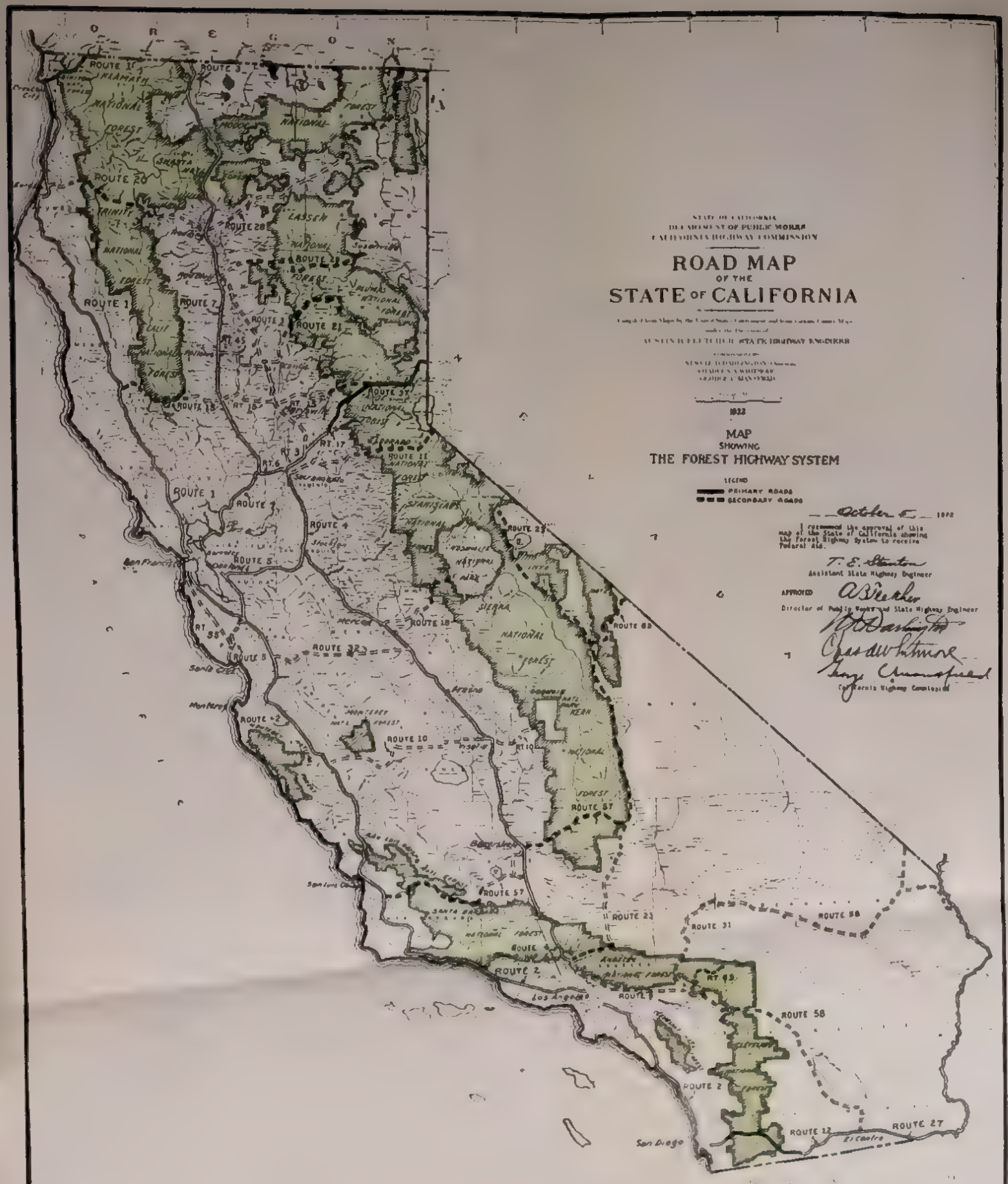
Plate XLIII. State Highway, method of weighing loaded trucks with Berry scales.



Plate XLIV. State Highway, heavily loaded truck being weighed with loadometers.



Plate XLV. State Highway, heavily loaded truck, loadometers under rear axle.


ROAD MAP
OF THE
STATE OF CALIFORNIA
1922
MAP
SHOWING
THE FOREST HIGHWAY SYSTEM
LEGEND
PRIMARY ROADS
SECONDARY ROADS
October 5
Assistant State Highway Engineer
APPROVED
Director of Public Works and State Highway Engineer
California Highway Commission
OREGON
ROUTE 1
ROUTE 2
ROUTE 3
ROUTE 4
ROUTE 5
ROUTE 7
ROUTE 8
ROUTE 10
ROUTE 11
ROUTE 12
ROUTE 20
ROUTE 23
ROUTE 27
ROUTE 28
ROUTE 31
ROUTE 32
ROUTE 57
ROUTE 58
KLAMATH NATIONAL FOREST
TRINITY NATIONAL FOREST
SHASTA NATIONAL FOREST
LASSEN NATIONAL FOREST
PLUMAS NATIONAL FOREST
SIERRA NATIONAL FOREST
STANISLAUS NATIONAL FOREST
SAN BERNARDINO NATIONAL FOREST
CLEVELAND NATIONAL FOREST
SAN FRANCISCO
SAN DIEGO
LOS ANGELES

The California Highway Commission subsequently approved this program.

The Forest Service later on refused to concur in the Auburn-Verdi project, but did concur in the other allotments.

As matters stand at the present time, therefore, there remains $200,000 unallotted in the forest highway fund, which is available for allotment at the present time. The forestry officials desire that this $200,000 be expended on roads other than the state highway system. The California Highway Commission has refused, however, to approve the allotment to any roads other than such as are on the seven per cent system, but the Commission is not insisting that it be applied to the Auburn-Verdi project. In fact, a subsequent request was made that this amount be applied towards completing the state highway into the Yosemite Valley by way of El Portal on the route from Mariposa, but the forest officials have refused to concur in this recommendation. The matter is now in the hands of the Secretary of Agriculture for decision.

On request of the U. S. Bureau of Public Roads and under the rules and regulations of the Secretary of Agriculture for administering forest roads and trails under the provisions of the Federal Highway Act, the California Highway Commission on October 5, 1922, approved and submitted to the bureau a map of the roads within and adjacent to the National Forests, which in its judgment should be included in the forest highway system as of primary importance to the state, counties, or communities thereof. There were designated 1200.16 miles in the forest highway system. All were on the state highway system and were in or adjacent to the National Forests as shown by the following table:

FOREST HIGHWAY SYSTEM.

Route	Description	Length miles
1	Crescent City to Oregon line	43.0
11	Placerville to Nevada State line	61.3
12	El Cajon to Jacumba	60.41
15	Route 1 near Calpella to east boundary Lake County	61.51
15	Nevada City to Route 37 near Cisco	24.03
18	Mariposa to Yosemite National Park	30.67
20	Three Rivers to Douglas City	73.40
21	Pulga to Quincy	55.33
23	Saugus to Palmdale	37.55
23	Red Rock to Bridgeport	242.51
28	Adin to Oregon line	81.30
29	Paynes Creek to Susanville	85 50
37	Auburn to Nevada line near Verdi	97.3
43	San Bernardino end county pavement to Big Bear Lake	38.0
57	Santa Maria to Maricopa	82.85
58	Bakersfield to Freeman	86.90
63	Big Pine to Oasis	38.6
	Total	1,200.16

TRAFFIC REGULATION.

Owing to the damage which is being done to the state highways by overloaded motor trucks and heavily loaded trucks traveling at excessive rates of speed, the Commission felt it necessary to place deputies in the field for the purpose of apprehending violators of the Motor Vehicle Act with respect to overloads.



Plate XLVI. State Highway, Siskiyou County, use of longitudinal float in finish of concrete base.



Plate XLVII. State Highway, Siskiyou County, completed concrete base.

Major C. L. J. Frohwitter, a retired regular Army officer, was employed as superintendent of traffic regulations, and beginning in December, 1921, five traffic regulation crews were placed in the field in different parts of the state.

The work was continued with marked success until August, 1922, at which time all work of this nature was suspended because it was stated that the Attorney General's office had given its opinion that it was illegal for the Superintendent of the Motor Vehicle Department to designate as field deputies any one not an employee of the Motor Vehicle Department. It is absolutely essential that the men engaged in this work be deputized as field deputies or peace officers, in order that they may have authority to stop and weigh trucks and to make arrests when necessary.

In Appendix H will be found a description of the work done by the traffic regulation crews under Major Frohwitter.

TRAFFIC CENSUS.

A census of the traffic on the California state highways is now being conducted by the United States Bureau of Public Roads in cooperation with the California Highway Commission.

A similar census was made by the Bureau of Public Roads in 1920, at the time that this agency was making a study of road conditions in California.

The work at present under way is being prosecuted on a much more extensive scale, however, than in 1920 and will cover a period of six months. There has been appropriated by the California Highway Commission $25,000 for the purpose and this appropriation will be matched by an equal amount of government funds.

RAILROAD AND HIGHWAY GRADE CROSSING SEPARATIONS.

The work of constructing grade crossing separations on the state highways of California is proceeding as rapidly as funds will permit. To date 163 separations have been made on the state highway system since work was started in 1912.

In order that this work may be prosecuted intelligently, a complete survey of the situation is now being made by the U. S. Bureau of Public Roads, the California State Railroad Commission and the California Highway Commission, in cooperation, and the results of this survey should be available before the end of 1922.

CONCLUSION.

Once more it is a pleasure to record the faithful, efficient and loyal services of the corps of assistants reporting to the State Highway Engineer and particularly to testify to the able and conscientious service of Mr. Thos. E. Stanton, Assistant State Highway Engineer, who has borne the brunt of the direction of the engineering work of the Commission since it was reorganized in 1921.

Respectfully,

A. B. Fletcher,
State Highway Engineer.

Appendix B.

LEGAL DEPARTMENT.

By Charles C. Carleton, Attorney.

The writer during the last biennium has continued to handle the several lines of activities entrusted to him in 1911 at the time of the organization of the Commission, namely: right of way, claim, legislative and legal.

The counties, in pursuance of the policy adopted by the Commission early in state highway operations, have rendered invaluable aid to the state highway enterprise in acquiring by donation, purchase, dedication and condemnation the bulk of the rights of way needed for the state highway system.

The writer has endeavored to assist the local District Attorneys in the preparation of necessary condemnation proceedings to the fullest possible extent. Fortunately, the element of time being considered, most of these cases have been settled out of court.

However, condemnation proceedings for the acquisition of state highway rights of way in most of the contested cases have not been permitted to delay construction work indefinitely, as advantage has been taken of section 14, article I of the constitution of California, many orders for immediate possession of the rights of way sought to be acquired having been obtained and money deposits made into court to secure the defendant land-owners pending actual trials and final judgments.

Singularly, during the last two years a large proportion of the court opposition to the Commission's locations and to the state's acquisition of necessary rights of way therefor has centered in Los Angeles County on the proposed Coast highway extending between Oxnard, in Ventura County, and San Juan Capistrano, in Orange County (created by the $40,000,000 state highway bond measure in 1919 and now in course of construction).

Deputies Attorney General Arthur Keetch and John Maltman of the Los Angeles branch office have borne the brunt of the contests in these cases with signal success to the state.

Several times orders of possession have been obtained by them on this route only one jump ahead of the contractor's steam shovels and the state highway work has thus been enabled to proceed without delay.

One interesting development of late in the state highway right of way work has been the constantly growing disposition of owners of timber tracts to donate standing timber along with the state highway rights of way, thereby insuring the maintenance of pleasing tree-bordered highways for the comfort and enjoyment of this and succeeding generations.

Additional ground for public parks and camp sites along the state highway system are also being obtained wherever practicable.

Claims of contractors against the state and claims of third persons against state highway contractors have absorbed much of the time of the legal department.

All claims of the contractors against the state have been adjusted satisfactorily to all concerned without recourse to the courts during the last two years.

Claims of third persons against state highway contractors, while very numerous, have also been settled in most instances outside the courts.

The legislature of 1919 much clarified the procedure in the prosecution of claims of creditors against state highway contractors, prescribing definite time limits for the commencement of such actions.

Theretofore the Commission felt itself obligated, through abundance of caution, to withhold contractors' moneys when claims were filed against the contractors in order to answer to such claims for as long as four years, which, of course, caused considerable embarrassment to contractors when claimants were dilatory or spiteful in properly following up their claims.

Now suits must be commenced within the much shorter period fixed by the 1919 legislature, thereby resulting in the claims filed on any particular contract being marshalled and disposed of in a much more expeditious manner than formerly.

The writer's efforts in the 1921 legislature were mainly devoted to the preparation of a gasoline tax measure in order to provide additional revenues for state highway betterments and of a set of amendments to the Motor Vehicle Act, designed to somewhat further reduce permissible weights of vehicles and loads on the highways and to obtain increased taxes from motor trucks and stages more in proportion to their actual use and abuse of the highways.

But owing to circumstances over which the Commission had no control, both these measures failed of final adoption.

An act of great importance to the Commission, chapter 58, Statutes of 1921, amending section 588 of the Penal Code, was prepared by District Attorney H. W. McGowan of Glenn County and the writer and passed by the legislature.

The evil of landowners flooding the highways with rice and other irrigation waters had become flagrant and immeasurable damage was being done to the highways of California.

The above section of the Penal Code, as now amended, provides public prosecutors with a direct and effective legal instrument to punish such offenders.

The writer has appeared for the Commission in a number of special matters before the Railroad Commission and other public boards and officials, federal, state, county and municipal, during the past two years.

The Railroad Commission has manifested in recent grade separation cases decided by that body an evident intention of requiring railroad corporations to bear their rightful share of the cost thereof, even though the new highway overhead crossing or subway, as the case may be, is located some distance from an existing grade crossing, and even though the existing grade crossing can not be entirely abandoned.

In other words, the Railroad Commission is taking the position that where a new state highway crossing structure will separate the highway and railroad grades and will actually handle practically all of the traffic in its particular vicinity, the railroad corporations should contribute toward the cost thereof despite the fact that existing grade crossings in



Plate XLVIII. State Highway, Mendocino County, completed graded roadway.



Plate XLIX. State Highway, Mendocino County, completed graded roadway.

the neighborhood can not be completely closed to all public highway use.

In addition to the other activities herein mentioned, the routine work of the legal department, such as the preparation and examination of contracts, bonds, deeds, assignments, releases, resolutions, notices and other papers, the rendering of opinions on the many questions arising pertaining to the state highway operations, the searching of land titles, the adjustment of right of way and other controversies, is ever increasing in volume, all combining to require the writer to continue to devote his time, as in the past, exclusively to the service of the state.

Among the court cases arising during the last two years, in which the Commission has been directly interested, may be cited the following:

Hueneme, Malibu and Port Los Angeles Railway vs. *A. B. Fletcher, California Highway Commission et al.* (No. 107302, Superior Court of Los Angeles County.) An injunction proceeding to restrain the defendants from constructing a certain portion of the Coast highway north of Santa Monica in Los Angeles County.

The court refused to grant an injunction and plaintiff has appealed to the Supreme Court of California, where the case is now pending.

Crocker-Huffman Land and Water Company vs. *State Department of Engineering* (Superior Court of Merced County). An injunction proceeding to restrain the state and its contractors from excavating certain ditches along a section of state highway under construction in Merced County. Settled out of court.

W. H. Goff vs. *United States Fidelity and Guaranty Company, Fred Hoffman, State of California et al.* (No. B-97589, Superior Court of Los Angeles County.) An action commenced in an endeavor to collect the claim of a subcontractor against a state highway contractor. Closed in so far as the state is concerned.

In the Matter of J. E. Lee, Bankrupt (District Court of the United States for the Southern District of California). This proceeding related to the distribution of funds in the hands of the California Highway Commission among the assignees and creditors of J. E. Lee, the original contractor on a state highway contract in Merced County. Closed.

Robert F. Jones vs. *Southern Pacific Railroad Company, California Highway Commission et al.* (No. B-98491, Superior Court of Los Angeles County.) Action which contests claim of state authorities to certain state highway right of way on Coast road, Los Angeles County.

In the Matter of the Northern California Construction Company, Alleged Bankrupt (No. 12406, District Court of the United States, Southern Division of the Northern District of California). An action still pending to determine financial status of a state highway corporate contractor which is now completing a state highway contract in Tuolumne County.

The People of the State of California vs. *Robert F. Jones et al.* (No. 105355, Superior Court of Los Angeles County.) Condemnation proceeding still pending for state highway right of way on Coast road, Los Angeles County.

S. H. Mitchell vs. *Wm. D. Stephens and others as the Advisory Board of the State Department of Engineering et al.* (District Court of the United States, Southern Division of the Southern District of California.) Action still pending arising out of the use of certain federal aid moneys to facilitate the sale of certain state highway bonds.



Plate L. State Highway, Sonoma County, completed concrete base.



Plate LI. State Highway, Fresno County, completed concrete base near Coalinga.

People of the State of California vs. *Southern Pacific Company* (No. 110326, Superior Court of Los Angeles County). Condemnation proceeding still pending for certain state highway right of way near Santa Monica in Los Angeles County.

American Indemnity Company vs. *Northern California Construction Company, California Highway Commission et al.* (No. 125673, Superior Court of the City and County of San Francisco.) An injunction proceeding. Dismissed.

People of the State of California vs. *Title Insurance Company* (No. 108032, Superior Court of Los Angeles County). Condemnation proceeding still pending for certain state highway right of way on Coast road north of Santa Monica in Los Angeles County.

Ocean Shore Railroad Company vs. *Spring Valley Water Company, State of California et al.* (No. 8831, Superior Court of San Mateo County.) An action to quiet title. Many years ago the Spring Valley Water Company conveyed a railroad right of way to the Ocean Shore Railroad Company. The Railroad Company has ceased operations of its railroad but still claims title to the strip of land originally deeded to it by the Spring Valley Water Company.

The Spring Valley Water Company and the State of California, the former having recently conveyed a portion of the strip of land in dispute to the state for state highway purposes, claim that when the railroad right of way ceased to be used for railroad purposes it reverted to the Spring Valley Water Company and its successors in interest. Trial will be held before end of year, 1922.

B. B. Hutson vs. *Frank Johnson, California Highway Commission* (Superior Court of Mendocino County). An action on a withhold notice.

Scott W. Alexander vs. *A. B. Fletcher, Director of Public Works, and California Highway Commission* (No. B-97442, Superior Court of Los Angeles County). In this case an important decision was rendered by Superior Court Judge J. Perry Wood of Los Angeles County in favor of the California Highway Commission.

For the first time in the history of the Commission an attempt was made through the medium of a court to set aside the determination of the Commission in the selection of a route for a state highway.

The suit was brought by a resident of Long Beach to compel the Commission to build the particular portion of the proposed O_nard-San Juan Capistrano state highway lying between Long Beach and Seal Beach immediately along the shore between these points instead of slightly inland from the shore, the latter location having been decided by the Commission to be the more economical and practical one to be followed.

By choosing the inland route the Commission avoided the necessity of constructing two expensive bascule bridges over inlets of the sea and avoided serious right of way difficulties.

Judge Wood held that the choosing of the route rested entirely within the discretion of the Commission, that the court could not interfere unless bad faith was shown, and that the plaintiff had failed to establish this.

Thereupon Judge Wood ordered that judgment of non-suit be entered against the plaintiff.

Appendix C.

MOTOR LUBRICATING OILS.

By Thos. E. Stanton, Assistant State Highway Engineer.

Owing to the large number of motor trucks and other motor vehicles operated by the California Highway Commission, the Division of Highways is an extensive purchaser of lubricating oils.

The trucks especially are frequently operated under trying conditions and therefore the elimination of any factor which adversely affects the condition of the motor is of considerable importance.

The most common source of supply from which motor lubricating oils are secured is crude petroleum.

The chief fields producing crude petroleum in America are located in Pennsylvania, the central United States, California and Texas. The base of the Pennsylvania and other northern and eastern crudes is paraffine, whereas the base of the Gulf and California crudes is almost universally asphalt. The finished oils from these two classes of crudes are referred to as paraffine base and asphalt base oils.

The viscosities of asphalt base oils are subject to a rapid decrease as the temperature of the oil is increased. An asphaltic base oil may have a viscosity from two to three times as high as a paraffine base oil at 100° F., but when the two oils are compared at a temperature of 210° their viscosities will be found to be approximately the same. See Fig. 1 showing viscosity curves for heavy and extra heavy California asphaltic base and paraffine base oils.

This fact makes it necessary to select an asphalt base lubricating oil from its viscosity at the desired working temperature of the bearing, as the viscosity at 100° F. frequently used to indicate the body of the oil is no absolute indication of its viscosity at working temperature.

Starting with oils of equal viscosity at 100° F. the asphalt base oil, thinning out so much more rapidly than the paraffine oil, causes the impression that the oil loses its lubricating qualities and also that it breaks down under high temperatures with, it has been claimed, the resultant formation of free carbon. As the California asphaltic base oils are considerably cheaper than the imported Eastern paraffine base oils, the determination, if possible, of the relative merits of the two grades was considered of such importance that a series of tests was carried on by the Commission during the summers of 1921 and 1922 in an effort to determine the relative merits of some of the principal brands of the lubricating oils on the market.

In one portion of California a paraffine base oil is produced, thus giving an opportunity to compare two oils made from California crudes, one with a paraffine base and one with an asphalt base.

Test No. 1.

Six trucks which had been secured as excess war equipment from the United States government, and which were practically new, having been operated less than 100 miles, were used in the conduct of the test. The

truck units were as nearly identical as practicable, having the same make of engines, magnetos and carburetors.

Three brands of oil manufactured by well known reliable manufacturers were used in the tests; one a well known Eastern paraffine base oil, one a California paraffine base oil and one a well known California asphalt base oil; two trucks to each brand of oil.

The test was carried on at the California Highway Commission testing laboratory on the State Fair grounds, Sacramento. The trucks were blocked up so that the wheels were free from the ground. They were then serviced with gasoline and with the oils which it was desired to test, set in high gear and run continuously at a truck speed of ten miles per hour, eight hours per day for ten consecutive days.

Before starting the test the crank case was drained and filled with new oil. After running the motor for a few minutes, the oil was drained off and the case again filled with a measured amount of fresh oil to the proper level of the oil gauge.

The trucks were equipped with two thermometers and an oil pressure gauge. One thermometer was placed in the water line between the motor and the radiator, the other being attached to the crank case in order to record the oil temperatures. The pressure gauge was attached to the oil feed line.

At the beginning and also at the completion of each day's run the compression in each motor cylinder was measured. The oil temperature, oil pressure, water temperature, atmospheric temperature and mileage readings were taken each hour.

At the end of each day's run the trucks were serviced with fresh oil and gasoline without removing the old oil, a record being kept of the oil used. Every second day a pint of oil was drawn from each crank case and set aside for test.

Upon completion of the ten-day run the oil was drained from the crank case, the motor was torn down and an inspection made of the bearings, etc. All carbon was removed from the piston heads, cylinders and valves and weighed.

A second run of ten days was then made with the two California oils, the paraffine base oil being used in the truck originally operated with asphalt base oil and vice versa.

Samples of the fresh and used oils were then sent to the chemical testing laboratory of the Commission in Sacramento and to the Bureau of Standards in Washington, D. C.

Viscosity, cold, flash and fire tests were made at the Sacramento laboratory.

The Bureau of Standards made tests to determine the grade of the oils, gravity, flash, fire, viscosity, pour, Conradson carbon, Waters carbonization, demulsibility, sediment, water and ash.

The viscosity tests at Sacramento were made at both high and low temperatures. For the high temperature viscosity tests the Saybolt viscosimeter and 60 c.c. viscosimeter flask was used.

In obtaining the viscosities at low temperature it was necessary to have an air-tight bath and an instrument which had a larger orifice than the Saybolt. A Tagliabue viscosimeter was modified by insulating the bath with asbestos, which was then shellacked. The cold water was run into



Plate LII. State Highway along the coast in Del Norte County.



Plate LIII. State Highway, through the redwoods in Del Norte County.

the bath from above at a rate that would give the outflowing water a temperature two degrees above the required temperature, whereas the mixture of ice and water when run in from the reservoir was about two degrees below the required temperature. This procedure was found to give the best results in maintaining the oil to be tested at the proper temperature while in the cup.

In taking the readings the ordinary spout of the viscosimeter was not used, the outlet tube being used without reduction in size.

This method was used in order to compare the oils at such low temperatures that the ordinary Saybolt viscosimeter could not be used.

Results Secured from Test No. 1.

The Eastern and the California "paraffine" base oils were definitely determined by the Bureau of Standards to have been manufactured from a crude, relatively high in paraffines, whereas the other California oil was determined to be from a napthene base crude.

The following table shows the gasoline and oil consumption and the amount of carbon formed:

TABLE SHOWING GASOLINE AND OIL CONSUMPTION AND CARBON DEPOSIT.

Test No. 1.

Oil used	Truck No.	Total carbon grams	Miles per quart oil	Miles per gallon gasoline
Eastern paraffine base	814	108	32.88	7.15
	810	95	99.81	6.65
Average		101	66.35	6.90
California paraffine base	801	86	88.49	7.41
	799	88	69.23	7.04
	806	74	107.53	6.73
	819	105	58.49	6.85
Average		88	80.93	7.01
California asphalt base	806	52	116.87	6.36
	819	57	71.33	6.67
	801	96	54.83	7.35
	799	89	37.37	8.11
Average		73	70.10	7.12

A close study of the above table does not indicate any marked superiority of one oil over the other.

While the asphalt base oil shows the least carbon and highest average gasoline mileage of the three oils tested, the oil consumption favors the California paraffine oil.

Though the averages are close, the wide range between different trucks where the same oil is used is a practical demonstration of the difficulty of securing identical operating conditions with two trucks or with the same truck after overhauling. Carburetor and other adjustments undoubtedly have a marked effect on the results. Where the results when operating under close control show such a marked variation and yet do not show any decided advantage in favor of any one oil when the average figures are compared, it can readily be seen how impossible it is for

the average operator to arrive at any intelligent comparison when operating under the usual working conditions.

Fig. 2 shows the viscosity curves for the three oils.

At 70° it will be noted that the California paraffine base oil (heavy) showed a viscosity of about 700, or less than one-third the viscosity of the asphaltic base oil. At 250°, however, the viscosity was the same.

Figs. 3 and 4 show the viscosity of samples of used oil taken at the end of four and ten days.

It will be noted that the relative viscosity is maintained throughout and that the asphalt base oil did not lose its viscosity through use more rapidly than the paraffine base oils.

The results secured by the Bureau of Standards checked very closely with the results secured at the Highway Commission laboratory in Sacramento.

Fig. 5 shows the modified Tagliabue viscosity curves for temperatures between 30° and 100°.

One interesting result shown by these curves is that while the viscosity of the asphalt base oil increases very rapidly with a drop in temperature from 100° to 46°, below 46° the viscosity of the California paraffine base oil increases so rapidly that the two oils show practically the same viscosity at 40°. Below 40° the paraffine base oil hardens very rapidly until it reaches the cold or freezing point at 25°, whereas the freezing point of the asphalt base oil was found at approximately 10° F. by the modified Tagliabue viscosimeter used in the test.

The three oils gave practically the same flash and fire tests.

The temperature of the motors and of the oil in all trucks during operation was approximately the same and the motors were all found to be in practically the same condition when examined after the test run.

Test No. 2.

In order to meet the objection that Test No. 1 had not been conducted under actual field operating conditions where either the load or the grades and surface of the road are such as to require the use of low gear for long distances, two three-ton trucks, similar in make and condition, one using an asphaltic and the other a paraffine base oil, were loaded with three tons of supplies and sent on a round trip over the Sierra Nevadas from Sacramento to Alpine County and return, the load being left on the work in Alpine County.

On the first day of the trip heavy pulls were encountered between White Rock and Placerville, a large portion of the distance being made in second with an occasional use of low gear.

The second day developed a great deal of heavy pulling, second and low gear being used most of the time.

The third day of the trip developed the hardest pulls, the first three miles being through sand, all second gear work; the next six or seven miles being a steady up-hill climb, all second or low gear.

The balance of the trip was fairly easy going.

In general the trip was well routed for the purpose, as many steep and long grades were encountered. The first three days the trucks were worked hard and the water kept boiling about three-quarters of the time.



Plate LIV. State Highway, Sutter County, showing warning signal and sign at Lomo crossing.

Following is a tabulation of the results secured:

Truck No.	Gross weights	Miles traveled	Oil	Oil used quarts	Gas. gals.	Carbon grams	Temp. of oil Low	Temp. of oil High
S14	14,519 lbs.	331.5	Asphalt base___	14.5	98	65	60°	180°
S19	14,525 lbs.	331.5	Paraffine base_	14.0	97	78	60°	190°

No. 7 asphalt base and heavy paraffine base oils were used.

Test No. 3.

In order to ascertain the relative action of the two types of oils under the extreme heat conditions prevailing in the Imperial Valley, a third series of tests was made during the latter part of May, 1922, with trucks engaged in hauling construction materials for a section of concrete pavement being constructed by day labor several miles west of Westmoreland.

A heavy paraffine base oil and No. 7 and No. 9 asphaltic base oils were used. The trucks used had already been through a season of hard work and would have been in the shop for repairs had it not been necessary to use all equipment available and exert every ounce of energy to complete the work before the extreme heat of summer. The roads hauled over were practically impassable.

Eight three and one-half-to five-ton trucks were used in the test, four using the paraffine base oil, two asphalt base No. 7 and two asphalt base No. 9.

Before filling the trucks with fresh oil, the crank cases were drained and cleaned with a flushing oil. After the trucks were serviced they were run between the railroad siding at Westmoreland and the mixer, a distance of about seven miles each way, delivering to the mixer four and one-half tons of concrete material and returning unloaded. The route was for the greater part through sand with considerable hard pulling, mostly second and third gear work. The atmospheric temperature during the test varied from 104° to 118°. After the trucks had been run long enough to obtain the desired records, they were drained of oil, flushed and refilled with new oil, the trucks originally using the paraffine oil being now filled with asphalt oil and vice versa; except one truck which had been dropped on account of a stripped worm gear and one other truck which was allowed to run without change.

The results of this test did not show any appreciable difference in the value of the oils used.

The consensus of opinion among the truckdrivers favored the No. 9 asphaltic base oil. The quantities consumed were approximately equal for each grade of oil.

Conclusions.

The net result of all three tests did not indicate any appreciable superiority in either grade of oil over the other.

Although thinning out more rapidly, the asphaltic base oil did not show any greater breaking down under high working temperatures than the paraffine base oil, nor was there a greater deposit of carbon. Neither did the viscosity after use increase or decrease any more in the case of one than the other.

Where one grade of oil is used all seasons of the year and under a wide range of temperature there appears to be some practical advan-

tages in the use of the paraffine base oil, as for normal temperatures above 40° this oil is less stiff and therefore it is easier to start the motor in cold weather than with an asphaltic base oil of the same viscosity at working temperatures.

There appears to be no reason, however, why a lighter grade of asphaltic base oil can not be used in cold weather than in hot weather and why, if a proper selection is made based on weather and working conditions, there should be any practical difficulties with this grade of oil.

VISCOSITY TABLE

Temperature Fahr.	California Asphaltic Base "7	California Asphaltic Base "9	California Paraffin Base (Heavy)	California Paraffin Base (Ex. Heavy)
100°	563 sec.	1390 sec.	306 sec.	437 sec.
150°	134 "	236 "	129 "	155 "
210°	53 "	75 "	53 "	69 "

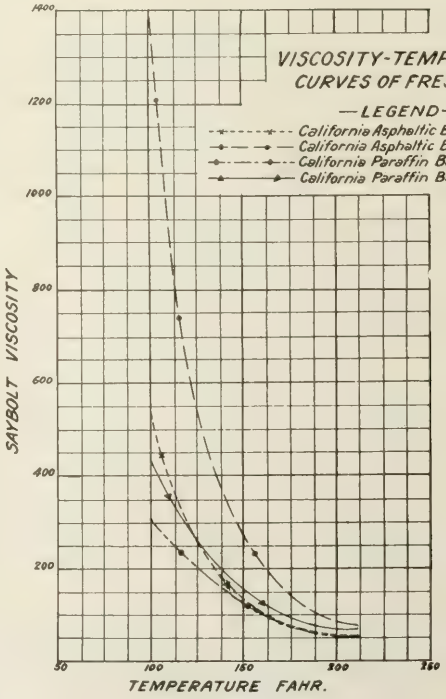


Fig-1

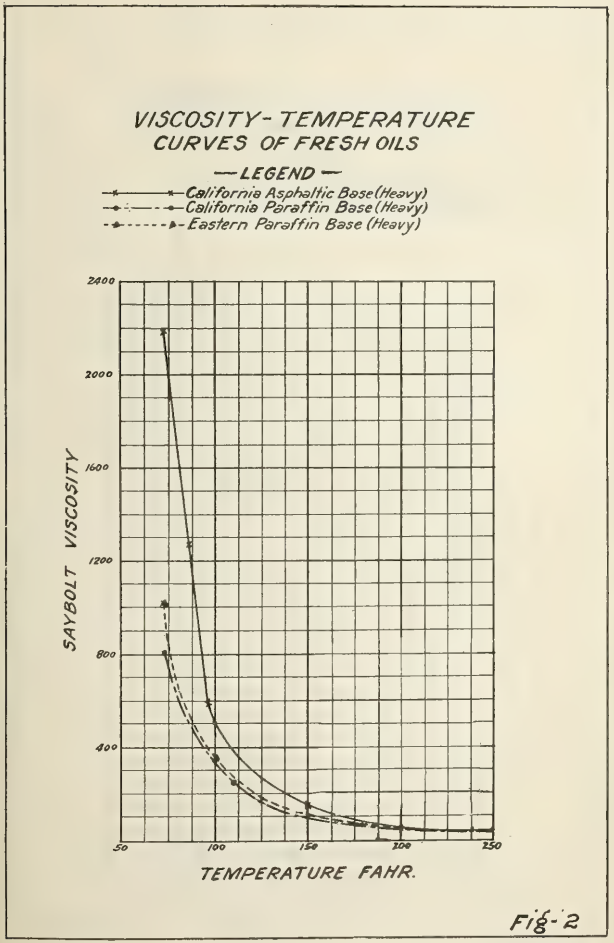

VISCOSITY-TEMPERATURE
CURVES OF FRESH OILS
—LEGEND—
California Asphaltic Base (Heavy)
California Paraffin Base (Heavy)
Eastern Paraffin Base (Heavy)
SAYBOLT VISCOSITY
2400
2000
1600
1200
800
400
50
100
150
200
250
TEMPERATURE FAHR.

Fig-2

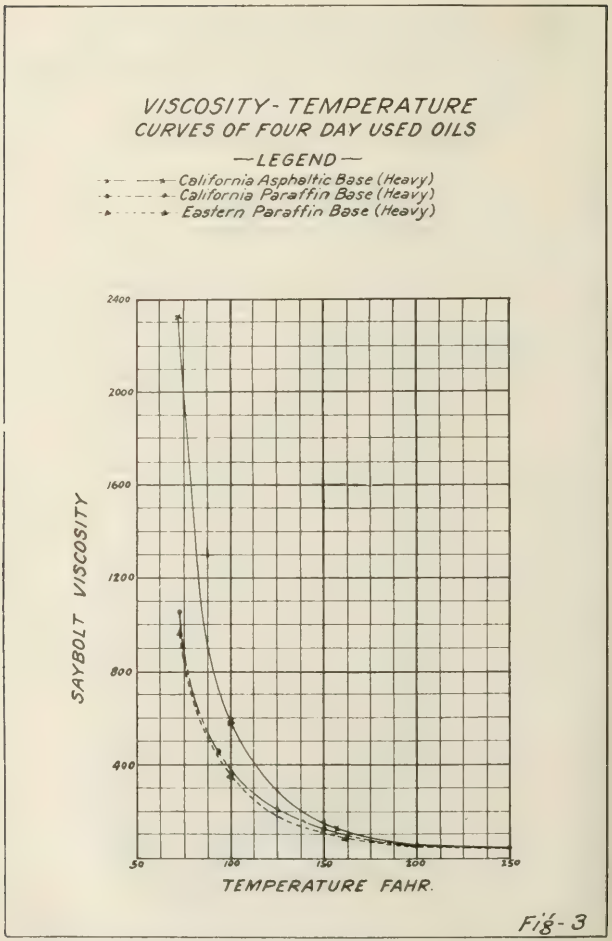
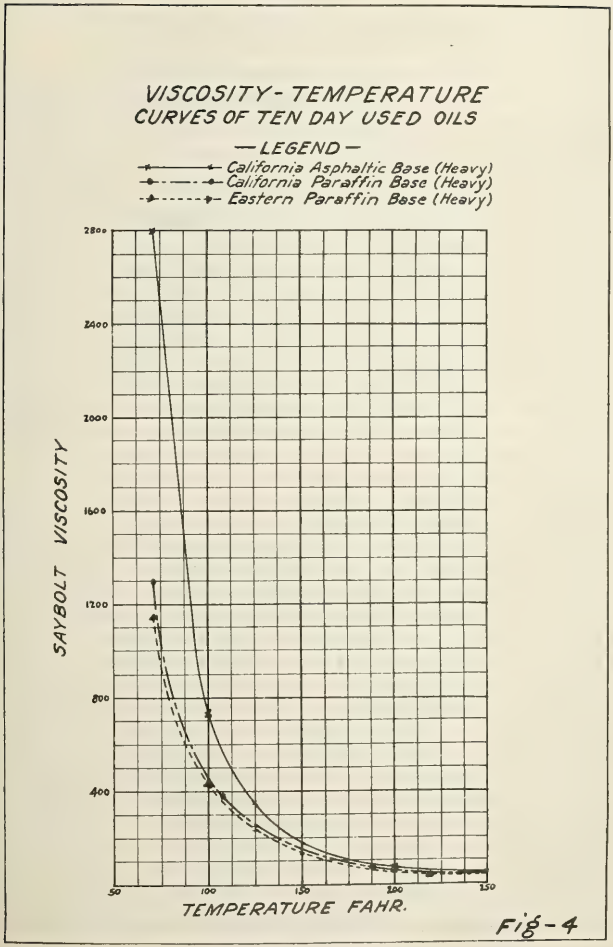
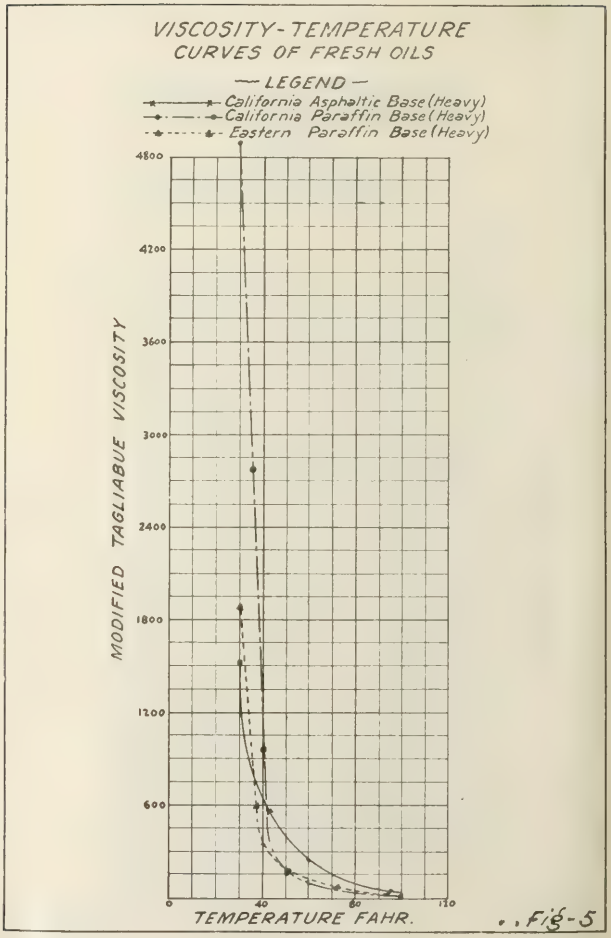

VISCOSITY - TEMPERATURE
CURVES OF FOUR DAY USED OILS
— LEGEND —
California Asphaltic Base (Heavy)
California Paraffin Base (Heavy)
Eastern Paraffin Base (Heavy)
SAYBOLT VISCOSITY
2400
2000
1600
1200
800
400
50
100
150
200
250
TEMPERATURE FAHR.

Fig. 3


VISCOSITY-TEMPERATURE
CURVES OF TEN DAY USED OILS
—LEGEND—
California Asphaltic Base (Heavy)
California Paraffin Base (Heavy)
Eastern Paraffin Base (Heavy)
SAYBOLT VISCOSITY
2800
2400
2000
1600
1200
800
400
50
100
150
200
250
TEMPERATURE FAHR.
Fig-4


VISCOSITY-TEMPERATURE
CURVES OF FRESH OILS
— LEGEND —
California Asphaltic Base (Heavy)
California Paraffin Base (Heavy)
Eastern Paraffin Base (Heavy)
MODIFIED TAGLIABUE VISCOSITY
4800
4200
3600
3000
2400
1800
1200
600
0
40
60
110
TEMPERATURE FAHR.
Fig-5

Appendix D.

EQUIPMENT AND SHOPS.

By R. H. Stalnaker, Assistant Highway Engineer.

EXCESS WAR MATERIAL.

At the close of the World War, the federal government had on hand an enormous quantity of equipment, machinery, and supplies, much of which has been distributed to the State Highway Departments of the several states, under the provisions of three acts of Congress; the Post Office Appropriation Act of 1919, the so-called Kahn Bill of 1920, and the Federal Highway Act of 1921. All three of these bills provide for the distribution of the material upon the same basis as that provided for federal aid roads. The Post Office Appropriation Act of 1919 and the Federal HighwayAct of 1921 required the states to pay the cost of packing and loading this material and the freight on the same, while the Kahn Bill provided that the states were to pay to the government 20 per cent of the estimated value of all material distributed under it, but also provided that the freight paid on such material might be deducted from such payments. However, under this bill both the charges and freight allowances are cumulative, and, in the case of California, on account of the long freight hauls on most of the material and the large quantity of heavy material of low intrinsic value, the total freight paid will probably exceed the 20 per cent valuation, so that, as a matter of fact, the total cost of this material will only be the freight and handling charges.

Under the provisions of these three acts, California had, up to June 30, 1922, received 884 trucks, 70 automobiles, other than Fords, 84 Fords, 121 motorcycles, several carloads of automobile and truck parts, three carloads of shovels, two of railroad picks, one of pick handles, several carloads of machine tools and road machinery, 300,000 yards of canvas of various weights, 1,750,000 pounds of T. N. T., hand grenade, and black blasting powder, and large quantities of other equipment and material, the total original cost to the government of which is stated by the United States Bureau of Public Roads to be approximately $4,463,000. Much of the equipment, however, was received in a used condition and its actual value at time of delivery was much below the original cost.

The total payments for freight, loading charges, etc., on this material to June 30, 1922, aggregate approximately $250,000.

During the past biennium a considerable number of used motor vehicles have been taken over at the various army posts in this state, many of which were practically worn out and only valuable as a source of spare parts. Such of these vehicles as are not worth repairing are being dismantled and all usable parts placed in stock for issue as required.

The Kahn Bill provides for the leasing by the states to the counties and other governmental subdivisions, for use in the construction and maintenance of public roads, of motor vehicles and other excess war

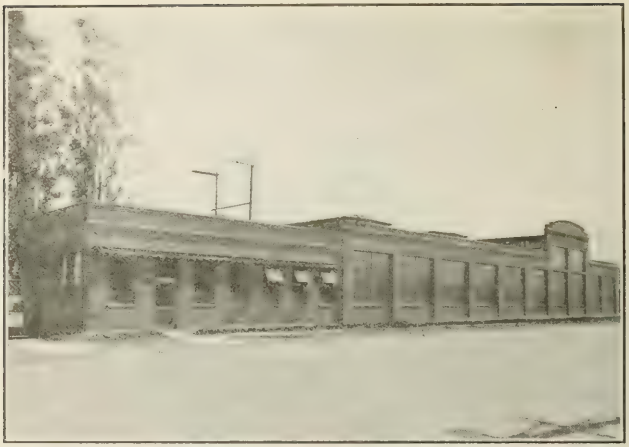


Plate LV. California Highway Commission Shops, Sacramento.



Plate LVI. California Highway Commission Shops, Sacramento.

DISPOSITION OF MOTOR VEHICLES RECEIVED FROM FEDERAL GOVERNMENT AS OF JUNE 30, 1922.

NAME	TYPE	CAPACITY TONS	UNDISTRIBUTED	SOLD, DISMANTLED, ETC.	HDQRS	DIVISION I	DIVISION II	DIVISION III	DIVISION IV	DIVISION V	DIVISION VI	DIVISION VII	OTHER STATE DEPTS.	CITIES	COUNTIES	TOTAL
Aviation, Heavy	Truck	3				13	4	3		2		6				28
Aviation, Light	Truck	1	12			6	7	2	6	4	5	2	1			45
Buick	Touring			4		1										5
Cleveland	Motorcycle				1	1	3	3	2	1	4	3				18
Commerce	Truck	1				1	3		2	1		3				10
Dodge	Touring		3	8	3	4	4	5	5	3	4	5				44
Dodge	Roadster		1								2	2	1			6
Dodge	Light Delivery		1		1			1								2
Federal	Truck	5		2	1					1						7
Ford	Touring			5	1	1	13	5	5	3	1	5	1			35
Ford	Roadster								3		2	2				7
Ford	Truck	1						7				2	1			10
Ford	Light Delivery		7	2				1	2							12
Ford	Ambulance			3		3	2	2	1	2	4	2	1			20
Franklin	Touring			1												1
F. W. D.	Truck	3	19	1			9	22	11					2		64
G. M. C.	Truck	3/4	4	1			8	1	1	2	1	1				14
G. M. C.	Truck	1			1		2		1		2	10				16
Harley-Davidson	Motorcycle		47	12	15	3	6	2	3	3	5	1				97
Hurlburt	Truck	5									1					1
Hudson	Limousine		2													2
Indian	Motorcycle		5									1				6
International	Truck	2		2			6	2		2	5	8			8	33
Kelly-Springfield	Truck	3	2		3							4	4		7	20
Locomobile	Truck	6										2				2
Liberty	Truck	3	64		19	1	3				3				15	105
Moreland	Truck	3/4							1			1				2
Moreland	Truck	1										1				1
Moreland	Truck	1½													1	1
Moreland	Truck	2½	1						1			9			8	19
Moreland	Truck	4				1	1		3	1		2		1	25	34
Nash Quad	Truck	3	13	12	1	11	24	45	12	12	14	25	1		52	222
Overland	Touring			1												1
Packard	Truck	1½	5		2			1								8
Packard	Truck	3	8	1	2	11	16	15	8	3	8	23	1			96
Pearless	Truck	3				5			12			6				23
Pierce Arrow	Truck	5				2	4	7	4	7	7	9				40
Pierce Arrow	Truck	2	5				3	2								10
Republic	Truck	3/4							2							2
Service	Ambulance								1							1
Standard	Truck	3½	7		6	5	22		5	2	4				2	53
Standard	Truck	2		1												1
Studebaker	Touring			4			1		1							6
Studebaker	Roadster											1				1
Studebaker	Limousine						1									1
Velie	Truck	3½		4												4
White	Truck	3/4	4													4
White	Truck	1				1	2	1								4
White	Truck	1½	1			1	2	1		3		4	1			12
White	Truck	3	4													4
TOTALS			215	64	56	77	129	136	92	52	72	140	12	1	130	1159

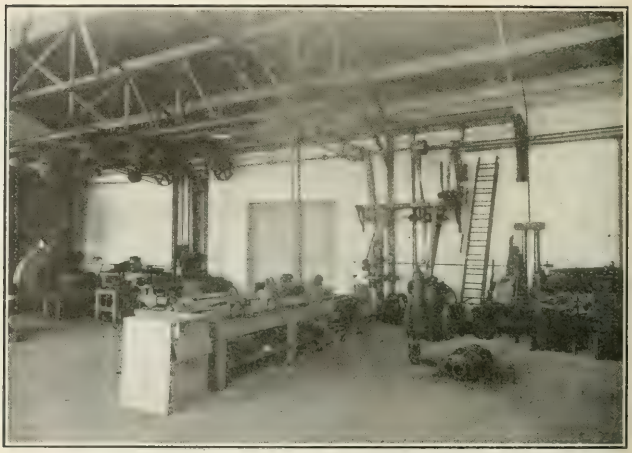


Plate LVII. California Highway Commission Shops, Sacramento.

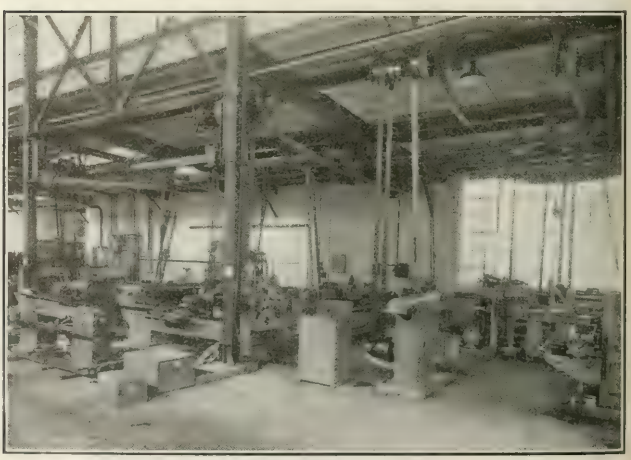


Plate LVIII. California Highway Commission Shops, Sacramento.

material, and under the provisions of this act the Commission has made three trucks available to each county, and practically all the counties have leased trucks under these offers.

SHOPS AND MAINTENANCE YARDS.

In order to house and care for the trucks and equipment allotted the several divisions and to facilitate the issuance of tools and materials as needed, division shops and warehouses have been established at Willits, Redding, Fruitvale, Petaluma, San Jose, San Luis Obispo, Fresno, Bishop and Lankershim, and a central shop and warehouses established at Sacramento.

The several division shops have been equipped with machinery and tools necessary for making routine repairs and the headquarters shop at Sacramento is fully equipped for the overhauling of all the equipment of the Commission. Nearly all the machinery and tools needed to equip these shops were received from the federal government.

The headquarters shop and warehouses are located on both sides of Thirty-fourth street, between R street and Serra Way, Sacramento. A spur track from the R street line of the Southern Pacific provides shipping facilities.

The shop is a one-story brick building, well lighted, and covering a floor area of about 26,000 square feet. It is completely equipped for the repair of all classes of equipment, and is one of the most complete shops of this nature in the state. The machine shop equipment includes three lathes, a planer, crankshaft grinder, cylinder grinder, universal and cutter grinder, five-foot radial drill, universal milling machine, hand milling machine, 28-inch sliding head drill, sensitive drill, tool grinders and other minor tools. The equipment of the blacksmith shop includes spring and felloe-band furnaces, heat-treating furnace, two down-draft forges, a hydraulic tire press, oxy-acetylene welding and cutting torches and other minor tools.

Two corrugated iron warehouses, each 60 x 140 feet, have been erected to house trucks and materials awaiting distribution, and a galvanized iron building on the west side of Thirty-fourth street, formerly occupied as a shop by the Commission, is now utilized as a warehouse for small tools and supplies.

In addition to these buildings, storage space in the city corporation yard and at the State Fair ground, has also been occupied through the courtesy of the officials in charge.

Prior to the distribution of surplus war material by the government, comparatively little equipment was owned by the Commission. As soon as it became apparent that a considerable quantity of equipment would be received from the government, an equipment department was organized at headquarters and the general charge of all equipment, as well as the distribution of supplies from government stock, placed in its custody.

This department is also in direct charge of the central repair shops at Sacramento, and exercises a general supervision over the use and repair of the equipment of the several divisions.

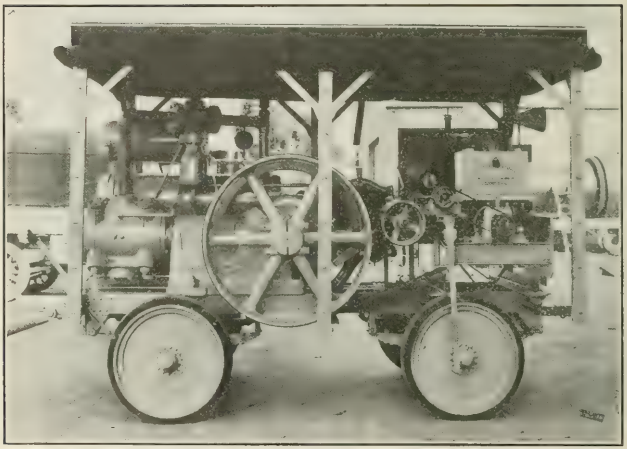


Plate LIX. Air compressor outfit for sand blasting and painting bridges assembled at the shops of the Highway Commission at Sacramento.

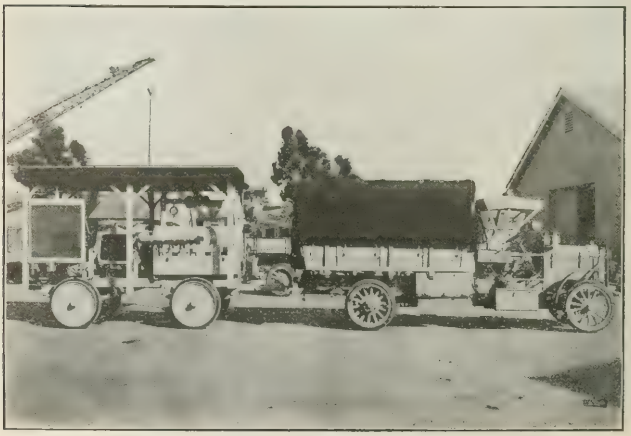


Plate LX. Complete air compressor outfit fully equipped.

Appendix E.

ACCOUNTING DEPARTMENT AND FINANCIAL STATEMENT.

By H. B. Weaver, Chief Accountant.

At the time the Department of Public Works came into existence, the accounting work of the different divisions of the department was brought under one head and to a considerable extent the work of the different divisions was made uniform.

In all divisions except one, the work was of such a nature that this could be done, but in the case of the Division of Land Settlement, many of the transactions were entirely different from those handled by the other divisions. Consequently, although part of the work was made uniform with the other divisions, much of it is yet handled by the local offices in the same manner as formerly.

The accounting work of the Division of Highways has greatly increased during the last biennium. By referring to the "Statement of Expenditures" on page number 118 it will be noted that the expenditures made under the direction of this Commission increased from $9,279,623.91 in 1920 to $14,144,741.83 in 1921. At the time of writing this report, it appears probable that the expenditures for the year 1922 will exceed $18,000,000. In 1918, about 3000 claims were being audited and handled monthly by the accounting department; by 1920, the number had increased to approximately 4500, and at present, the number of claims being audited and handled is approximately 7000 per month.

During the biennium, federal aid was requested from the federal government to the extent of over $3,000,000, and to support the vouchers for this amount it was necessary to render, in full detail, schedules of payments covering more than twice that amount.

Included in this appendix is the "Statement of Condition" of June 30, 1922, statements showing expenditures in the different counties, from the First, Second and Third State Highway Funds during the last two years, and the consolidated statement showing all expenditures made by this Commission since 1912.

In appendix "O" will be found a full statement of expenditures for maintenance, together with an analysis of such expenditures.

STATEMENT OF CONDITION.

June 30, 1922.

(Recapitulation.)

Assets.

First State Highway Fund expenditures	$18,002,129 00
Second State Highway Fund expenditures	14,876,883 42
Third State Highway Fund expenditures	18,710,116 47
Motor Vehicle Fund expenditures	11,902,862 76
Special appropriation expenditures	123,477 90
Expenditures, contributions by counties and cities	943,785 05
Expenditures Federal Aid	3,586,827 31
Discount on Third State Highway bonds	222,160 50
Cash on hand	109,911 19
Funds in treasury	7,601,158 05
Total assets	$76,079,310 65

Liabilities.

55	Vouchers payable	$620,019 07
57	First State Highway bonds	18,000,000 00
58A	Donations	945,399 24
60	Unclaimed wages (State Highway Fund)	2,286 47
60A	Unclaimed wages (Motor Vehicle Fund)	549 56
62	Motor Vehicle Fund apportionments	11,992,556 14
64	General appropriations, chapter 704, Acts 1915	7,321 86
65	General appropriations, chapter 708, Acts 1915	7,986 50
66	Premiums (First State Highway bonds)	2,129 00
67	Federal Aid road account	3,808,987 81
68	Appropriation, chapter 746, Acts 1917	250,000 00
69	Second State Highway bonds	15,000,000 00
70	Premiums (Second State Highway bonds)	25 00
73	Revolving Fund Reserve (First State Highway Fund)	100,000 00
74	Revolving Fund Reserve (Second State Highway Fund)	50,000 00
81	Revolving Fund Reserve (Third State Highway Fund)	50,000 00
75	Third State Highway bonds	24,000,000 00
78	Premiums (Third State Highway bonds)	1,134,550 00
80	Appropriation, chapter 888, Acts 1921	70,000 00
82	Appropriation, chapter 883, Acts 1921	30,000 00
83	Appropriation, chapter 832, Acts 1921	7,500 00
	Total liabilities	$76,079,310 65

STATEMENT OF CONDITION.

June 30, 1922.

(Details.)

Assets.

First State Highway Fund expenditures:			
2	Highways in process		$16,308,250 14
5	Sand plants		20,474 64
20	Construction equipment	$18,255 04	
21	Engineering equipment	18,914 43	
22	Furniture and fixtures	17,038 04	
23	Stable equipment	12,477 54	
24	Automobile equipment	40,839 04	
25	Camp equipment	4,744 67	
26	Laboratory equipment	2,847 42	
	Total equipment		115,117 08
35	Store account		21,174 76
43	Headquarters expense	$272,101 01	
44	Divisions expense	372,381 08	
72	County expense	892,630 29	
	Total expense		1,537,112 38
	Total State Highway Fund (first) expenditures		$18,002,129 00
Second State Highway Fund expenditures:			
2	Highways in process		$13,090,659 28
202	Highways in process (new routes)		714 76
4	Office buildings		46 87
5	Sand plants		14,603 91
10	Maintenance yards		37,648 54
11	Powder magazines		12,289 50
20	Construction equipment	$117,134 94	
21	Engineering equipment	22,247 45	
22	Furniture and fixtures	22,090 18	
23	Stable equipment	5,306 36	
24	Auto equipment	180,323 36	
25	Camp equipment	19,523 35	
26	Laboratory equipment	4,206 75	
28	Shop equipment	915 87	
	Total equipment		371,748 26



Plate LXI. State Highway, Solano County, laying asphalt surface.



Plate LXII. State Highway, Solano County, showing widening and thickening, finishing asphalt concrete wearing surface.

35	Store account		$2,609 60
40	Shop work in progress		20,262 60
41	Shop expense		6,282 87
43	Headquarters expense	$252,035 18	
44	Division expense	449,111 29	
72	County expense	527,970 92	
245	County expense (new routes)		
	Total expense		1,229,117 39
79	Other divisions		1,768 29
71	Motor Vehicle Fund charges on State Highway Fund schedules		9,130 55
	Total Second Highway Fund expenditures		$14,876,882 42
	Third State Highway Fund expenditures:		
2	Highways in process		$14,705,143 27
202	Highways in process (new routes)		988,001 02
4	Office buildings		16,334 68
5	Sand plants		1,430 91
10	Maintenance yards		116,062 17
11	Powder magazines		384 36
20	Construction equipment	$248,291 72	
21	Engineering equipment	15,002 14	
22	Furniture and fixtures	28,147 85	
23	Stable equipment	2,175 88	
24	Auto equipment	313,172 09	
25	Camp equipment	53,039 82	
26	Laboratory equipment	8,638 53	
28	Shop equipment	15,637 54	
	Total equipment		684,105 57
35	Store account		252,205 86
40	Shop work in progress		68,136 01
41	Shop expense		13,856 23
39	Bills vs. divisions		40,705 76
43	Headquarters expense	$276,693 02	
44	Divisions expense	428,430 54	
72	County expense	387,430 12	
245	County expense (new routes)	652,706 12	
	Total expense		1,745,259 80
79	Other divisions		762 68
71A	Motor Vehicle Fund charges on State Highway Fund schedules		77,728 15
	Total Third State Highway Fund expenditures		$18,710,116 47
	Motor Vehicle Fund expenditures:		
103	Highway maintenance		$10,882,426 94
105	Sand plants		8 75
107	Nursery site		15,399 00
110	Maintenance yards		255,411 54
111	Powder magazines		8,673 96
120	Construction equipment	$306,061 34	
121	Engineering equipment	155 13	
122	Furniture and fixtures	1,220 47	
123	Stable equipment	755 49	
124	Auto equipment	202,818 52	
125	Camp equipment	13,839 52	
126	Laboratory equipment	56 25	
128	Shop equipment	31,423 90	
	Total equipment		556,331 62
135	Store account		70,162 70
140	Shop work in progress		33,810 30
141	Shop expense		7,426 02
145	County expense		59,703 32
146	Traffic census and regulations		9,161 08
147	Pittsburg test road		4,347 83
	Total Motor Vehicle Fund expenditures		$11,902,862 76

Special appropriation expenditures:		
301	Chapter 704, Acts 1915: Los Angeles County	$7,321 86
302	Chapter 748, Acts 1915: Ventura County	7,986 50
303	Chapter 746, Acts 1917: Klamath River Road	40,000 00
304	Chapter 746, Acts 1917: Trinity-Humboldt Extension	4,124 41
305	Chapter 746, Acts 1917: Oxnard-San Juan	12,934 61
306	Chapter 746, Acts 1917: Jackson's Ranch-Governor's Camp	3,033 01
307	Chapter 746, Acts 1917: Carmel-San Simeon	11,358 52
308	Chapter 746, Acts 1917: Carmel-San Simeon-Jolon connection	2,204 37
309	Chapter 746, Acts 1917: Dumbarton Bridge	2,240 71
310	Chapter 746, Acts 1917: Santa Maria-Cuyama	6,500 00
311	Chapter 746, Acts 1917: Huasna-Alamo	45 16
320	Chapter 888, Acts 1921: Alturas-Cedarville	25.728 75
321	Chapter 883, Acts 1921: Madera-Yosemite	
322	Chapter 832, Acts 1921: San Luis Obispo-School	
	Total special appropriation expenditures	$123,477 90
Expenditures—contributions by counties and cities:		
401	Expenditures Humboldt County contribution	$120,229 37
402	Expenditures Shasta County contributions	64,000 00
403	Expenditures Siskiyou County contributions	55,499 71
404	Expenditures Glenn County contributions	15,021 52
405	Expenditures Contra Costa County contributions	3,056 95
406	Expenditures Marin County contributions	35,000 00
407	Expenditures Napa County contributions	65,000 00
408	Expenditures Sonoma County contributions	75,000 00
409	Expenditures San Luis Obispo County contributions	9,385 81
410	Expenditures Imperial County contributions	53,104 60
411	Expenditures Calaveras County contributions	20,000 00
412	Expenditures Mendocino County contributions	60,209 14
413	Expenditures Colusa County contributions	17,860 47
414	Expenditures Solano County contributions	5,000 00
415	Expenditures Mariposa County contributions	2,200 00
416	Expenditures Santa Barbara County contributions	113,715 75
417	Expenditures Kern County contributions	19,452 04
418	Expenditures Town of Niles contributions	2,143 86
419	Expenditures City of San Juan Bautista contributions	9,000 00
420	Expenditures City of El Cajon contributions	5,992 00
421	Expenditures Merced County contributions	2,707 88
422	Expenditures San Benito County contributions	2,000 00
423	Expenditures Tulare County contributions	1,997 54
424	Expenditures Yolo County contributions	6,737 12
425	Expenditures El Dorado County contributions	6,716 77
426	Expenditures Tuolumne County contributions	878 23
427	Expenditures Orange County contributions	9,001 50
428	Expenditures Nevada County contributions	13,953 17
429	Expenditures Stanislaus County contributions	14,103 47
430	Expenditures Sierra County contributions	17,749 68
431	Expenditures City of Oceanside contributions	8,005 49
432	Expenditures Yuba County contributions	17,319 30
433	Expenditures Monterey County contributions	69,364 58
434	Expenditures Placer County contributions	711 91
435	Expenditures Butte County contributions	21,350 00
436	Expenditures Lassen County contributions	2,853 42
437	Expenditures Sutter County contributions	463 59
438	Expenditures Trinity County contributions	1,000 00
	Total contributions expenditures	$943,785 05
480	Expenditures Federal Aid	$3,586,827 31
76	Discount on Third State Highway Fund Bonds	222,160 50

Cash on hand:		
48	Office Fund (headquarters)	$425 00
48A	Office Fund (divisions)	54,500 00
50	National Bank of D. O. Mills and Company	33,752 93
52	Farmers and Mechanics Bank	*7,754 76
53	California National Bank	8,287 44
53A	Sacramento-San Joaquin Bank	98 73
54	Capital National Bank (General Fund)	20,601 85
	Total	$109,911 19
Funds in treasury:		
91	First State Highway Fund	$100,000 00
92	Second State Highway Fund	96,169 97
93	Third State Highway Fund	6,869,857 33
94	Motor Vehicle Fund	286,686 59
95	Chapter 746, Acts 1917 Fund	167,559 21
96	Federal Aid Fund	
97	Chapter 888, Acts 1921 Fund	44,455 89
97B	Chapter 883, Acts 1921 Fund	30,000 00
97A	Chapter 882, Acts 1921 Fund	5,429 06
97C	Vallejo-Sears Point Survey	1,000 00
	Total	$7,601,158 05

*Overdraft.

EXPENDITURES IN COUNTIES FROM FIRST STATE HIGHWAY FUND.

County	Division	To June 30, 1922*	County	Division	To June 30, 1922*
Alameda	IV	$452,652 79	Orange	VII	$528,908 27
Alpine	III		Placer	III	364,093 39
Amador	III	406 49	Plumas	III	58 58
Butte	III	306,654 17	Riverside	VII	92,442 11
Calaveras	III	5,793 78	Sacramento	III	103,912 03
Colusa	III	493,128 12	San Benito	V	230,836 93
Contra Costa	IV	251,686 37	San Bernardino	VII	261,021 75
Del Norte	I	10,976 95	San Diego	VII	622,188 21
El Dorado	III	287,149 73	San Francisco	IV	
Fresno	VI	248,399 38	San Joaquin	III	4,278 08
Glenn	III	250,413 29	San Luis Obispo	V	823,571 26
Humboldt	I	673,221 05	San Mateo	IV	425,128 89
Imperial	VII	404,895 41	Santa Barbara	V	839,664 59
Inyo	VI	21,609 25	Santa Clara	IV	926,022 63
Kern	VI	882,644 61	Santa Cruz	IV	215,027 48
Kings	VI	106,554 38	Shasta	II	481,030 22
Lake	I	16 04	Sierra	III	17,763 75
Lassen	II	714 35	Siskiyou	II	386,473 19
Los Angeles	VII	1,284,762 35	Solano	III	402,995 94
Madera	VI	220,476 65	Sonoma	IV	494,848 22
Marin	IV	236,080 41	Stanislaus	III	305,356 18
Mariposa	VI	190,337 16	Sutter	III	107,620 68
Mendocino	I	789,719 41	Tehama	II	297,610 12
Merced	VI	342,940 97	Trinity	II	7,029 96
Modoc	II	33 06	Tulare	VI	245,345 67
Mono	VI	88,025 19	Tuolumne	III	129,775 75
Monterey	V	618,929 66	Ventura	VII	607,294 54
Napa	IV	19,330 09	Yolo	III	762,134 78
Nevada	III	8,063 46	Yuba	III	121,951 33
			Total		$18,000,000 00
General expense, undistributed (premiums on bonds)					2,129 00
			Grand total		$18,002,129 00

*As the fund was exhausted on June 30, 1918, there have been no expenditures from this fund since that date.

EXPENDITURES IN COUNTIES FROM SECOND STATE HIGHWAY FUND.

County	Division	Total to June 30, 1920	July 1, 1920, to June 30, 1921	July 1, 1921, to June 30, 1922	Total to June 30, 1922
Alameda	IV	$333,983 11	$176 43	$3,858 08	$338,017 62
Alpine	III				
Amador	III	7,668 33	221 92	12,186 94	20,177 19
Butte	III	589,027 98	4,427 22	11,448 05	604,903 25
Calaveras	III	125,336 88	37 62	93 50	125,468 00
Colusa	III	8,659 58	2,926 37	2,699 04	14,284 99
Contra Costa	IV	240,119 23	168 03	1,145 20	241,432 46
Del Norte	I	40,908 22	39,274 09	54,130 42	134,312 73
El Dorado	III	262,443 95	141 51	99 48*	262,485 98
Fresno	VI	117,295 80	4 13	39,168 12	156,468 05
Glenn	III	5,773 14	608 29	5,941 89	12,323 32
Humboldt	I	574,223 04	17,596 30*	73,072 67	629,699 41
Imperial	VII	204,870 98	84,322 68	77,247 46	366,441 12
Inyo	VI	145,182 73	301 84*	29,358 76	174,239 65
Kern	VI	81,841 84	42,175 60	51,501 91	175,519 35
Kings	VI	2,392 24	29,779 49	30,047 23	62,218 96
Lake	I	27,940 18	12,413 13*	3,626 33	19,153 38
Lassen	II	50,984 81	8,621 64	11,895 89	71,502 34
Los Angeles	VII	1,107,450 49	18,197 28	48,477 32	1,174,125 09
Madera	VI	1,187 79			1,187 79
Marin	IV	449,012 45	291 03	1,730 53	451,034 01
Mariposa	VI	193,075 54	391 60	13,214 69	206,681 83
Mendocino	I	908,370 98	1,602 02	18,709 15	928,682 15
Merced	VI	63,732 62	4,967 03*	60,119 22	118,884 81
Modoc	II	44,077 23	13,528 41*	12,954 12	43,502 94
Mono	VI	151,053 99	366 42*	9,895 16	160,582 73
Monterey	V	874,073 62	21,972 50*	1,237 78*	850,863 34
Napa	IV	182,451 12	8 88	2 33	182,462 33
Nevada	III	289,198 31	7,115 03	31,064 90	327,378 24
Orange	VII	62,607 57	26,867 08*	394 22*	35,348 27
Placer	III	53,815 12	2,953 07	21,868 26	78,636 45
Plumas	III	2,573 70	1,194 23	965 01*	2,802 92
Riverside	VII	89,144 14	53,674 57	17,721 22	160,539 93
Sacramento	III	8,910 21	300 15	10,551 19	19,761 55
San Benito	V	1,320 53	104 52	95 84*	1,329 21
San Bernardino	VII	17,565 04	283 90	4,924 55	22,773 49
San Diego	VII	535,940 93	43,582 66	28,044 50	607,568 09
San Francisco	IV		96 58	90 58*	6 00
San Joaquin	III	120,163 78	1,608 53	2,943 20	124,715 51
San Luis Obispo	V	343,279 25	1,884 74	4,629 08	349,793 07
San Mateo	IV	14,363 69	9,690 05	4,032 77*	20,020 97
Santa Barbara	V	718,240 65	69,189 89*	26,599 48	675,650 24
Santa Clara	IV	85,033 72	7,976 95	51,353 40	144,364 07
Santa Cruz	IV	145,841 47	8,601 27	16,770 87	171,213 61
Shasta	II	893,758 57	46,352 17*	77,657 33	925,063 73
Sierra	III	143,688 15	12,670 27	7,588 16	163,946 58
Siskiyou	II	155,379 87	9,098 02*	14,559 07	160,840 92
Solano	III	160,701 00	463 73	20,251 57	181,416 30
Sonoma	IV	264,557 06	1,283 77	66,280 77	332,121 60
Stanislaus	III	61,208 12	14,093 75*	1,240 18	48,354 55
Sutter	III	21 46	611 80	579 95*	53 31
Tehama	II	69,349 32	8,439 22	87,030 21	164,818 75
Trinity	II	128,143 24	50,048 64*	28,874 14	106,968 74
Tulare	VI	471,362 55	330 93*	27,417 51	498,449 13
Tuolumne	III	19,096 53	182 66	19,514 58	38,793 77
Ventura	VII	57,459 39	864 08	39 36	58,362 83
Yolo	III	298,837 12	21,302 78	22,775 81*	297,364 09
Yuba	III	103,870 69	2,779 82	5,767 60	112,418 11
Totals		$12,108,569 05	$133,914 10	$1,114,943 70	$13,357,426 85

*Credit, covering federal aid received and cement sacks returned.

EXPENDITURES IN COUNTIES FROM THIRD STATE HIGHWAY FUND.

County	Division	July 1, 1919, to June 30, 1920	July 1, 1920, to June 30, 1921	July 1, 1921, to June 30, 1922	Total to June 30, 1922
Alameda	IV	$325 63	$4,821 03	$13,450 93	$18,597 59
Alpine	III				
Amador	III	3,721 72	5,129 01	67,961 48	76,812 21
Butte	III	135,122 18	103,877 38	201,808 89	440,808 45
Calaveras	III	5,400 97	1,115 62	5,208 19	11,724 78
Colusa	III	14,328 72	35,031 01	20,788 32	70,148 05
Contra Costa	IV	4,967 83	1,956 12	21,371 31	28,295 26
Del Norte	I	102,656 42	134,764 70	191,564 58	428,985 70
El Dorado	III	3,984 04	1,160 07	25,124 86	30,268 97
Fresno	VI	62,234 77	40,293 59	484,781 25	587,309 61
Glenn	III	9,268 99	9,220 25	30,058 98	48,548 22
Humboldt	I	126,576 77	303,580 12	759,991 44	1,190,148 33
Imperial	VII	296,009 75	279,492 46	389,499 95	965,002 16
Inyo	VI	34,559 43	31,157 61	205,991 00	271,708 04
Kern	VI	87,903 05	243,627 19	428,114 18	759,644 42
Kings	VI	57 58	131,252 67	230,294 84	361,605 09
Lake	I	73,743 93	20,887 53	40,013 72	134,645 18
Lassen	II	9,405 59	63,207 93	216,512 24	289,125 76
Los Angeles	VII	136,442 14	180,538 80	516,790 42	833,771 36
Madera	VI	198 42	18 12	8,880 37	9,096 91
Marin	IV	3,871 89	5,349 12	84,862 95	94,083 96
Mariposa	VI	34,131 85	9,784 39*	93,717 67	118,065 13
Mendocino	I	151,716 34	36,998 03	303,838 87	492,553 24
Merced	VI	43,648 17	118,258 40	600,325 42	762,231 99
Modoc	II	22,455 74	80,081 48	177,918 55	280,455 77
Mono	VI	26,005 07	58,643 06	120,648 96	205,297 09
Monterey	V	126,838 89	51,731 07*	89,655 25	164,763 97
Napa	IV	7,023 24	49 25	11,189 78	18,262 27
Nevada	III	74,357 15	115,414 35	165,529 02	355,300 52
Orange	VII	31,877 36	3,576 44	9,321 08	44,774 88
Placer	III	15,957 06	7,077 74	78,875 37	101,910 17
Plumas	III	1,102 79	9,801 28	34,620 19	45,524 26
Riverside	VII	87,999 55	196,442 23	12,833 46*	271,608 32
Sacramento	III	111 33	12,641 63	24,662 32	37,415 28
San Benito	V	553 15	1,421 80	3,723 83	5,698 78
San Bernardino	VII	23,462 30	1,801 27*	212,258 07	233,919 10
San Diego	VII	207,725 55	416,940 48	81,763 99*	542,902 04
San Francisco	IV	218 99	2,512 94	33,613 48	36,345 41
San Joaquin	III	115,453 18	14,951 06	35,682 01	166,086 25
San Luis Obispo	V	14,047 53	45,534 95	539,857 00	599,439 48
San Mateo	IV	12,479 01	64,514 66	90,613 43	167,607 10
Santa Barbara	V	53,953 86	96,051 89	417,632 91	567,638 56
Santa Clara	IV	57,316 18	131,551 00	227,041 04	415,908 22
Santa Cruz	IV	9,336 33	131,522 84	42,735 99	183,595 16
Shasta	II	47,518 95	67,415 25	549,831 13	664,765 33
Sierra	III	11,031 52	85,438 78	39,786 68	136,256 98
Siskiyou	II	51,984 31	35,627 54	157,654 29	245,266 14
Solano	III	4,602 92	7,627 99	187,595 63	199,826 54
Sonoma	IV	31,695 84	9,819 62	398,381 01	439,896 47
Stanislaus	III	103,690 32	149,200 80	37,580 15*	215,310 97
Sutter	III	4,413 12	19,373 18	137,771 29	161,557 59
Tehama	II	96,400 35	361,260 80	746,182 89	1,203,844 04
Trinity	II	72,008 00	82,927 21	218,746 82	373,682 03
Tulare	VI	9,727 32	2,164 98	5,074 47	16,966 77
Tuolumne	III	21,127 33	4,268 74	126,076 50	151,472 57
Ventura	VII	48,762 37	61,236 48	32,887 91	142,886 76
Yolo	III	18,229 64	137,876 07	49,236 44	205,342 15
Yuba	III	2,862 28	11,895 27	21,125 24	35,882 79
Totals		$2,752,604 71	$4,113,281 82	$9,794,702 84	$16 660,589 37

*Credit, covering federal aid received and cement sacks returned.

STATEMENT OF EXPENDITURES FROM ALL FUNDS COMING UNDER CONTROL OF THE CALIFORNIA HIGHWAY COMMISSION, 1912 - 1917, INCLUSIVE.

Month	Fund	1912	1913	1914	1915	1916	1917
January	Bond Issues		$ 127 761.95	$ 100,352.70	$ 470,566.72	$ 477 770 64	$ 146,344 05
	Contributions						
	Federal Aid						
	Motor Vehicle Fees				- 14,859 35	107 152.46	54,155.60
	Special Appropriations						1,903.27
	Total		$ 127,761 95	$ 100 352 70	$ 485 426.07	$ 584,923.10	$ 201,402 93
February	Bond Issues		147,409.73	204 336 82	704,103 90	344 996.50	- 25 308.56
	Contributions						
	Federal Aid						
	Motor Vehicle Fees				14,320.88	117,811 14	68,422.48
	Special Appropriations						1,605.44
	Total		$ 147,409.73	$ 204,336.82	$ 718,424.78	$ 462,807.64	$ 44,719.36
March	Bond Issues	$ 86,169.77	132,558.63	152 264 68	446,381.31	196,291.20	71,892.49
	Contributions						
	Federal Aid						
	Motor Vehicle Fees				11 348.85	111,198.18	69,749.70
	Special Appropriations						1,389.62
	Total	$ 86,169.77	$ 132,558.63	$ 152 264 68	$ 457 730 16	$ 307,489.38	$ 142,531.81
April	Bond Issues	29,041.26	128,735 95	124 000.34	402,961 70	249,971.52	68,955.11
	Contributions						
	Federal Aid						
	Motor Vehicle Fees				10,619.35	150,851.23	37,119.28
	Special Appropriations						35.51
	Total	$ 29,041.26	$ 128,735.95	$ 124,000.34	$ 413,581.05	$ 400,822.75	$ 106,109.90
May	Bond Issues	38,984.09	161,686 48	319,883.26	842,483.57	244,740.93	135,735.56
	Contributions						
	Federal Aid						
	Motor Vehicle Fees				46,494.94	138,516.33	57,960.18
	Special Appropriations						398.78
	Total	$ 38,984.09	$ 161,686.48	$ 319,883.26	$ 888,978.51	$ 383,257.26	$ 194,094.52
June	Bond Issues		191,472.79	261,915.68	518,340.96	190,564.11	89,475.39
	Contributions						
	Federal Aid						
	Motor Vehicle Fees			4,655.17	18,007.48	88,894.69	88,836.75
	Special Appropriations						-250.80
	Total		$ 191,472.79	$ 266,570.85	$ 536,348.44	$ 279,398.80	$ 177,760.34
July	Bond Issues	71,756.93	142,050.46	179,906.69	856,658.32	279,490.53	138,795.41
	Contributions						
	Federal Aid						
	Motor Vehicle Fees			6,289.40	39,250.80	119,258.88	58,295.54
	Special Appropriations						-147.96
	Total	$ 71,756.93	$ 142,050.46	$ 185,995.79	$ 895,909.12	$ 398,749.41	$ 196,941.97
August	Bond Issues	48,468.33	187,313.82	604 768.55	911,280.51	211,883.29	249,823.74
	Contributions						
	Federal Aid						
	Motor Vehicle Fees			7,753.05	43,924 10	82,210.47	79,701.05
	Special Appropriations					-250.00	
	Total	$ 48,468.33	$ 187,313.82	$ 612,521.60	$ 955,174.61	$ 294,343.76	$ 329,524.79
September	Bond Issues	61,525.73	184,654.23	614,315.94	546,794.95	224,942.94	34,233.57
	Contributions						
	Federal Aid						
	Motor Vehicle Fees			13,685.65	33,934.65	62,062.44	50,628.15
	Special Appropriations					996.01	-2.33
	Total	$ 61,525.73	$ 184,654.23	$ 628,001.59	$ 580,729.60	$ 288,001.39	$ 84,859.39
October	Bond Issues	66,411.79	279,564.39	454,404.06	771,684.52	168,723.69	322,110.31
	Contributions						
	Federal Aid						
	Motor Vehicle Fees			10,266.48	41,551.59	58,390.39	79,569.18
	Special Appropriations					2,044.25	-1,762.67
	Total	$ 66,411.79	$ 279,564.39	$ 464,670.54	$ 833,238.11	$ 229,156.33	$ 400,336.82
November	Bond Issues	56,950.64	212,541.43	1,044,551 06	774,654.76	146,331.91	433,443.84
	Contributions						
	Federal Aid						
	Motor Vehicle Fees			29,550.07	82,204.20	48,103.33	53,114.42
	Special Appropriations					2,231.98	
	Total	$ 56,950.64	$ 212,541.43	$1,074,101.93	$ 856,858.96	$ 196,667.18	$ 486,558.26
December	Bond Issues	134,802.04	202,985.75	494,725.25	580,361.63	345,767.55	334,485.44
	Contributions						
	Federal Aid						
	Motor Vehicle Fees			11,735.23	98,376.21	105,362.50	76,811.82
	Special Appropriations					6,217.38	
	Total	$134,802.04	$ 202,985.75	$ 505,460.48	$ 678,740.04	$ 458,347.43	$ 411,297.26
Totals by Year	Bond Issues	594,110.58	2,098,745.61	4,555,224.73	7,846,255.05	3,084,812.81	1,993,487.16
	Contributions						
	Federal Aid						
	Motor Vehicle Fees			83,935.85	454,894.40	1,189,812.10	772,463.15
	Special Appropriations					11,799.52	3,598.84
	GRAND TOTAL	$594,110.58	$2,098,745.61	$4,639,160.58	$8,301,149.45	$4,286,424.43	$2,769,539.15

STATEMENT OF EXPENDITURES FROM ALL FUNDS COMING UNDER CONTROL OF THE CALIFORNIA HIGHWAY COMMISSION, 1918 TO JUNE 30, 1922.

Month	Fund	1918	1919	1920	1921	1922	
January	Bond Issues	$ 330,189.34	$ 349,625.42	$ 785,709.90	$ −161,726.38	$ 487,156.40	
	Contributions					1,461.59	
	Federal Aid				342,024.65	338,650.00	
	Motor Vehicle Fees	72,962.73	105,113.65	109,699.24	385,939.92	296,194.28	
	Special Appropriations		1,343.35	2,454.09		165.17	
	Total	$ 403,152.07	$ 456,481.42	$ 895,863.23	566,238.59	$1,125,033.41	
February	Bond Issues	387,060.22	182,273.63	567,718.36	317,884.59	345,164.43	
	Contributions		1,456.66	566.39		1,000.00	
	Federal Aid				73,266.32	353,641.89	
	Motor Vehicle Fees	65,946.52	96,198.73	74,265.99	162,485.11	136,312.86	
	Special Appropriations		425.00	35.77		139.50	
	Total	$ 453,006.74	$ 280,353.22	$ 642,586.70	$ 551,636.02	$ 899,458.62	
March	Bond Issues	278,916.47	[illegible]	677,325.52	346,374.54	833,045.64	
	Contributions		14,000.00			5,041.00	
	Federal Aid			222,160.54	129,097.37	53,714.46	
	Motor Vehicle Fees	61,924.14	99,167.69	80,427.93	198,344.36	391,357.83	
	Special Appropriations		−190.11	136.76		5.40	
	Total	$ 340,840.61	$ 345,368.12	$ 982,050.75	$ 673,816.29	$1,283,161.27	
April	Bond Issues	396,352.72	[illegible]	561,538.97	500,525.91	788,496.48	
	Contributions		2,437.36		11,700.75	2,136.38	
	Federal Aid					26,677.80	
	Motor Vehicle Fees	72,233.47	117,346.26	177,769.10	158,269.07	274,515.00	
	Special Appropriations	342.56	− 36.55	− 34.80		53.00	
	Total	$ 468,928.77	$ 405,209.98	$ 839,213.24	$ 669,794.98	$1,272,072.58	
May	Bond Issues	509,997.12	458,788.28	695,266.68	659,752.55	1,203,740.88	
	Contributions		45,729.20	11,145.39	1,971.32	6,600.00	
	Federal Aid				58,745.58	43,341.56	
	Motor Vehicle Fees	71,[illegible]	167,350.92	127,073.44	219,977.61	238,431.91	
	Special Appropriations	1,[illegible]	681.85			1,225.45	
	Total	$ 583,479.11	$ 673,368.25	$ 833,485.51	$ 950,448.06	$1,493,341.80	
June	Bond Issues	581,777.69	[illegible]	601,020.75	634,016.59	1,316,513.32	
	Contributions	531,761.98*	[illegible]		50,000.00	9,241.24	
	Federal Aid	59,571.76			10,588.00	362,222.87	
	Motor Vehicle Fees	61,940.13	168,432.76	191,252.30	233,435.84	371,892.77	
	Special Appropriations	1,176.08	1,258.88			−1,892.64	
	Total	$1,236,169.57	$ 629,016.34	$ 792,273.05	$1,128,040.43	$2,054,674.36	
July	Bond Issues	567,610.47	390,118.13	589,978.37	394,326.29		
	Contributions	5,992.00		32,386.51	21,150.00		
	Federal Aid				468,132.67		
	Motor Vehicle Fees	89,115.60	154,[illegible]	174,531.55	165,014.41		
	Special Appropriations	[illegible]	[illegible]				
	Total	$ 664,852.59	$ 550,550.89	$ 752,916.15	$ 982,823.57		
August	Bond Issues	469,430.59	564,080.15	35,668.31	915,879.59		
	Contributions		[illegible]	134,069.69			
	Federal Aid			390,001.63	291,235.16		
	Motor Vehicle Fees	[illegible]	156,[illegible]	159,251.99	342,036.12		
	Special Appropriations	[illegible]	[illegible]				
	Total	$ 605,379.27	$ 721,681.03	$ 717,861.04	$1,549,150.86		
September	Bond Issues	423,566.45	462,194.60	400,334.96	1,443,107.82		
	Contributions		5,365.00				
	Federal Aid			24,999.16			
	Motor Vehicle Fees	82,409.67	[illegible]	139,811.46	306,767.71		
	Special Appropriations	5,365.25	[illegible]				
	Total	$ 511,331.37	$ 607,380.27	$ 565,162.46	$1,749,875.53		
October	Bond Issues	499,190.39	750,095.65	523,501.66	1,229,709.13		
	Contributions			2,164.58			
	Federal Aid			77,777.13	67,063.66		
	Motor Vehicle Fees	104,323.07	156,876.77	223,666.05	347,982.85		
	Special Appropriations	[illegible]	3,437.57				
	Total	$ 606,543.52	$ 910,409.99	$ 847,249.42	$1,644,695.64		
November	Bond Issues	[illegible]	674,658.96	466,372.06	1,332,175.31		
	Contributions		4,765.49	711.91	518.92		
	Federal Aid			21,586.28	14,906.86		
	Motor Vehicle Fees	56,393.35	84,575.43	175,921.40	346,385.13		
	Special Appropriations	141.11	43,556.41		1,777.50		
	Total	$ 436,853.03	$ 756,947.29	$ 664,593.30	$1,696,383.82		
December	Bond Issues	539,150.69	726,536.72	390,486.06	1,306,[illegible]		
	Contributions	2,[illegible]		1,[illegible]	10,[illegible]		
	Federal Aid			116,[illegible]	116,[illegible]		
	Motor Vehicle Fees	137,238.02	73,261.66	105,[illegible]	444,[illegible]		
	Special Appropriations	721.09	319.12		21,[illegible]		
	Total	$ 679,817.88	$ 800,117.49	$ 757,090.75	$1,901,[illegible]		
Totals by Year	Bond Issues	5,343,463.65	5,484,523.92	6,486,241.58	9,308,851.35	4,975,111.65	$31,589,147.89
	Contributions	540,487.85	79,599.91	206,266.30	95,435.76	55,512.21	944,399.24
	Federal Aid	59,571.76		871,676.52	1,513,149.74	1,459,977.54	3,868,997.61
	Motor Vehicle Fees	1,00[illegible],829.82	1,516,[illegible].20	1,814,[illegible].29	3,296,933.89	1,[illegible],[illegible].[illegible]	11,[illegible],[illegible].75
	Special Appropriations	23,744.45	56,[illegible].46	2,611.72	25,463.84	−304.15	[illegible],[illegible].71
	GRAND TOTAL	$6,990,374.54	$7,137,089.29	$9,279,623.91	14,144,711.83	38,127,742.04	$68,368,241.41

Appendix F.

PURCHASING DEPARTMENT.

By Lowell R. Smith, Purchasing Agent.

The work of this department has materially increased during the past two years so that now, in addition to the purchasing agent, there are two assistant purchasing agents.

Since August 1, 1921, this department has carried on the purchasing for the State Department of Public Works, consisting of the following divisions:

Division of Highways.
Division of Architecture.
Division of Engineering and Irrigation.
Division of Water Rights.
Division of Land Settlement.

On the above date on account of such additional duties it was necessary to add the second assistant purchasing agent to the force.

The following tabulation of purchase orders issuing from this department will show the increase of work from year to year:

Year	Number of orders issued
1912	487
1913	858
1914	2,180
1915	2,338
1916	3,193
1917	5,510
1918	6,774
1919	10,216
1920	11,585
1921	17,263
1922 to June 30	10,770

Prior to August 1, 1921, all orders as shown above were issued for the California Highway Commission. The following is a segregation of number of orders issued in 1921 and during the present year to and including June 30, 1922:

Year 1921.

Division of Highways	16,180
Division of Architecture	750
Division of Engineering and Irrigation	151
Division of Land Settlement	133
Division of Water Rights	49

Year 1922 to June 30.

Division of Highways	9,353
Division of Architecture	1,058
Division of Engineering and Irrigation	150
Division of Land Settlement	81
Division of Water Rights	128

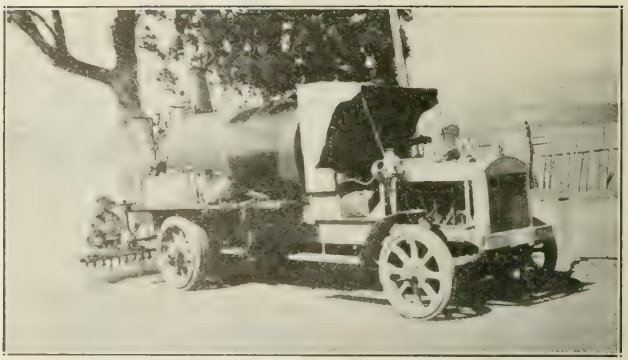


Plate LXIII. State Highway, Mendocino County, oiling resurfaced macadam pavement.



Plate LXIV. State Highway, Mendocino County, completed resurfaced asphalt macadam.

The number of orders issuing from this department for the present year will probably be in the neighborhood of 25,000. The total number of employees in the purchasing department, including clerks and stenographers, is nine.

During the biennium ending June 30, 1920, as was mentioned in that report of the purchasing department, work was seriously hampered on account of scarcity of many commodities entering into building construction. This situation has greatly improved during the past two years with the exception that during the present year a serious shortage of cement, especially in the northern part of the state, exists. The cement companies attribute this condition to the enormously increased building operations, claiming the demand for cement far exceeds the production.

Freight rates on all commodities remained unchanged up to the close of this biennium. However, on July 1, 1922, a general reduction of 10 per cent on all commodities was made. Full tariff rates are being paid on all commodities, no special rates being extended to the state as was done prior to August 5, 1918.

While the records of this department show that prices on various commodities generally have declined, they are still considerably above prewar prices, especially on major items of construction material. Prices on rock, sand and gravel have not made any appreciable decrease since the peak prices of 1920. Reinforcing steel has shown a considerable drop, going as low as $2.35 per cwt. base during the spring of the present year as against a peak price of $5 per cwt. base during the close of the year 1920 and the early spring of 1921. The mill base price of cement during the close of 1920 was generally $2.70 net per barrel at the mill. The price on this commodity made several slight decreases from time to time since then, the present price being $2.35 net per barrel.

Appended to this report is a detailed statement of cement purchases made from 1920 to June 30, 1922.

Below is given a recapitulation of all cement deliveries to the California Highway Commission from year 1912 to June 30, 1922, showing that the average mill base price paid for the cement during that period was $1.673.

Year	(barrels) Total deliveries	at mill Total cost	Average per barrel mill base
1912	142,465.50	$176,683 24	$1.240
1913	242,514.50	317,376 36	1.309
1914	677,790.25	898,403 48	1.325
1915	355,005.50	485,267 31	1.367
1916	110,090.00	150,958 28	1.371
1917	220,794.00	321,064 61	1.454
1918	221,418.00	359,036 76	1.621
1919	241,581.00	464,342 77	1.922
1920	312,304.00	677,290 29	2.168
1921	540,127.00	1,231,801 11	2.280
1922	70,290.00	163,611 64	2.327
	3,134,379.75	$5,245,835 85	$1.673

The small deliveries of cement shown for period to June 30, 1922, are accounted for by the fact that these deliveries include only cement delivered on contracts let during that period. Some of the contracts awarded

in 1921 extended into 1922 and deliveries of cement on such contracts during 1922 are shown in the 1921 deliveries. Furthermore, some of the larger contracts for cement concrete roads were let shortly before June 30, 1922, and large cement deliveries did not start until after that date. The total cement purchased during the year 1922 up to June 30 was 194,288 barrels.

In conclusion, it may again be said that the records of few departments will show such a diversity of commodities purchased. On contract work, this department purchases all road material, such as cement, rock, sand, gravel, culvert pipe and reinforcing steel. In connection with day labor work, and particularly that in the convict labor camps, a wide diversity of wants are met, embracing in the case of free labor camps, not only the materials of construction, but food supplies, tools, road machinery, hay and grain, camping outfits, gasoline, oils and greases, and all other supplies necessary for carrying on such work. In the case of convict labor camps, in addition to the above, clothing, medicines, barber supplies and tobacco are but a few of the many purchases made for the Division of Highways. Also extensive purchases of electrical materials, building hardware, plumbing supplies and equipment, building tile and brick, paints and all other materials and supplies entering into the construction of buildings are purchased for the Division of Architecture. Various other items are purchased for state institutions, such as moving picture machines, milking machines, etc. Purchases for the Division of Land Settlement include such items as concrete pipe machinery, alfalfa seed, barley seed, etc.

The above will give a general idea of the great range of commodities purchased, although they are but a few of the hundreds of items being bought.

Appendix G.

HIGHWAY TREE PLANTING.

By M. B. Pratt, State Forester, and
W. S. Caruthers, Assistant Highway Engineer.

Systematic planting of trees on the state highways of California was made possible through the establishment of a state nursery, in 1920, where thousands of trees are now being propagated annually for this purpose. This nursery, which is a result of the cooperative efforts of the California State Highway Commission and the State Board of Forestry, is located along the state highway between Davis and Sacramento. It is in charge of Albert Aldinger, a trained nurseryman, and consists of an attractive group of buildings of colonial design, consisting of the nurseryman's cottage, bunk house for his helpers, barn and implement shed. Back of this group is a lath house, pumping house, and reservoir. Last year 7600 trees were propagated and distributed for planting on the state highways, and this year 60,000 trees will be available for this purpose. The principal trees that have been grown so far are California black walnut, European sycamore, Lombardy poplar, American elm, and black locust.

The plan of highway planting that is being used is a cooperative one, which involves three different agencies: the California Highway Commission, the State Board of Forestry, and the agency which makes application to plant the trees. As soon as an application is received by the Highway Commission to plant trees along the state highway, it is referred to the Highway Tree Planting Committee, consisting of the State Highway Engineer, State Forester, State Gardener and the Professor of Landscape Architecture of the University of California, which prepares a plan with detailed instructions for the planting, after examination of the locality for which application is made. This plan is used as a basis for the terms of the planting permit, issued by the Highway Commission.

After the permit is issued, the stakes marking the location of the trees are set by a survey party for the Highway Commission. In setting these stakes it is the aim to have the trees placed in the clear as much as possible, so that their symmetrical growth will not be interfered with in years to come, by overhead wires. No stakes are set within 100 feet of road intersections and 200 feet of railroad crossings, or within 75 feet of the beginning of the inside of curves, where trees might obscure the vision of the traveling public. The trees are spaced 100 feet apart and planted in alternate arrangement on the two sides of the highway. This gives a fifty-foot effect, and does not restrict the view of the adjoining landscape.

The entire cost of planting is borne by the applicant. As a general rule it is required that holes three feet in diameter and three feet deep be dug, and that each tree be supported by a stout stake and protected against stock by a cylinder of woven wire netting. The trees are furnished from the state nursery, the only cost to the applicant being that

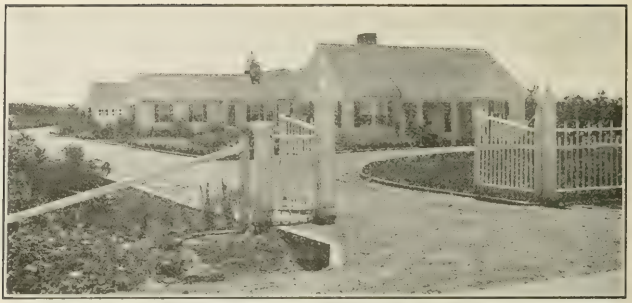


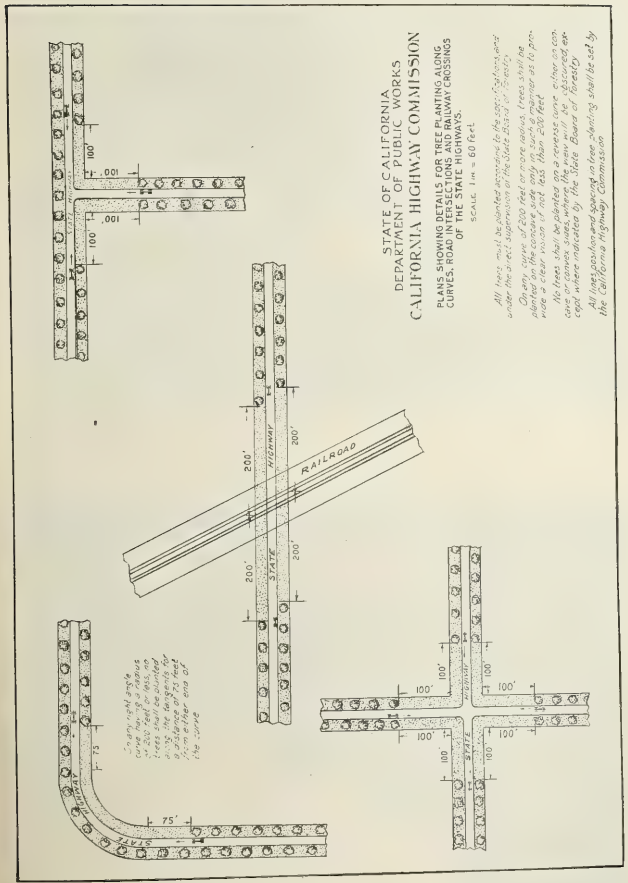
Plate LXV. State Nursery Buildings, Davis.



Plate LXVI. State Nursery, showing buildings and stock.



Plate LXVII. State Nursery, trees ready for transplanting along State Highway.


STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
CALIFORNIA HIGHWAY COMMISSION
PLANS SHOWING DETAILS FOR TREE PLANTING ALONG CURVES, ROAD INTERSECTIONS AND RAILWAY CROSSINGS OF THE STATE HIGHWAYS.
SCALE 1 in. = 60 Feet
All trees must be planted according to the specifications and under the direct supervision of the State Board of Forestry
On any curve of 200 feet or more radius, trees shall be planted on the concave side only, in such a manner as to provide a clear view around the curve.
At least shall be planted on a reverse curve either in connecting tangents, where the view will be obscured except where indicated by the State Board of Forestry
All trees, position and spacing of tree planting shall be set by the California Highway Commission
RAILROAD
HIGHWAY
STATE
100'
200'
75'
.001

of transportation from the nursery. The cost of planting on the average, unless it is necessary to blast holes in hard pan or rock when the cost is augmented by about 25 per cent, does not exceed $1 per tree. In many cases it can be done for less, especially where soil conditions are favorable. In some cases planting has been done by community effort, as at Orland, where three hundred and fifty volunteers planted seven miles of trees in one day. This means of planting is laudable, inasmuch as it develops community spirit, but it is necessary that the work be well organized and carried out, since the chances of survival of the trees is directly dependent upon the care with which they are planted.

After the trees are planted, they are maintained by the Highway Commission, which is a task of no mean proportions. The trees must be watered and cultivated with regularity, the grass must be burned to guard against roadside fires, drainage facilities must be provided, and there must be a constant warfare against pests, such as gophers, grasshoppers and borers. Experience during the past two years has shown that one of the greatest sources of loss has been from drowning, due to the standing water resulting from irrigation operations in adjoining fields. It is always to be expected that some losses will occur due to the many hazards to which young trees are subjected, and it will only be by constant effort and replacement of the trees, that are lost from year to year, that a uniform planting can be secured.

It was soon realized that the services of a tree expert were necessary to give advice concerning the care of the trees along the state highway, and this spring Mr. W. E. Glendinning was employed in this capacity. He has given attention to all trees planted on the state highway under the plan now in effect, and his recommendations have been carried out by those in direct charge of the maintenance of the trees. As a result, many trees have been saved through receiving special care at the critical time. Reports on 5600 trees examined by Mr. Glendinning show an 85 per cent survival. The percentage of survival will steadily increase as better methods for the planting and care of the trees are developed.

Prior to the highway tree planting plan now being followed, Kern County planted trees along the state highway for a distance of twenty miles. Those trees were planted on desert land, where the conditions were most unfavorable. The Highway Commission has maintained these trees with much effort since 1915, and as a result a road that would otherwise be most unattractive and uncomfortable during the summer season, has been made an object lesson of what can be accomplished by systematic tree planting. A tree count this summer showed that 80 per cent of the 3400 trees that were planted are in a flourishing condition. Plans are now being made to fill all gaps in this planting, and to extend it for several miles with trees from the state nursery.

Highway tree planting permits have been issued from and including 1920 to the end of the fiscal year 1922 for a total of 99.85 miles, as shown in detail in the following table:

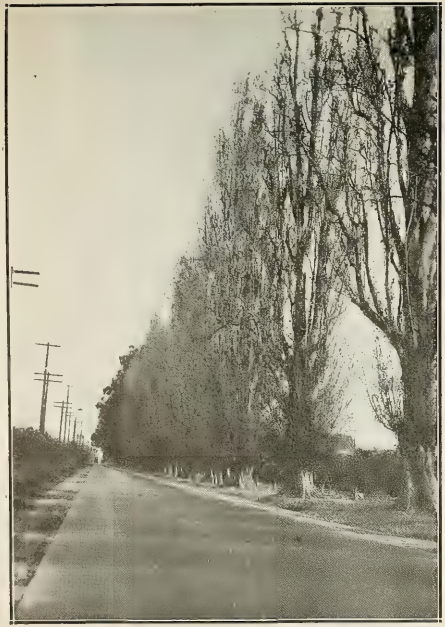


Plate LXVIII. State Highway, Orange County, showing trees along road.

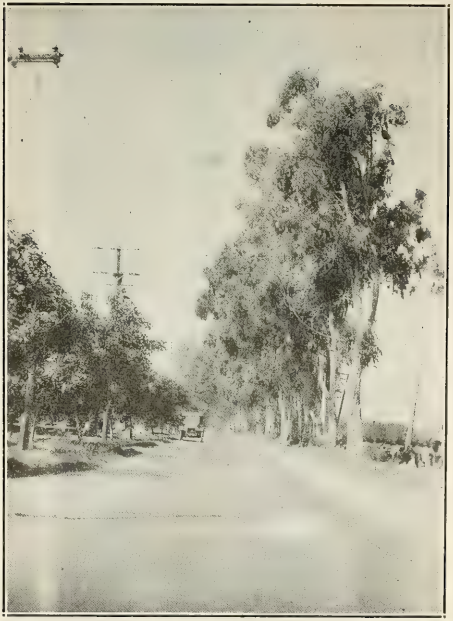


Plate LXIX. State Highway, Orange County, road protected by trees on either side.



Plate LXX. State Highway, Placer County, asphalt macadam pavement, applying hot oil.



Plate LXXI. State Highway, Placer County, rolling asphalt macadam pavement.

TREE MAINTENANCE ACCOUNT.

Total amount expended to June 30, 1922.

Division	Section	Amount	Distance miles	Cost per mile per year	Years
II	Miscellaneous expense	$52 25	-----	-------	1922
III	Butte-3-A Butte-21-A	1,310 09	8.53	$76 79	1921–1922
	Sacramento-3-A Sacramento-3-B Sacramento-11-B	5,800 88	18.15	159 79	1921–1922
IV	Sonoma-1-C	1,940 71	14.64	59 45	1921–1922
V	Miscellaneous expense	38 00	-----	-------	1922
VI	Kern-4-B	49,145 59†	17.00	269 24	1915–1922 inc.
	Kern-4-C	4,473 23	3.00	186 38	1915–1922 inc.
	Madera-4-B	365 01	2.00	91 25	1921–1922
VII	Miscellaneous expense	160 00	----	-------	1922
	Totals	$63,285 76	63.32		

†Includes $12,530.15, cost of 2" pipe line—amount not included in cost per mile per year.

TOTAL TREE PLANTING PERMITS ISSUED TO JULY 1, 1922.

Division	Permit	Section	Dist.	To whom issued	Species
I	335	Humboldt-1-A-B	0.64	Civic Club Garberville	Black locust
	2294	Humboldt	1.00	Fortuna Board of Trade	Black locust
III	2828	Butte-3-A	2.25	Gridley Chamber of Commerce	European sycamore and black walnut
	2802	Butte-21-A	6.25	Oroville Chamber of Commerce	Black walnut and Oriental plane
	359	Butte-3-C	1.00	Chico Chamber of of Commerce	Pistachio and black walnut
	2170	San Joaquin-4-C	0.80	Woman's Club of Lodi	Oriental plane
	2874	Placer-17-A	0.45	Woman's Club of Loomis	Black walnut
	2859	Stanislaus-13-A	0.07	Paul Burton	Black walnut
	249	Glenn-7-B	5.00	Willows Chamber of Commerce	Black walnut
	35	Sacramento-4 approx.	20.00	Sacramento County Board of Forestry	American elm
	309	Yolo-6-A-C Yolo-7-A	19.17	Board of Supervisors, Yolo County	Lombardy poplars, live oak and black walnut
	472	Nevada-17-B	0.44	Frances Jones	Scarlet maple
	302	Glenn-7-C	7.00	Orland Chamber of Commerce	Black Walnut
IV	2801	Sonoma-1-C	5.52	Cotati Company	Black walnut
	2834	Sonoma-1-C	5.35	Petaluma Civic Organization	English elm, Norway maple, European sycamore and European linden
	2891	Sonoma-1-C	3.77	Santa Rosa Chamber of Commerce	European sycamore and European linden
IV	2272	Sonoma-1-B	0.50	Healdsburg Chamber of Commerce	Canary Island date palm
	2875	Napa-8-A	0.90	Napa Chamber of Commerce	Black walnut
	2872	Santa Clara	0.06	F. Maggini	English walnut
	458	San Mateo-2-A	2.00	Foresters of America	European sycamore
	519	Marin-1-B	3.50	Marin County Federation of Women's Clubs	Tanbark oak

Division	Permit	Section	Dist.	To whom issued	Species
	26	Alameda-5-D	0.07	H. B. Shoemaker	English walnut
	419	Contra Costa-14-A	0.45	Union Oil Company	Black walnut
VI	438	Inyo-23-B	1.83	Aberdeen Fish Springs Farm Center	Lombardy poplars
	370	Madera-4-B	1.00	Madera Chamber of Commerce	American elm
	2829	Madera-4-B-C	2.00	Madera Chamber of Commerce	English elm
	2915	Kern-4-F	0.04	Geo. L. King	Black acacia
	320	Tulare-4-A	0.23	Pixley Townsite Improvement Committee	English elm
	2831	Tulare-4-C	1.00	Tulare Board of Trade and Tulare Woman's Club	Arizona cypress
	386	Tulare-4-D	6.51	Visalia Welfare Club	Valley oak
	2830	Tulare-4-B 10-B	1.00	Visalia Board of Trade	Deodar
VII	369	Los Angeles-23-E	0.05	Jos. Aebischer	Black locust
			99.85		

Appendix H.

TRAFFIC REGULATION.

By Major C. L. J. Frohwitter, former Superintendent of Traffic Regulation.

The decision of the Highway Commission to take steps to protect the state highways from abuse and damage by trucks and other vehicles transporting loads in excess of the legal limit permissible under the provisions of the California Motor Vehicle Act was brought about by the condition of the state highways in different parts of the state.

In October, 1921, the Motor Vehicle Department was asked to cooperate in this work through its field deputies. The equipment for the purpose consisting of motor transportation and loadometers, was furnished by the California Highway Commission.

For about three weeks from October 28, 1921, two field deputies with equipment operated over the state highways in parts of Stanislaus, San Joaquin, Alameda, Santa Clara, Santa Cruz and Monterey counties.

The Highway Commission finally decided to undertake the work independent of the Motor Vehicle Department, by putting out five one-man crews with necessary equipment and by obtaining support of the several counties through the county traffic officers.

Visits to county officials of all counties in which traffic regulation was planned were made and agreements reached that a county traffic officer would accompany the Highway Commission employee whenever he was patrolling or operating over the state highway in each particular county.

The five employees were designated traffic regulation inspectors.

The traffic regulation was to be confined to discovering vehicles carrying loads exceeding the legal limit, vehicles with solid rubber tires with less thickness than permitted by law, and tractors moving over the highways without permits or in violation of the conditions thereof.

Assignments were made between December 5, 1921, and January 30, 1922, to the following territories:

1. San Francisco as centre: (Dec. 5, 1921)	Counties of Humboldt, Mendocino, Sonoma, Marin, San Mateo, Santa Clara, Santa Cruz, San Benito, Monterey.
2. Bakersfield as centre: (Dec. 9, 1921)	Counties of Fresno, Tulare, Kings, Kern and Los Angeles from Kern County line to San Fernando.
3. Los Angeles as centre: (Dec. 27, 1921)	Counties of San Luis Obispo, Santa Barbara, Ventura, Orange, San Diego, Imperial, Riverside, San Bernardino and Los Angeles, excepting from San Fernando north to Kern County line.
4. Stockton as centre: (Jan. 18, 1922)	Counties of Contra Costa, Alameda, San Joaquin, Stanislaus, Merced, Madera.

5. Oroville as centre: (Jan. 30, 1922) — Counties of Napa, Solano, Yolo, Colusa, Glenn, Tehama, Shasta, Butte, Sutter, Yuba, Nevada, Placer, El Dorado, Sacramento.

At the start, each man was taken over the state highways in the territory assigned and practical instruction given in the method of weighing vehicles with loadometers.

Patrolling of the state highways then commenced. No definite hours were fixed, night patrolling and weighing were often the rule, particularly in Los Angeles and Kern counties, through and out of which the bulk of long haul freight moves during night hours.

The utmost care was taken against doing an injustice when weighing any vehicle. The ground selected was such as to put as near as possible the front and rear wheels in the same horizontal plane, so there would be little, if any, forward or rear thrust of the load. The rear end was raised with the loadometers until the rear axle was level, the loadometers being placed symmetrically with reference to the medial line of the vehicle from front to rear. The front axle was leveled with a screw jack so there would be no torsion of the chassis or running gear of the vehicle. The dial readings of the loadometers were then taken. Similarly the weights on the front wheels were found.

The loadometers were frequently tested against corresponding public scale weights, weighing the rear end of a truck simultaneously with scales and loadometers. When found necessary the loadometers were adjusted by a sealer of weights and measures. Record was made of every loadometer weighing and forwarded to headquarters for file.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
CALIFORNIA HIGHWAY COMMISSION

TRAFFIC REGULATION RECORD

COUNTY

OWNER AND ADDRESS	DRIVER AND ADDRESS	KIND OF TRUCK
		REGISTRY NUMBER

TIRES: SOLID ..... METAL ..... PNEUMATIC .....

WIDTHS, INCHES	ALLOWABLE LOAD	LOADOMETER	TIRE OVERLOAD	INCH OVERLOAD	THIN TIRES MEASUREMENTS
R.R.					
L.R.					
R.F.					
L.F.					
TOTALS					

DATE ..... PLACE .....

LOCAL TRAFFIC OFFICER .....

LOAD CONSISTED OF .....

REMARKS:

ACTION TAKEN
LOAD ADJUSTED
OVERLOAD REMOVED
SUMMONS SERVED NO. .....
COURT ACTION
ACQUITTED
CONVICTED
FINES
IMPRISONMENT
SUSPENSION

TRAFFIC REGULATION INSPECTOR

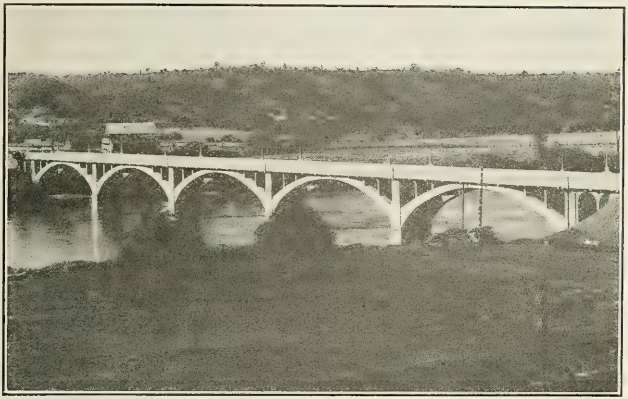


Plate LXXII. State Highway, Shasta County, bridge over Sacramento River, north of Redding.



Plate LXXIII. State Highway, Shasta County, bridge over Doney Creek.

Dependent upon the county traffic officers for the legal halting and weighing of vehicles on the state highways and, in case of violation of the load limits fixed by law, the issuance of legal citation to the offender to appear before the nearest justice for trial, there were times when the traffic regulation inspector and equipment were idle because a county traffic officer by reason of county needs was not available. To remedy this, the Chief of the Motor Vehicle Department was requested to appoint the five traffic regulation inspectors as field deputies, and this was done. The police power given proved of great value, permitting the traffic regulation inspectors to handle violations at all times and places and did away with enforced idleness.

At the beginning of patrolling in an assigned territory the work was largely educational, violators were informed of the legal load limits, minimum thickness of solid rubber tires and, in case of tractors, the permit requirements. Excess loads were removed or adjusted, a warning given the chauffeur or driver and the vehicle allowed to proceed. Solid rubber tires thinner than the legal minimum of one inch were put on an allowable load basis corresponding to metal tires. Apprehended violators were cited to appear for trial before the nearest local justice of the county in which the violation was found and a complaint was filed with the justice against the violator.

Of the number of convictions on complaints filed in justice courts there were two appeals to the superior courts. Both convictions resulted from charges of violations of the Motor Vehicle Act, to wit, overloading of trucks upon the public highways. The cases were argued and submitted together before the superior court in Los Angeles County. The defendants contended that conviction of exceeding "Weight limit per inch of tire width" imposed in section 15, paragraph C, of the Motor Vehicle Act, was illegal unless the total excess load was at least one full ton.

The superior court rendered decision affirming in each case the judgment of the court below and remittiturs were sent down to the justice court in due course. This decision clarified the situation and affirmed all convictions secured in justice courts on complaints charging loads on any solid rubber or metal tire in excess of the maximum legal limit.

Between December 5, 1921, and August 16, 1922, on which date traffic regulation work by the Highway Commission ceased, the amount of work done by the five traffic regulation inspectors is shown by the following tabulation.

TABLE OF OPERATIONS OF TRAFFIC REGULATION CREWS OPERATING UNDER THE JURISDICTION OF THE CALIFORNIA HIGHWAY COMMISSION, DECEMBER, 1921, TO AUGUST, 1922.

Period	No. of vehicles	Vehicles Carrying total overloads		Tire inch Overloads		Thin Tires		Tractors without permits	Overloads Adjusted & removed	Summons served	Convictions	Total money penalties	Other penalties	Speeding trucks & trailers	Cases pending or not reported.
		No.	%	No.	%	No.	%								
Dec. 1921 to Feb.28, 1922	195	24	12.31	79	40.51	5	2.56		88	39	32	$552.00	2	-	-
March "	154	15	9.74	44	28.57	22	14.29		56	42	36	618.00	5	2	-
April "	89	6	6.74	41	46.07	10	11.23	3	38	28	26	391.00	5	2	2
May "	104	12	11.54	37	35.58	32	30.77	3	46	26	25	280.00	9	3	-
June "	126	16	12.70	53	42.06	52	41.27	1	45	52	43	681.25	5	1	4
July "	149	29	19.46	38	25.50	94	63.09	7	28	69	59	595.00	9	6	7
August "	97	16	16.49	31	31.96	60	61.86	4	22	41	34	437.00	8	2	6
Totals	914	118	12.91	323	35.34	275	30.09	18	323	297	255	$3617.25	43	16	19

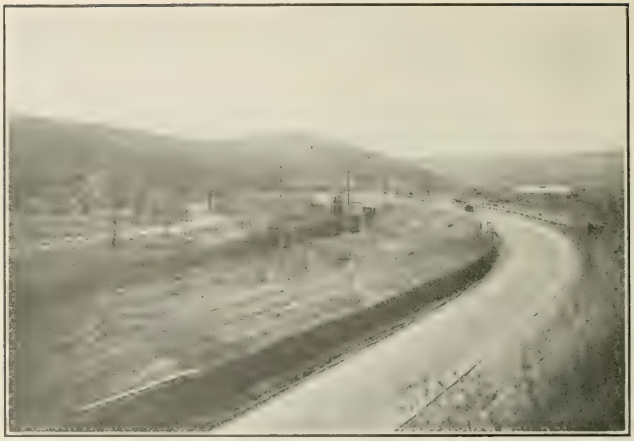


Plate LXXIV. State Highway, Alameda County, overhead crossing of Southern Pacific Railroad at Summit School, Altamont.



Plate LXXV. State Highway, Alameda County, overhead crossing of Southern Pacific Railroad in course of construction, between Altamont and Greenville.

It seems pertinent to record that county officials, particularly supervisors, are alive to the need for adequate policing of the highways against abuse and damage by motor trucks and other vehicles carrying illegal excess loads. A number of counties, following the lead of the Highway Commission, have put out similar equipment and are campaigning against overloaded vehicles.

The total working time for the five traffic regulation inspectors between December 5, 1921, and August 16, 1922, including all days, was 1149. This time was spent in constant patrolling of about 1500 miles of state highways, and included in addition visits to justice courts to file complaints and attendances before the court as prosecuting witness. Trucks, trailers and other vehicles were weighed, using loadometers.

Three hundred twenty-three overloads, either total or tire inch, and 275 tires thinner than the minimum allowed by law were discovered. Two hundred fifty-five convictions were secured and $3,617.25 in fines was assessed by courts against the violators. There were also 23 suspended sentences. Many loaded vehicles were inspected, which did not indicate overloads and therefore were not weighed and no record made.

As a rule, only the rear end of the truck was weighed. The total load of 375 trucks was taken, however, and the distribution of gross load ascertained to be as follows:

Number weighed	Gross weight lbs. between	Per cent of load on rear end	Per cent of load on front end
4 trucks	0–10,000	79.94	20.06
152 trucks	10,000–20,000	74.51	25.49
148 trucks	over 20,000	75.73	24.27
71 trailers	4,600–22,600	55.76	44.24

The utmost courtesy toward the public was demanded of the inspectors employed on the work. The conduct of the work was clearly set forth in the following general instructions to the superintendent of traffic regulations:

"April 18, 1922.

Mr. C. L. J. Frohwitter,

Superintendent Traffic Regulations,

Sacramento, California.

Dear Sir: You and your assistants will please be governed by the following instructions in regard to conduct and enforcement of the provisions of the Motor Vehicle Act, relative to overloading of vehicles:

1. Provide yourself with a copy of the California Motor Vehicle Act as amended in 1919 and 1921, and thoroughly familiarize yourself with all of the paragraphs of section 15 and paragraphs (*b*) and (*c*) of section 22, which sections have to do with the permissible weights of vehicles and the speed limit of trucks.

2. Arrangements have been made to provide each one of your assistants with some means of motor transportation; also with a pair of loadometers and heavy jacks. One of the first duties of your inspectors should be to see that the speedometers on the motor vehicles accurately record the speed of the vehicle. This is very essential in connection with checking up the speed of trucks. The loadometers likewise should be checked at present by local representatives of the Sealer of Weights and Measures. Arrangements will be made soon for checking and adjusting all loadometers at headquarters in Sacramento. The loadometers and the speedometers on the motor vehicles should be checked periodically to insure that they do not become inaccurate.

3. Each inspector has been deputized by the Motor Vehicle Department. The object of so deputizing the Traffic Regulation Inspector is for the purpose of enabling him to make arrests when it is not possible to have the assistance of a local traffic officer. It is expected, however, that wherever possible, the assistance of the local authorities will be secured. In this way the work can be made more effective and if the arrest for violation is made by a local traffic officer, it will not as a rule be necessary for the Traffic Regulation Inspector to appear as a witness in the case and he will be free to proceed, unhampered by the necessity of adjusting his work to the convenience of the Court.

4. The utmost courtesy towards the public must be observed at all times by yourself and your assistants. It should be possible after a reasonable amount of experience for your assistants to judge somewhat as to the load of trucks and thus obviate the necessity of stopping and weighing a large percentage of trucks which are within the law.

The inspectors are expected to acquaint themselves with the average weights of farm produce and merchandise carried in containers of fixed size or volume habitually moved through their territory, so that they can by counting the number of packages or by sizing up the dimensions of a load arrive at an approximate estimate as to whether or not the vehicle is overloaded. In this way a great deal of annoyance will be saved to the public and the work of the inspector can be made more effective.

5. Trucks should be checked for speed, as well as for overloading, as heavily loaded trucks operating at speeds in excess of those permitted by the Motor Vehicle Act are the occasion of serious damage to the pavement.

6. Whenever the truck is not found to be overloaded on the rear end, it will not be necessary to weigh the front end. However, when the rear end is found to be overloaded, the front end must always be weighed and the loads on all four wheels shown on the record sent to this office.

In weighing trucks, care should always be taken to have the trucks as near level as possible, especially the two rear wheels.

7. In order not to place undue strain on the loadometers and also in order to make the work easier for the inspector, the trucks should be jacked up with the heavy jacks, the loadometer placed underneath the axle and the load eased onto the loadometer by lowering the jack. Place the loadometers under the axle as near as possible the same distance inside the wheel on each side. Use sufficient blocking under the base of the loadometer so that the screw is not unscrewed more than 1 to $1\frac{1}{2}$ inches when the wheels are clear of the ground. Keep all working and bearing parts of the loadometers well oiled or greased.

8. Whenever a truck is found to be overloaded, the driver should be required to adjust the load, if possible, so as to secure a more uniform loading. If it is impossible to remove the overload on any one wheel by adjustment, the excess load should be entirely removed from the vehicle.

9. Trucks which are found to have insufficient rubber on the tires should be treated the same as all-metal-tired trucks and the load checked on the basis of 500 pounds per inch in width, instead of the 700 pounds per inch in width allowed for motor vehicles with solid rubber tires one or more inches in thickness; the speed limit for such trucks to be the same as the permissible speed limit for metal-tired vehicles.

10. When the vehicle is found to be but slightly overloaded, it will not be necessary to do any more than see that the load is properly adjusted and warn the offender that on the second offense, it will be necessary to arrest him. However, if the overloading is serious, arrest should be made even on the first offense and every effort made to secure conviction.

In general, it may be stated that minor violations of the provisions of the Motor Vehicle Act are not to be considered sufficient justification for Court action. Such action as may be necessary to put the load within the requirements of the law should be required of the driver and he should be instructed, cautioned, and allowed to proceed.

11. A book of "Traffic Regulation" report records will be furnished to each inspector. These records are to be made out in triplicate by the inspector, the original copy to be mailed direct to this office; the duplicate to be mailed to the Superintendent of Traffic Regulation, and the triplicate copy to be retained by the inspector for future reference.

12. Whenever a truck is weighed, the record should be made out immediately and mailed the same night to Sacramento. If an arrest is made, a subsequent report

should be made showing the ultimate disposition of the case. The second report should clearly indicate that a preliminary report has already been turned in.

13. Whenever an arrest is made, the number of the "Notice of Arrest" should be shown on the Traffic Regulation Records sent to this office.

Yours very truly,

THOS. E. STANTON,
Assistant State Highway Engineer."

In 1922 the Attorney General's office is stated to have rendered an opinion that the appointment as field deputy of anyone not in the direct employ of the Motor Vehicle Department was illegal.

As this decision took away from the traffic regulation inspectors their power to stop and weigh trucks and also to make arrests, and it was not considered feasible to always have the service of a county traffic officer for the purpose, the California Highway Commission was forced to discontinue the work and disband the traffic regulation organization.

Appendix I.

BRIDGE WORK ON STATE HIGHWAYS.

By H. E. Warrington, Assistant Highway Engineer.

In common with that of other departments, the work of this office has been considerably increased during the past two years. Much time has been given to the checking of plans submitted by the county authorities for bridges upon the state roads, and to their design by this department when this has been requested. In general, it is pleasant to record, there has been hearty cooperation with the Commission in making these county designs conform to modern requirements, but occasionally some disposition has been evinced to neglect conservative practice in favor of lower first cost.

It is, therefore, still believed that legal authority should be lodged with the Commission to require that the design of all structures on state highways shall accord with proper standards, and to compel close inspection during their building. The importance of the latter is not realized to the extent desirable. It is easily possible to vitiate the design in construction, especially in concrete structures, where improper placing of the steel, failure to hold it rigidly during the pouring of the concrete, or poor mixing or placing of the concrete may readily reduce the strength of the completed bridge to the danger point. All this requires inspectors of wide experience and sound judgment.

Much attention is necessary to what may seem minor details both in design and construction, or large expenditures will be necessary later in repairs. The building of concrete bridges is essentially a manufacturing process carried on in the field, whereas, for steel structures the fabrication has been attended to in shops fitted for it, and only the erection remains, usually a comparatively simple matter.

During the past two years the Commission has designed and built forty-nine bridges and other structures, at an aggregate cost of $983,000, the bridges being well distributed over the state. In addition, plans have been finished and contracts let for twelve bridges and structures, now under construction. The contract cost of these structures is $247,000. Plans for eleven bridges on the highways have been prepared for various counties at their request. The contract costs of these bridges is not known, but it is estimated at $156,000. County plans for forty-five bridges have been checked by the Commission. The cost of these bridges is figured to be $1,300,000. Plans have been practically completed by the Commission for eighteen other bridges, contracts for which can be let at an early date. The preliminary estimate for these bridges is $700,000.

Some fifty special culverts, mostly under heavy fills, have been designed for different roads, and plans are under way for twenty-four more. These special culverts are of all sizes.

Five railway grade crossings have been done away with during the past two years, and plans are in preparation or completed for eight others. Notes upon these structures are given later. The work of elimi-

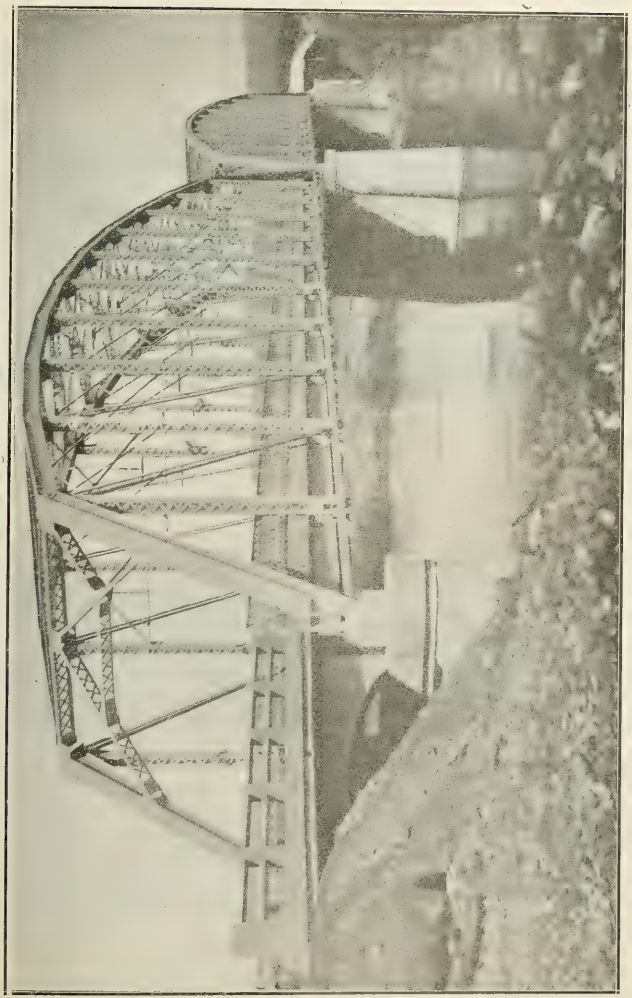


Plate LXXVI. State Highway, Butte County, bridge over Feather River.

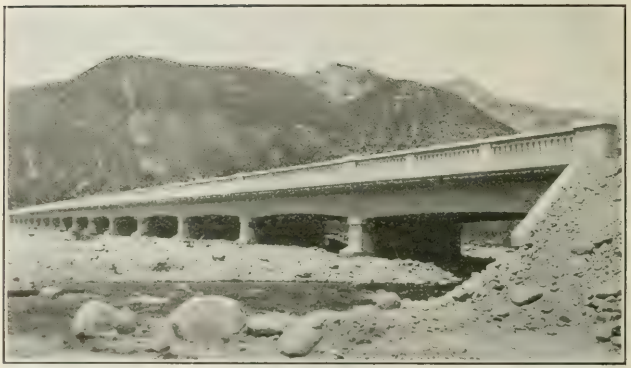


Plate LXXVII. State Highway, Los Angeles County, bridge over the North Branch of the Big Tujunga River.



Plate LXXVIII. State Highway, Los Angeles County, bridge over North Branch of Big Tujunga River, showing roadway.

nating dangerous grade crossings is being pushed as rapidly as funds will permit.

Some notes on a few of the larger structures designed by the Commission and completed during the past two years are here appended.

The bridge over the Feather River in Butte County on the Oroville lateral (Plate LXXVI) consists of two steel spans of 231 feet each, having a reinforced concrete floor upon which is placed an asphalt paving. On the easterly side is a creosoted pile trestle approach 647 feet long, and a concrete girder approach span 30 feet long is placed at the westerly end, avoiding a costly abutment, which would be necessary otherwise. The main steel spans rest upon concrete piers. The total length of the bridge is 1145 feet. Both approaches also have asphalt surfacing.

The bridge over the Rio Hondo in Los Angeles County, adjacent to Monterey Park (formerly Montebello), consists of four steel pony truss spans of 100 feet each, with a reinforced concrete approach span of 35 feet at each end. The concrete spans allow the approach fills to slope under them, eliminating expensive abutments. The steel spans have reinforced concrete floors, and the whole is surfaced with asphalt. The spans rest upon reinforced concrete piers, carried some 20 feet below the river bed and resting on wood piles. The total length of the bridge is 480 feet.

As a matter of historical interest the following is added concerning the structure replaced by this bridge.

The old bridge included two combination wood and steel spans, each 80 feet long on steel cylinder piers, and there were wooden approach trestles at each end. The total length of this old structure was approximately 740 feet. On October 14, 1920, this bridge was entirely destroyed, a camper's fire spreading to dry underbrush near the structure having ignited it. A high pressure gas main on the bridge made it impossible to control the fire until the bridge was consumed.

The traffic over this structure is very heavy, as it is on the main route between Los Angeles and San Diego.

The bridge over the north branch of the Big Tujunga (Plates LXXVII, LXXVIII), also in Los Angeles County, consists of sixteen reinforced concrete girder spans of 54 feet each. The spans rest upon plain concrete piers and abutments. The total length of the bridge is 869 feet.

The Bear Gulch bridge, in Humboldt county (Frontispiece), mentioned in the lest biennial report, has now been completed. It consists of a reinforced concrete arch span of 128 feet with reinforced concrete approach spans, its total length being 247 feet. It is over a deep narrow arroyo, with rocky sides. The roadway is approximately 120 feet above the bottom of the arroyo.

The bridge over the Middle Fork of the Yuba River (Plate LXXX) in Nevada and Yuba counties was built by the Commission's forces. It is a reinforced concrete arch span 132 feet long, with concrete girder approach spans at each end, the total length being 200 feet.

In Nevada County is the bridge over the South Fork of the Yuba River (Plate LXXIX), also built by the Commission's forces. It is a single reinforced concrete arch span of 120 feet, with concrete girder approaches at each end; its total length is 199 feet.

The bridge over the Salinas River near King City is now completed and opened to traffic.

Under contract, but not yet finished, are three bridges on the Cuyama lateral in San Luis Obispo and Santa Barbara counties. These are over Huasna Creek (two steel pony truss spans of 100 feet each); Alamo Creek (of the same general plan as Huasna Creek), and across the Cuyama River, a steel truss span of 200 feet, with reinforced concrete girder approach spans, the total length of bridge being 356 feet.

BRIDGE PLANS COMPLETED OR UNDER WAY.

In addition to the above work, plans have been completed or are under way for several important bridges, among which is that over the San Gabriel River in Los Angeles County, made up of eighteen spans of 54 feet each, reinforced concrete girders, upon plain concrete piers. The new bridge replaces an old structure of wood and steel, but is located upon a revised line, about a quarter mile below the old bridge. Its total length is 1004 feet.

In San Joaquin County, plans are well along towards completion for a new bridge over the San Joaquin River. This bridge will contain a draw span 250 feet long, having concrete floor, and with reinforced concrete girder approach spans. The total length of the bridge will be 554 feet. The general plan has been approved by the government, and its building authorized by the Secretary of War.

Considerable study has been given to plans for a long reinforced concrete viaduct in Sacramento County, north of the American River, and across its overflow channel. The design is complicated by two railroad crossings, and the plans have not yet reached a final stage, as changes in this overflow channel are contemplated by the Reclamation Board.

OVERHEAD AND SUBWAY CROSSINGS.

The undergrade crossing of the Southern Pacific Railroad near Red Bluff in Tehama County has now been completed. This eliminates a very bad grade crossing where a number of accidents have occurred.

The undergrade crossing of the Northwestern Pacific Railroad near Arnold in Mendocino County has now been finished (Plate LXXXIII).

A crossing over the San Diego and Arizona Railway in San Diego County, near Jacumba, has been completed, doing away with a grade crossing at this point, which was particularly dangerous, as the railway approach to it was through a deep cut, and trains could not be seen until they were close to the crossing.

The undergrade crossing of the Western Pacific Railroad near Overacker, in Alameda County, has also been finished (Plate LXXXIV).

Negotiations with the Southern Pacific Railroad for an undergrade crossing near Cottonwood in Shasta County have been concluded, and this work is expected to be finished later in the year. The same is true of an undergrade crossing of the Southern Pacific Railroad near Redding, in Shasta County.

The overhead crossing of the Northwestern Pacific Railroad near Lytton, in Sonoma County, has been authorized by the Railroad Commission and work upon this is expected to be begun before the close of the year.



Plate LXXIX. State Highway, Nevada County, bridge over South Fork Yuba River.



Plate LXXX. State Highway, Yuba-Nevada Counties, bridge over Middle Fork Yuba River.

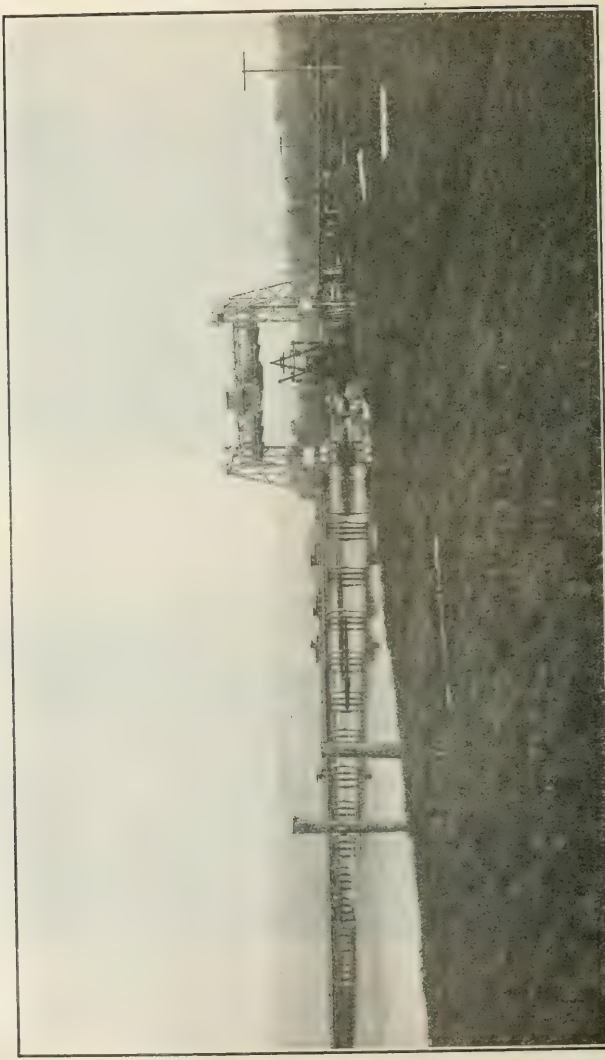


Plate LXXXI. State Highway, Humboldt County, bridge across Eureka Slough, showing lift span open.

The overhead crossing of the Southern Pacific Railroad east of Altamont has now been completed. (Plate LXXIV). That west of Altamont is under construction. (Plate LXXV). Both crossings are in Alameda County.

The plans for the elimination of a grade crossing of the Southern Pacific Railroad near Fredonia in Lassen County have been completed, together with those for the requisite bridge over the Susan River at this place, and it is expected that a contract for the work will soon be let.

A general plan for an overhead crossing of the San Francisco-Sacramento electric railroad near Denverton, in Solano County, has been submitted to the Railroad Commission. Their decision, permitting its construction and apportioning the cost thereof between the state and the railroad has been rendered, and detail plans of the necessary structure will soon be undertaken.

General plans for an undergrade crossing of the Northwestern Pacific Railroad near Alta in Marin County have been submitted to the Railroad Commission, but its decision thereon has not yet been made.

Preliminary studies for separation of grades of the highway and the Southern Pacific Railroad at five points in Placer County, near Bowman and Applegate, have been made, but no further work thereon has been done as yet.

Appendix K.

TESTING AND RESEARCH LABORATORY.

C. S. Pope, Assistant Highway Engineer.

F. T. Maddocks, Testing Engineer (Physical).

G. H. P. Lichtharvt, Testing Engineer (Chemical).

Previous to the creation of the Department of Public Works, the examination and testing of materials by the California Highway Commission related largely to those materials encountered or used in highway construction.

After the organization of the Department of Public Works, however, the chemical testing laboratory, which up to that time had been under the jurisdiction of the State Purchasing Agent and which was principally employed in making chemical analyses of materials and supplies purchased for the various state institutions, was by arrangement placed under the jurisdiction of the Director of Public Works.

In order to properly house and centralize the testing and research work, the California Highway Commission has erected and equipped a building to be known as the testing and research laboratory.

This structure is a Class A building of brick, one story in height, with a spacious basement, and covers an area approximately 33 feet in width by 105 feet in length, and is set in a plot of ground approximately 272 feet long by 50 feet in width.

The main floor is occupied by a centrally located office with physical and chemical laboratories occupying the wings, and the blue print establishment a room in the rear.

The basement is devoted to the photostat department and to storage purposes.

The laboratories are well equipped with all necessary instruments to insure efficient handling of the work to be done.

PHYSICAL TESTING LABORATORY.

This laboratory controls materials used in highway construction throughout the entire state, and also makes physical tests of construction materials for all state departments.

Since its organization in May, 1912, the scope of work handled by this department has been so complete that records exist of materials from practically all usual sources of supply in the state.

In addition, a considerable amount of research work has been done from time to time.

Extensive experiments have been made relating to the action of alkali soils on cement concrete and asphaltic concrete, and some experiments also on the proper treatment of adobe and other adverse soils.

Numerous tests have been made of reinforced concrete slabs of various thicknesses, compositions, and differing arrangements of steel.

The effect of adulterants of various kinds has been given some attention in connection with concrete tests.

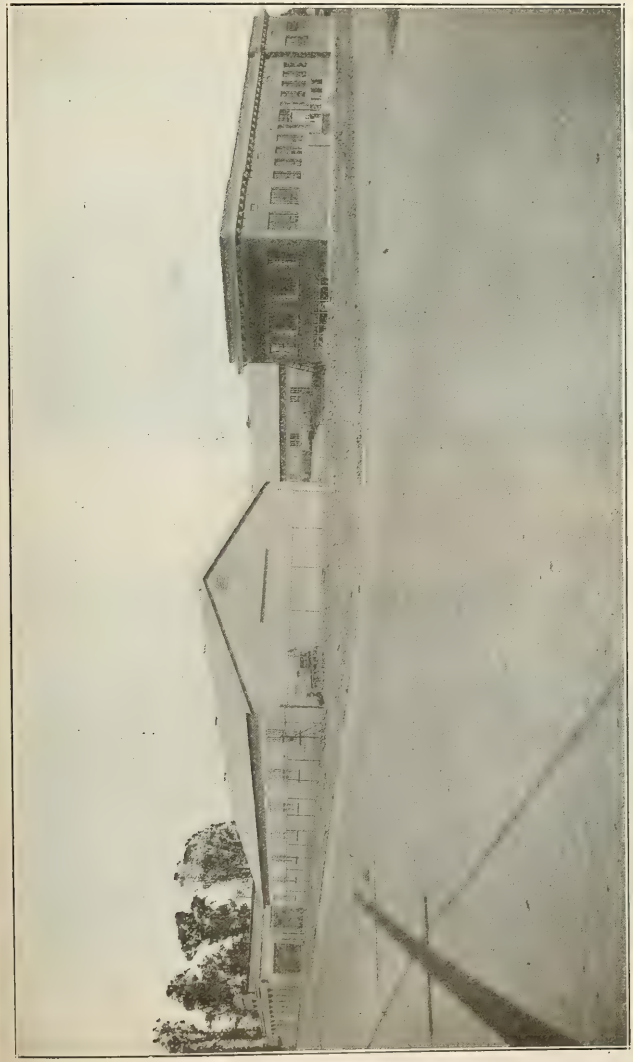


Plate LXXXII. California Highway Commission, testing laboratory, warehouses and repair shop buildings, Sacramento.



Plate LXXXIII. State Highway, Mendocino County, showing Arnold undergrade crossing of Northwestern Pacific Railroad.

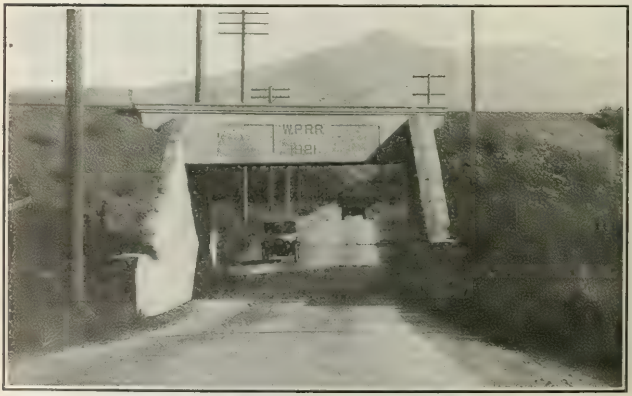


Plate LXXXIV. State Highway, Alameda County, showing undergrade crossing of Western Pacific Railroad.

Materials from all work are tested with a frequency conforming to federal aid regulations and all tests are governed by the A. S. T. M. standards.

The minimum requirements governing tests of materials used in federal aid road construction are as follows:

DETERMINATION FOR QUALITY.

Portland cement	a.	Sample from each car or its equivalent, or
	b.	If bin tested, requirements of A. S. T. M. standard Test, C 9-17 govern.
Paving brick	a.	Sample from each car or its equivalent, or
	b.	If plant sampled, 3 tests from each kiln, or pile.
Bituminous materials	a.	Sample from each car or its equivalent, and
	b.	Sample each day from each kettle for consistency.
Bituminous concrete sheet asphalt	a.	Sample of mix from each day's run.
Rock	a.	Prior to use unless from a quarry tested within two years.
Slag	a.	Prior to use in all cases.
Gravel or sand	a.	Prior to use when intended as concrete aggregate.
Culvert metal	a.	One sample from each 10 culverts.
	b.	Not less than 3 samples from any one shipment.
Reinforcing steel	a.	Sample of each size bar from each consignment.
	b.	Sample of mesh reinforcement from each consignment.
	c.	In lieu of (a) and (b) steel may be sampled at mill in which case A. S. T. M. Standard Test A 15-14 or A 16-14 are to govern.

DETERMINATION FOR SIZE.

Crushed stone, slag, gravel and sand for cement concrete, bituminous concrete and sheet asphalt pavements	a.	Composite sample from each consignment. No sample to represent more than 100 cubic yards and
	b.	In the case of bituminous concrete and sheet asphalt daily determinations on total mineral aggregate also to be made.
Mineral filler	a.	Sample from each consignment. No sample to represent more than 200 barrels.

During the year 1922 a large increase in asphaltic surfacing made necessary an expansion in personnel of this department and the work is now as thoroughly organized in the field and at the laboratory as any other part of the work.

Field engineers are equipped with scales, sieves, thermometers and other equipment necessary for field examination of materials at paving plants.

Samples of asphaltic cements and asphaltic mixtures are forwarded to the laboratory daily, together with complete reports of plant procedure and road progress.

The laboratory equipment comprises the usual cement testing equipment and in addition two compression machines of 50,000 and 200,000 pounds capacity, respectively.



Plate LXXXV. State Highway construction camp, Mendocino County.



Plate LXXXVI. State Highway construction camp, Los Angeles County.

Preliminary sieving is done by means of a mechanical sieving machine, and asphaltic mixtures are handled by two Rotarexes of 50 and 1000 grammes capacity.

A Deval abrasion machine is used for rock tests and carborundum saws for sawing samples of cement concrete or asphatic concrete. Asphaltic work is handled with the usual standard equipment.

Tests of corrugated metal pipe are made for weight and for spelter coating only at the present time.

The volume of the work has increased so greatly during the years 1920-22 that the force in this department now consists of the testing engineer and five assistants.

The amount of work done in the last biennium practically equals the total work done up to the year 1920, as shown by the following tabulation:

	1912–1920	1920–1922
Sand	985	955
Gravel	357	
Rock	270	753
Cement concrete	1,796	1,504
Asphaltic mixtures	1,004	1,140
Portland cement	4,000	3,000
Asphaltic cement	1,700	600
Corrugated metal	130	276
Steel	None	None

CHEMICAL TESTING LABORATORY.

This department on request makes analyses of materials purchased by the State Purchasing Department and by the various state institutions. Samples of coal, fuel oils, paints, grease, lubricating oils, varnish, leather, cloth, paper, and the numerous varied materials required by the different departments are submitted to this laboratory for test and the state thereby assured that materials will conform to specification requirements.

A great many of the articles now purchased by the state are purchased under specifications framed by this department and the system is rapidly being extended.

Coal and fuel oil, for instance, are purchased on a B.T.U. rating.

The force in this laboratory consists of the chemical engineer and two assistants and the laboratory is well equipped for the work it has to do. During the last biennium this department reported on some 1200 tests.

BLUE PRINT DEPARTMENT.

This department is equipped with an electric blue print machine. The volume of work handled by the department requires the employment of two men. These men are capable of turning out work equal to that of privately operated plants at a considerable saving in cost.

The monthly output of blue prints aggregates approximately 20,000 square feet and the cost is somewhat less than two cents per square foot.

Work is done for all state departments and both blue prints and blue line prints are turned out expeditiously and regardless of weather conditions.

PHOTOSTAT DEPARTMENT.

This department is equipped with an Eastman photostat and is engaged in reproducing title sheets, maps, tracings, drawing, etc., at a convenient size for use in office and field, and other work of similar character. One of its principal functions is the reproduction of documents, photographs, and general photographic work.

Since the organization of the Department of Public Works the work of the photostat department has increased considerably and two men are now required to handle the work.

Appendix L.

STATE HIGHWAY BOND SALES.

FIRST STATE HIGHWAY BONDS SOLD.

$18,000,000

Numbers	Amount	Orighal sale date	Purchaser	Resale date	Purchaser
1–150	$150,000	10/21/11	N. W. Halsey and Company		
151–300	150,000	10/21/11	Anglo-London-Paris National Bank		
301–400	100,000	12/ 5/11	State of California	7 3 14	School Fund
401–450	50,000	12/ 5/11	Sacramento Valley Bank and Trust Company		
451–650	200,000	8/29/12	Los Angeles Trust and Savings Bank		
651–700	50,000	8/13/12	Wells Fargo National Bank		
701–704	4,000	9/23/12	D. O. Mills and Company		
705–714	10,000	9/25/12	J. B. Toplitz		
715–800	86,000	10/ 4/12	Sacramento Valley Bank and Trust Company		
801–900	100,000	7/29/12	E. H. Rollins and Sons		
901–1000	100,000	7/12/12	D. O. Mills and Company		
1001–1100	100,000	7/18/12	Anglo-London Paris National Bank		
1101–1150	50,000	10/ 3/12	California National Bank		
1151–1200	50,000	7/23/12	N. W. Halsey		
1201–1350	150,000	7/18/12	Anglo-London Paris National Bank		
1351–1400	50,000	7/29/12	E. H. Rollins and Sons		
1401–1550	150,000	7/23/12	N. W. Halsey		
1551–1600	50,000	7/12/12	D. O. Mills and Company		
1601–1610	10,000	11/21/12	E. H. Rollins and Sons		
1611–1620	10,000	12/ 5/12	Wm. McLean		
1621–1625	5,000	12/ 5/12	Ida M. Smith		
1626–1630	5,000	12/ 5/12	Willis Smith		
1631–1730	100,000	12/14/12	N. W. Halsey		
1731	1,000	12/19/12	F. R. Sumner		
1732–1778	47,000	1/22/13	Sacramento Valley Bank and Trust Company		
1779–1780	2,000	1/30/13	Mrs. F. R. Sumner		
1781–1980	200,000	1/30/13	Hibernia Savings and Loan Society		
1981–1984	4,000	1/30/13	Consuelo Supreme Da U. P. E. C.		
1985–2000	16,000	2/15/13	N. W. Halsey and Company		
2001–2250	250,000	2/ /13	Security Trust and Savings Bank, Los Angeles		
2251–2400	150,000	2/ /13	First National Bank Los Angeles		
2401–2450	50,000	3/ 7/13	Bank of Italy		
2451–2500	50,000	3/11/13	German Savings and Loan Society, San Mateo		
2501–2520	20,000	6/16/13	California National Bank, San Bernardino		
2521–2525	5,000	6/16/13	California National Bank		
2526–2528	3,000	3/10/13	Mrs. F. R. Sumner, San Bernardino		
2529–2558	30,000	3/29/13	Wells Fargo National Bank, Santa Clara		
2559–2585	27,000	4/12/13	E. D. Roberts a/c S. F. Seawall Sinking Fund		

2586–2605	20,000	4/18/13	Bank of Ukiah, Mendocino		
2606–2607	2,000	4/26/13	D. O. Mills and Company, San Bernardino		
2608–2687	80,000	5/13/13	First National Bank, San Diego		
2688–2700	13,000	5/27/13	First National Bank, Rialto, San Bernardino		
2701–2720	20,000	11/ 1/13	E. D. Roberts a/c S. F. Seawall Sinking Fund		
2721–2795	75,000	2/21/14	Citizens National Bank, Riverside		
2796–2800	5,000	3/ 5/14	San Francisco Seawall Sinking Fund		
2801–2900	100,000	4/11/13	Associated Banks, Humboldt		
2901–3000	100,000	4/11/13	Hibernia Savings and Loan, San Mateo		
3001–3010	10,000	3/13/13	California National Bank		
3011–3017	7,000	3/18/13	California National Bank		
3018–3039	22,000	3/20/13	California National Bank		
3040	1,000	3/20/13	California National Bank		
3041–3047	7,000	4/22/13	Sacramento Valley Bank and Trust Company		
3048–3062	15,000	4/23/13	California National Bank		
3063–3082	20,000	4/24/13	California National Bank		
3083–3089	7,000	5/ 5/13	California National Bank		
3090–3104	15,000	5/ 5/13	Mierson Banking Company, Placerville		
3105–3115	11,000	12/ 2/13	Alameda County		
3116–3125	10,000	2/11/14	State of California	2/11/14	S. F. Seawall Sinking Fund
3126–3200	75,000	1/ 3/14	State of California	1/ 1/14	Teachers Salary and Retirement Fund
3201–3400	200,000	4/24/13	Associated Banks, Orange		
3401–3402	2,000	4/24/13	Mayfield Bank and Trust		
3403–3413	11,000	4/23/13	Bank of Los Gatos		
3414–3463	50,000	4/28/13	First National Bank, San Jose		
3464–3501	38,000	5/ 9/13	Bank of San Jose		
3502–3511	10,000	7/16/13	Garden City Bank and Trust Company		
3512–3518	7,000	4/22/13	Bank of Sunnyvale		
3519–3525	7,000	4/21/13	Bank of Campbell		
3526–3527	2,000	5/ 3/13	First National Bank, Gilroy		
3528–3530	3,000	4/23/13	Bank of Morgan Hill		
3531–3534	4,000	6/18/13	Mission Bank, Santa Clara		
3535–3548	14,000	4/18/13	Bank of Gilroy		
3549–3558	10,000	4/23/13	Bank of Hopland, Mendocino		
3559–3633	75,000	4/25/13	Peoples Bank, Santa Cruz		
3634–3903	270,000	4/26/13	Los Angeles Banks, Los Angeles		
3904–3908	5,000	4/30/13	State Bank, Dunsmuir, Shasta		
3909–3923	15,000	5/13/13	First National Bank, Salinas, Monterey		
3924–4000	77,000	5/13/13	First National Bank, San Diego		
4001–4100	100,000	6/27/13	Central National Bank, Oakland		
4101–4110	10,000	7/17/13	First National Bank, Hollister, San Benito		
4111–4125	15,000	7/17/13	Bank of Hollister, San Benito		

FIRST STATE HIGHWAY BONDS SOLD—Continued

Numbers	Amount	Original sale date	Purchaser	Resale date	Purchaser
4126–4140	15,000	6/18/13	Salinas City Bank		
4141–4155	15,000	6/19/13	Monterey County Bank		
4156–4180	25,000	12/ 2/13	Alameda County		
4181–4230	50,000	7/ 1/13	Safe Deposit Bank, San Jose, Santa Clara		
4231–4270	40,000	10/ 1/13	E. D. Roberts, San Bernardino		
4271–4295	25,000	10/14/22	Commercial Bank, Santa Barbara		
4296–4298	3,000	10/18/22	First National Bank, Paso Robles, S. L. O.		
4299–4309	11,000	10/18/22	Union National Bank, San Luis Obispo		
4310–4345	36,000	10/18/22	Commercial Bank, San Luis Obispo		
4346–4360	15,000	11/ 6/13	Supervisor, Mendocino County		
4361–4380	20,000	11/11/13	Colony Holding Corporation, San Luis Obispo		
4381–4400	20,000	11/ 7/13	Supervisors, San Luis Obispo		
4401–4450	50,000	10/18/13	Commercial Bank, Santa Barbara		
4451–4485	35,000	10/20/13	Commercial Bank, Santa Barbara		
4486–4565	80,000	11/10/13	Colony Holding Corporation, San Luis Obispo		
4566–4645	80,000	11/ 7/13	Supervisors, San Luis Obispo		
4646–4660	15,000	10/24/13	Commercial Bank, San Luis Obispo		
4661–4667	7,000	10/28/13	Jamestown National Bank, Tuolumne County		
4668–4674	7,000	10/28/13	First National Bank, Jamestown, Tuolumne Co.		
4675–4824	150,000	11/18/13	Fresno County		
4825–4924	100,000	12/ 4/13	Contra Costa County		
4925–5074	150,000	12/ 2/13	Alameda County		
5075–5124	50,000	11/20/13	Siskiyou County		
5125–5134	10,000	12/ 1/13	First National Bank, Santa Barbara		
5135–5159	25,000	11/25/13	Title Insurance and Trust Company, Los Angeles		
5160–5165	6,000	11/20/13	Central Bank, Santa Barbara		
5166–5176	11,000	11/20/13	First National Bank, Tuolumne County		
5177–5190	14,000	12/ 2/13	Alameda County		
5191–5200	10,000	12/ 4/13	Contra Costa County		
5201–5390	190,000	12/22/13	Contra Costa County		
5391–5590	200,000	1/ 8/14	Kern County		
5591–5605	15,000	1/ 7/14	San Bernardino Savings Bank, San Bernardino		
5606–5655	50,000	2/ 5/14	Imperial County		
5656–5705	50,000	2/13/14	Sacramento Clearing House, Yolo		
5706–5775	70,000	2/20/14	Merced County		
5776–5782	7,000	3/ 6/14	San Diego County		
5783–5800	18,000	3/ 5/14	Glenn County		

5801–6000	**200,000**	3/ 5/14	Glenn County		
6001–6400	**400,000**	2/13/14	Sacramento Clearing House, Yolo		
6401–6450	50,000	2/20/14	Merced County		
6451–6500	50,000	3/13/14	Imperial County		
6501–6550	50,000	3/ 4/14	Marin County		
6551–6675	125,000	3/ 2/14	Colusa County		
6676–6700	25,000	3/ 6/14	San Diego County		
6701–6800	100,000	3/ 4/14	Marin County		
6801–6883	83,000	3/ 6/14	San Diego County		
6884–7000	117,000	3/ 3/14	Shasta County		
7001–7083	83,000	3/31/14	Shasta County		
7084–7200	**117,000**	4/ 4/14	Tehama County		
7201–7375	175,000	4/ 2/14	Butte County		
7376–7525	150,000	4/ 3/14	Ventura County		
7526–7540	15,000	4/ 7/14	Tehama County		
7541–7600	60,000	4/ 3/14	Kern County		
7601–7750	150,000	3/31/14	Solano County		
7751–7950	200,000	4/ 7/14	Tehama County		
7951–8000	50,000	3/31/14	Siskiyou County		
8001–8100	100,000	3/31/14	San Benito County		
8101–8300	200,000	4/17/14	Orange County		
8301–8500	200,000	4/ 9/14	Alameda County		
8501–8650	150,000	3/31/14	Humboldt County		
8651–8870	220,000	4/17/14	Sonoma County		
8871–9020	150,000	5/ 3/14	Kern County		
9021–9120	100,000	6/12/14	Santa Clara County		
9121–9160	40,000	6/12/14	Santa Clara County		
9161–9200	40,000	4/18/14	Tuolumne County		
9201–9218	18,000	6/16/14	Tehama County		
9219–9230	12,000	6/17/14	San Francisco Seawall Sinking Fund		
9231–9275	45,000	6/12/14	Santa Clara County		
9276–9400	125,000	5/26/14	San Mateo County		
9401–9450	50,000	5/25/14	Yolo County		
9451–9850	400,000	4/18/14	Santa Barbara County		
9851–10000	**150,000**	3/31/14	Hibernia Savings and Loan Bank, Yolo		
10001–10075	75,000	2/ 5/15	Mendocino County		
10076–10115	40,000	3/25/15	Yuba County		
10116–10265	150,000	6/16/14	Humboldt County		
10266–10365	100,000	9/24/14	Los Angeles County		
10366–10545	180,000	6/23/14	Kern County		
10546–10645	100,000	8/28/14	Santa Clara County		
10646–10675	30,000	10/31/14	Capital National Bank, Sacramento		

FIRST STATE HIGHWAY BONDS SOLD—Concluded.

Numbers	Amount	Original sale date	Purchaser	Resale date	Purchaser
10676–10800	125,000	9/24/14	Los Angeles County		
10801–10900	100,000	9/19/14	Hibernia Savings and Loan Bank, San Francisco		
10901–10950	50,000	10/16/14	Siskiyou County		
10951–10960	10,000	11/23/14	Solano County		
10961–10980	20,000	12/10/14	Colusa County		
10981–10995	15,000	8/11/14	Trinity County		
10996–11035	40,000	12/12/14	Sutter County		
11036–11055	20,000	12/29/14	Colusa County		
11056–11057	2,000	11/11/14	Sutter County		
11058–11082	25,000	11/19/14	Sutter County		
11083–11087	5,000	12/10/14	Colusa County		
11088–11100	13,000	11/30/14	Sutter County		
11101–11200	100,000	12/10/14	Colusa County		
11201–11300	100,000	11/ 9/14	Solano County		
11301–11384	84,000	11/23/14	Solano County		
11385–11434	50,000	12/24/14	Los Angeles County		
11435–11494	60,000	2/15/15	Imperial County		
11495–11590	96,000	12/29/14	Colusa County		
11591–11600	10,000	3/ 9/15	Imperial County		
11601–11875	275,000	12/24/14	Los Angeles County		
11876–11900	25,000	12/29/14	Siskiyou County		
11901–12000	100,000	1/29/15	Napa County		
12001–12075	75,000	1/ 2/15	Stanislaus County		
12076–12100	25,000	1/29/15	Napa County		
12101–12225	125,000	3/16/15	Monterey County		
12226–12250	25,000	2/17/15	Capital National Bank, Sacramento		
12251–12275	25,000	3/16/15	Stanislaus County		
12276–13000	725,000	1/ 3/15	State of California		
12276–12338				2/15/16	E. H. Rollins and Sons
12401–12600				2/15/16	E. H. Rollins and Sons
12601–12800				2/18/16	E. H. Rollins and Sons
12802–12900				2/15/16	E. H. Rollins and Sons
12901–13000				2/18/16	E. H. Rollins and Sons
12339–12400				2/18/16	E. H. Rollins and Sons
13001–13150	150,000	3/16/15	Humboldt County		
13151–13400	250,000	3/24/15	Monterey County		
13401–13500	100,000	4/ 5/15	Imperial County		
13501–13700	200,000	3/16/15	San Diego County		
13701–13950	250,000	3/16/15	Ventura County		

13951–14000	50,000	3/16/15	Kings County		
14001–14150	150,000	8/ 7/15	Butte County		
14151–14200	50,000	7/30/15	Mono County		
14201–14235	35,000	7/28/15	Stanislaus County		
14236–14335	100,000	6/15/15	Merced County		
14336–14435	100,000	7/30/15	Inyo County		
14436–14535	100,000	7/30/15	Placer County		
14536–14670	135,000	8/ 3/15	San Luis Obispo County		
14671–14705	35,000	8/11/15	Tulare County		
14706–14760	55,000	8/ 3/15	Kings County		
14761–14820	60,000	8/11/15	Imperial County		
14821–14920	100,000	7/30/15	Placer County		
14921–14970	50,000	7/31/15	Mendocino County		
14971–15020	50,000	7/30/15	Placer County		
15021–15170	150,000	8/ 5/15	Monterey County		
15171–15200	30,000	11/10/15	Colusa County		
15201–15290	90,000	11/10/15	Colusa County		
15291–15315	25,000	7/30/15	Mendocino County		
15316–15365	50,000	8/11/15	Mendocino County		
15366–15415	50,000	8/11/15	Glenn County		
15416–15595	180,000	8/11/15	Tulare County		
15596–15630	35,000	8/ 3/15	National Bank, Sonora		
15631–15680	50,000	8/ 3/15	San Diego County		
15681–15730	50,000	6/30/15	Title Abstract Ins. and Trust Co. for Kern Co.		
15731–15790	60,000	8/17/15	Santa Cruz County		
15791–15990	200,000	7/28/15	Humboldt County		
15991–16040	50,000	1/ 5/16	Humboldt County		
16041–16290	250,000	7/30/15	Santa Barbara County		
16291–16340	50,000	1/ 5/16	Humboldt County		
16341–16365	25,000	8/11/15	Santa Barbara County		
16366–16400	35,000	8/23/15	Santa Clara County		
16401–16490	90,000	8/23/15	Santa Clara County		
16491–16500	10,000	8/ 5/15	Monterey County		
16501–18000	1,500,000	3/15/16	State of California, Surplus Fund		
16501–16850				4/ 4/17	Compens'n Insurance Fund
Total issue	$18,000,000				

Note:

16851–18000	1,150,000	Remains in surplus fund.
12801	1,000	

SECOND STATE HIGHWAY BONDS SOLD.

$15,000,000. Act, 1915.

Numbers	Amount	Original sale date	Purchaser	Resale date	Purchaser
1–3000	$3,000,000	8/ 1/17	National City Company and E. H. Rollins	----------	----------
3001–3250	250,000	9/11/17	Teachers' Permanent Fund	----------	----------
3251–5000	1,750,000	9/ 8/17	National City Company	----------	----------
5001–5005	5,000	5/ 8/18	National Bank of D. O. Mills and Company	----------	----------
5006–5011	6,000	6/22/18	National Bank of D. O. Mills and Company	----------	----------
5012–5311	300,000	8/ 2/18	General Fund Surplus	10/19/18	Anglo - London - Paris Bank
5312–5316	5,000	8/ 8/18	H. J. Aden	----------	----------
5317–5516	200,000	8/17/18	General Fund Surplus	----------	----------
5317–5416	100,000*	----------	----------	10/19/18	Anglo - London - Paris Bank
5417–5516	100,000*	----------	----------	11/22/18	Anglo - London - Paris Bank
5517–5841	325,000	10/28/18	General Fund Surplus	----------	----------
5842–6041	200,000	11/25/18	General Fund Surplus	----------	----------
5517–5616	100,000*	----------	----------	11/22/18	Anglo - London - Paris Bank
5617–6041	425,000*	----------	----------	11/29/18	Anglo - London - Paris Bank
6042–6641	600,000	11/27/18	General Fund Surplus	11/29/18	Anglo - London - Paris Bank
6642–7116	475,000	11/29/18	Anglo-London-Paris Bank	----------	----------
7117–8141	1,025,000	1/15/19	General Fund Surplus	----------	----------
8142–8491	350,000	4/ 3/19	General Fund Surplus	----------	----------
8492–8500	9,000	4/22/19	General Fund Surplus	----------	----------
7951–8500	550,000*	----------	----------	4/22/19	Anglo - London - Paris Bank
7117–7466	350,000*	----------	----------	4/ 2/19	Anglo - London - Paris Bank
7467–7476	10,000*	----------	----------	5/16/19	Anglo - London - Paris Bank
7501–7750	250,000*	----------	----------	5/16/19	Anglo - London - Paris Bank
7477–7500	24,000*	----------	----------	5/20/19	Anglo - London - Paris Bank
7751–7760	10,000*	----------	----------	5/20/19	Anglo - London - Paris Bank
7761–7765	5,000*	----------	----------	5/21/19	Anglo - London - Paris Bank
7766–7775	10,000*	----------	----------	5/22/19	Anglo - London - Paris Bank
7876–7885	10,000*	----------	----------	5/23/19	Anglo - London - Paris Bank
7886–7935	50,000*	----------	----------	5/26/19	Anglo - London - Paris Bank
7776–7795	20,000*	----------	----------	5/31 19	Anglo - London - Paris Bank
7796–7875	80,000*	----------	----------	6/ 3/19	Anglo - London - Paris Bank
7936–7950	15,000*	----------	----------	6/ 3/19	Anglo - London - Paris Bank
8501–10000	1,500,000	4/10/19	General Fund Surplus	4/19/19	Anglo - London - Paris Bank
10001–10049	49,000	9/15/19	General Fund Surplus	9/15/19	Sacramento State Bldg. Fund
10050–10099	50,000	9/17/19	General Fund Surplus	9/19/19	Capital National Bank
10100–11099	1,000,000	9/30/19	General Fund Surplus	9/30/19	Capital National Bank

11100–11189	90,000	10/ 2/19	General Fund Surplus	10/ 2/19	Bank of Gridley.
11190–11389	200,000	10/10/19	General Fund Surplus	10/11/19	Bank of Italy
11390–12000	611,000	10/18/19	General Fund Surplus	10/20/19	Bank of Italy
12001–12500	500,000	12/22/19	General Fund Surplus	12/ 7/21	Anglo - London - Paris Bank
12501–12800	300,000	1/ 8/20	General Fund Surplus	12/ 7/21	Anglo - London - Paris Bank
12801–13000	200,000	1/19/20	General Fund Surplus	12/ 7/21	Anglo - London - Paris Bank
13001–13062 13126–13313 13501–13688 13876–13937 13938–14062 14251–14438 14626–14812	1,000,000	12/17/20	General Fund Surplus	12/17/20	Butte County
13063–13125 13314–13500 13689–13875 14063–14250 14439–14625 14813–15000	1,000,000	12/ 7/21	General Fund Surplus	12/ 7/21	Anglo - London - Paris Bank
Total issue	$15,000,000				

*Bonds resold not included in total.

THIRD STATE HIGHWAY BONDS SOLD.

$40,000,000.

Numbers	Amount	Original sale date	Purchaser	Resale date	Purchaser
3001–3500 4001–4500 5001–5500 6001–6500 7001–7500 8001–8500	$3,000,000	3/ 1/20	General Fund Surplus	3/ 1/20	Anglo - London - Paris Bank
278–382 1377–1381 2375–2379 3698–3700 4691–4693 5687–5688 6687–6688 7691–7692 8698–8700 9375–9379 10377–10381 11378–11382	45,000	7/15/20	General Fund Surplus	7/15/20	Stanislaus County
1933–1937	5,000	7/27/20	General Fund Surplus	7/27/20	Bank of Cambria, S.L.O. Co.
1926–1932	7,000	7/27/20	General Fund Surplus	7/27/20	First National Bank of Monterey, Monterey County
384–389 1383–1388 2381–2387 3702–3703 4695–4696 5690–5691 6690–6691 7694–7695 8702–8703 9381–9387 10383–10388 11384–11389	50,000	8/ 3/20	General Fund Surplus	8/ 3/20	Yolo County

390–401 1389–1401 2388–2400 3704–3707 4697–4700 5692–5695 6692–6695 7696–7699 8704–8707 9388–9400 10389–10401 11390–11401	100,000	8/ 5/20	General Fund Surplus	8/ 5/20	Tehama County
383 & 1382 2380–3701 and 4694	5,000	8/ 6/20	General Fund Surplus	8 /6/20	Modoc County
5689–6689– 7693	3,000	8/ 6/20	General Fund Surplus	8/ 6/20	J. S. Potter
402–413 1402–1413 2401–2414 3708–3711 4701–4704 5696–5699 6696–6699 7700–7703 8708–8711 9401–9414 10402–10413 11402–11413	100,000	8/10/20	General Fund Surplus	8/10/20	Anglo - London - Paris Bank
8701 9380 10382 11383	4,000	8/24/20	General Fund Surplus	8/24/20	San Luis Obispo County.

THIRD STATE HIGHWAY BONDS SOLD—Continued.

Numbers	Amount	Original sale date	Purchaser	Resale date	Purchaser
417–421 1417–1420 2418–2421 3714–3716 4706–4707 5701–5702 6700–6701 7705–7706 8714–8716 9418–9421 10417–10420 11417–11421	$40,000	8/24/20	General Fund Surplus	8/24/20	Butte County
414–416 1414–1416 2415–2417 3712–3713 4705 ----- 7704 ----- 5700 ----- 8712–8713 9415–9417 10414–10416 11414–11416	25,000	8/24/20	General Fund Surplus	8/24/20	Del Norte County
422–424 1421–1423 2422–2424 3717–3719 4708–4710 5703–5704 6702–6704 7707–7709 8717–8719 9422–9424 10421–10423 11422–11424	35,000	8/25/20	General Fund Surplus	8/25/20	Lassen County
425–430 1424–1429 2425–2431 3720–3721	21,000	8/28/20	General Fund Surplus	8/28/20	Humboldt County

4711–4712 5705–5706 6705–6706 7710–7711 8720–8721 9425–9430 10424–10429 11425–11431	29,000	8/28/20	General Fund Surplus	8/28/20	Humboldt County
431–475 1430–1474 2432–2476 3722–3766 4713–4747 5707–5741 6707–6741 7712–7746 8722–8766 9431–9475 10430–10474 11432–11476	500,000	9/10/20	General Fund Surplus	9/10/20	Los Angeles County
477–483 1476–1481 2478–2483 3767–3768 4748–4749 5742–5743 6743–6744 7747–7748 8767–8768 9476–9481 10475–10481 11477–11482	50,000	9/15/20	General Fund Surplus	9/15/20	Yolo County
476–1475 2477 -----	3,000	9/15/20	General Fund Surplus	9/15/20	Plumas County
484–489 1482–1488 2484–2491 3769–3770 4750 ----- 5744 ----- 6742 ----- 7749 -----	27,000	9/21/20	General Fund Surplus	9/21/20	Santa Cruz County

THIRD STATE HIGHWAY BONDS SOLD—Concluded.

Numbers	Amount	Original sale date	Purchaser	Resale date	Purchaser
8769–8770 9482–9489 10482–10487 11483–11489	23,000	9/21/20	General Fund Surplus	9/21/20	Santa Cruz County
490–539 1489–1538 2492–2541 3771–3810 4751–4780					
5745–5774 6745–6774 7750–7779 8771–8810 9490–9539 10488–10537 11490–11539	500,000	10/ 5/20	General Fund Surplus	11/ 4/20	Los Angeles County
540–545 1539–1543 2542–2546 3811–3813 4781–4783 5775–5777 6775–6777 7780–7782 8811–8813 9540–9544 10538–10542 11540–11545	50,000	10/21/20	General Fund Surplus	10/21/20	Kern County
546–605 1544–1603 2547–2606 3814–3833 4784–4808 5778–5802 6778–6802 7783–7807 8814–8833 9545–9604 10543–10602 11546–11605	500,000	11/ 4/20	General Fund Surplus	10/ 5/20	Los Angeles County

1–377 606–1228	1,000,000	5/10/21	Merced County		
2268–2374 2607–2649	150,000	5/11/21	State School Land Fund		
2650–2699	50,000	5/11/21	Sacramento State Building Fund		
1229–1376 1604–1925 1938–2267	880,000	5/17/21	Kern County		
2700–3000 3501–3697 3834–4000 4501–4690 4809–5000 5501–5686 5803–6000 6501–6686 6803–7000 7501–7690 7808–8000 8501–8697 8834–9000 9001–9374 9605–10000 10001–10376 10603–11000 11001–11377 11606–12000	4,878,000	7/19/21	Anglo-London-Paris Bank		
12001–17000	5,000,000	11/ 1/21	Anglo-London-Paris Bank		
17001–24000	7,000,000	12/27/21	Anglo-London-Paris Bank		
Total	$24,000,000				

Appendix M.

ANALYSIS OF CEMENT PURCHASES 1920, 1921, 1922.

ANALYSIS OF CEMENT PURCHASES IN YEAR 1920.

Contract Number	Date of Delivery	Quantity Barrels	Delivery Station	1	2	3	4	5	6	7	8	9	Total Price	Unit Price	Total Cost
C-46	June 5-19	2600	Reddi	2.78*	2.99	2.59	2.10*	2.10*	2.59				241	2.10	506.10
C-46	June 5-19	2600	Wyndel	2.99	2.99	2.59	1.95**						14098	2.10	2703.90
C-46	Sept. 5-19	2600	Little Valley	3.53	3.53	3.53							1700	1.85	351.00
C-264	Sept. 17-19	10360	Olean		2.63	2.63*		2.52			2.518		8163	1.69	1738.83
C-264	Oct. 4-20	910	Olean										910	2.72	2457.00
C-264	Oct. 4-19	17220	Olean	2.72	2.72	2.63		2.57	1.95*	2.67	2.56*		20339	2.37	48253.70
C-264	Oct. 4-19	11200	Cuba	2.63	2.63			2.63		2.71			30240	2.69	81345.60
C-264	Nov. 4-19	1350	Cuba					2.63		2.71			3564	2.64	9411.00
C-267	Feb. 4-20	24430	Olean					1.85**	2.00*	1.68*	2.82		28545	1.85	52814.25
C-269	Oct. 5-20	10000	Rosia		2.48	2.48*							8960	1.85	16576.00
C-269	Apr. 5-20	21000	Rosia		2.99								21952	2.35	51555.20
C-269	Apr. 5-20	19100	Lakeville			2.47*		3.16*		2.40*	3.23		21952	2.35	51555.20
C-270	Apr. 5-20	15795	Glenwood										31119	2.16	67249.90
C-271	July 31-20	13500	Ten Mile	2.63	2.98	2.98							28177	2.45	77145.65
C-271	Aug. 31-19	14500	Wayne	3.56	2.63	2.63		1.95*	1.893**	1.95*	1.893*		21700	1.69	36673.00
C-271	Dec. 31-19	11000	Cuba							2.80*			11700	1.69	31171.10
C-269	Jan. 1-20	5364	Bakersfield		2.70**	2.70**							6984	2.70	18856.80
C-73	Apr. 17-20	1390	South Bay	2.76	2.76*	2.76	2.76						15863	2.10	33324.30
C-73	May 1-20	9974	Riverbank		2.63*	2.63*							1862	2.80	5213.60
C-73	May 17-20	1000	Riverbank		2.70**		2.179*	1.85*	2.00*	1.68*	2.82		3015	1.69	5095.03
C-73	Jun. 30-20	1000	Riverbank										1015	1.78	1806.67
C-264	Feb. 26-20	14000	Olean					2.48*		2.80*	3.00		30465	1.85	56360.25
C-73	Jun. 3-20	1800	Summerland		2.85	3.12	3.17	2.85*	2.65*	2.80*	3.00		1790	2.10	3759.00
C-264	June 3-20	836	Allegany		2.74*	2.74*				2.80*	3.00		420	2.40	1008.00
C-264	June 17-20	1000	Allegany		2.74*	2.74							420	2.40	1008.00
C-141	Jun. 30-20	960	Bakersfield		3.65	3.64		2.35**		2.80*	3.44		1438	2.35	3377.25
C-140-154-74	June 16-20	160	Jamesville		2.70**			3.17		3.17	2.91*		160	2.35	376.00
C-271	Apr. 1-20	175	Riverside		2.77	3.03							175	2.70	472.50
C-271	Apr. 1-20	1350	Owensmouth		2.77	3.18		2.90		2.40*	2.95*		1350	2.35	3172.50
C-271	Apr. 1-20	1350	Owensmouth								2.95*		1375	2.35	3229.60
C-1077	Jun. 4-20	205	Mahtomedi		2.40**								205	2.40	492.00
C-1077	Jun. 4-20	300	Oakdale		2.77*	3.77							300	2.40	720.00
C-1077	Sept. 4-20	2220	Stockton		2.70**								2220	2.70	5994.00
C-1043	Mar. 17-20	600	Hilmetto		2.80*	2.80							1598	2.70	4309.50
C-140-134-47	Feb. 11-20	150	Hope		2.70**								160	2.70	432.00
C-1140	Sept. 11-20	1000	Bakersfield		2.70*								1000	2.80	2800.00
C-1140	Sept. 11-20	1000	Owensmouth		2.70*								1000	2.70	2700.00
C-140-1075	Oct. 12-20	864	Bakersfield		2.70*								864	2.70	2332.80
C-140-1075	Apr. 13-20	662	Delano		2.70**								672	2.70	1814.40
C-140-1071	May 1-20	670	Delano		2.70*			2.50**			3.61		667	2.50	1667.50
C-140-1071	May 1-20	670	Livorne										667	2.70	1800.90
C-140-1071	Nov. 11-20	160	Dixieland					2.48*		2.80*	4.14*		160	2.35	376.00
C-1145	Dec. 9-20	175	Tracy		2.76			3.11*					170	2.15	365.50
C-140-154	Dec. 9-20	340	Tracy		2.70**			4.76		1.16			340	2.35	799.00
	Dec. 20-20	250	Orcutt										243	2.15	522.45
90													317904	2.198	698780.29

* Successful bidder.
** Bid less than 10 cents per barrel above successful bidder.
Key to Bidders' names: See last page of Analysis of Cement Purchases in Year 1921.

ANALYSIS OF CEMENT PURCHASES IN YEAR 1921.

Contract Number	Date of Award	Quantity bid on	Delivery Points	1	2	3	4	5	6	7	8	9	Quantities Delivered	Mill Base	Cost at Mill
C-270	Apr. 27-21	8600	Vina		3.16*								9440	2.50	23600.00
C-272	Mar. 22-21	800	Red Bluff		3.42*	3.42							800	2.70	2160.00
C-275	Apr. 9-21	15864	Huron	3.73	3.63	3.63	2.37*	2.20*+	2.35*	3.65	2.05*	3.63	15545	2.20	34199.00
C-276	Apr. 9-21	23536	Coalinga	3.75	3.68	3.65	1.85*	1.83*+	2.25*	3.85	2.05*	3.63	24490	1.63	44816.70
C-277	Apr. 1-21	25600	Red Bluff		3.42*	3.42							29781	2.70	80408.70
C-278	Apr. 1-21	41568	Cottonwood		3.31*	3.31							29044	2.50	72610.00
C-279	Apr. 9-21	36560	Soviets	4.01	3.99	3.99	2.18*	2.09*+	2.25*	4.00	2.05*	3.91	44535	2.09	93078.15
C-280	Apr. 9-21	30328	Rosamond	3.75	3.99		2.18*	1.90*+	2.25*	3.85	2.05*		34910	1.90	66329.00
C-281	Apr. 9-21	24072	Perbrow	4.37	4.27	4.27						4.27*	22960	2.52	57713.04
C-282	Apr. 11-21	2000	Oroville	3.62	3.42*	3.42							2615	2.70	7060.50
C-283	Apr. 9-21	23040	Paso Robles	3.82	3.72	3.42*	2.45*	2.55*				3.42	23923	2.60	62199.80
C-284	May 25-21	1280	Ukiah	3.80	3.70	3.70*							942	2.58	2430.36
C-285	May 28-21	300	Auburn		2.70*+								300	2.70	810.00
C-287	May 25-21	884	Clay		3.29	3.27*							906	2.60	2355.60
C-288	May 25-21	304	Ione		3.32	3.32*							318	2.60	819.00
C-289	May 25-21	23264	Garfield	3.04	3.04*	3.04							10060	2.70	27162.00
C-291	May 25-21	1824	Santa Maria		3.74	3.74	3.16*	2.55*	2.25*	2.55*	2.35*	3.74	1900	2.00	3800.00
C-293	May 25-21	1567	Newhall		3.32		2.50*	2.45*	2.25*+	2.60*	2.49*		1800	2.25	4050.00
C-294	May 28-21	6340	Pacoima	3.33			2.28*+	2.17*	2.25*	2.55*	2.35*		7355	2.22	16380.30
C-295	May 25-21	1650	Pacoima	3.33			2.28*+	2.17*	2.25*	2.55*	2.35*		1330	2.22	2952.60
C-296	June 21-21	265	Jacumba					2.50*	2.45*	2.55*	3.77*		265	2.40	636.00
C-297	May 28-21	16496	Lancaster				3.46*	2.55*	2.25*	2.55*	2.35*		15955	2.00	31930.00
C-298	June 5-21	695	Arcata	3.72	3.72*	3.72						3.72	842	2.70	2273.40
C-299	July 9-21	495	Hanlett		2.55*+								495	2.55	1262.25
C-300	June 30-21	675	Minden, Nev.		2.55*+								675	2.55	1721.25
C-300	June 14-21	225	Minden, Nev.		2.70*+								225	2.70	607.50
C-301	June 30-21	784	Derby	4.01	4.01	4.01	2.25*+					4.01	1078	2.65	2418.75
C-302	July 11-21	300	Paso Robles	3.42	3.55	3.27*						3.42	306	2.55	780.30
C-303	July 11-21	450	Orland	3.49	3.21	3.21*						3.35	475	2.26	1073.50
C-304	July 11-21	600	Lonyvale	4.39	4.24	4.24*						4.39	639	2.26	1895.14
C-305	July 11-21	720	Lonyvale	4.39	4.24	4.24*						4.39	624	2.26	1410.24
C-306	July 11-21	400	Lonyvale	4.39	4.24	4.24*						4.39	407	2.26	919.82
C-307	July 11-21	3552	Hamiltoncity	3.36	3.21	3.21*							3769	2.25	8517.94
C-308	July 11-21	39936	Los Banos	3.32	3.17	3.17	2.20*+					3.32	40910	2.20	90575.20
C-309	Aug. 2-21	496	Lawa	3.89	4.24		2.40*	2.55*	3.68*	2.55*	3.73		555	2.60	1313.00
C-310	Aug. 2-21	290	Lawa	3.89	4.24		2.40*	2.55*	3.68*	2.55*	3.73		287	2.60	745.20
C-311	Aug. 2-21	1198	Redding	3.40	3.40*	3.40							1250	2.55	3187.50
C-312	Aug. 2-21	255	Susanville	4.18	4.18	4.18						4.18	190	2.55	484.50
C-313	Aug. 2-21	21500	Dunsmuir	3.59	3.59*	3.59						3.59	2104	2.55	5365.20
C-314	Aug. 2-21	37600	Healdsburg	3.31	3.31	3.31*						3.31	28706	2.44	70042.64
C-315	Aug. 20-21	1000	Edgewood	3.59	3.59*	3.59							1116	2.55	2845.80
C-316	Aug. 22-21	1425	South Fork	4.54	4.54	4.54*						4.54	1370	2.44	3342.80
C-317	Oct. 10-21	650	Ignacio		2.84	2.84*							650	2.30	1430.00
C-317	Nov. 28-21	180	Ignacio		2.45*+								180	2.45	441.00
C-318	Sept. 14-21	6400	Goleta			3.51	2.00*	2.88	2.77	2.66*	2.77		6380	1.90	12122.00
C-319	May 25-21	25600	Reseda				2.00*+	2.55*	2.25*	2.55*	2.35*	(Contin. from C-1568	6840	2.00	13680.00
C-320	Oct. 28-21	6000	Gilroy	2.84	2.98	2.84						2.45*+	5673	2.45	13898.85
C-321	Nov. 25-21	395	Sunnyvale	3.79	3.79*	3.79						4.14	311	2.45	761.95
C-323	Oct. 24-21	1750	Fairville	2.84	2.84	2.84						2.84*	1596	2.30	3496.00

* Successful Bidder
\+ Mill Base Price
* Emergency Purchase; competitive bids not taken
For key to bidders see last page of "Analysis of Cement Purchases in Year 1921"

ANALYSIS OF CEMENT PURCHASES IN YEAR 1921—Continued.

Contract Number	Date of Award	Quantity bid on	Delivery Points	1	2	3	4	5	6	7	8	9	Quantities Delivered	Mill Base	Cost at Mill
C-325	Oct. 18-21	10656	La Habra				2.43	2.47	2.33*	2.82			9200	1.90	17480.00
C-328	Nov. 16-21	250	Hesperia				2.35*	2.40*	2.70	2.85*	2.70*		135	2.40	364.00
C-331	Oct. 24-21	2800	SanSimeon		3.79	3.93*						3.79	1356	2.45	5102.20
C-332	Nov. 7th-21	18400	Keystone	3.55	3.55	3.55*						3.55	10263	2.41	34733.83
C-333	Nov. 7-21	1200	Sacramento		2.79*	2.79							1540	2.45	3773.00
C-336	Dec. 1-21	160	Clarents	3.07	3.07	3.07						3.07*	160	2.36	377.60
C-337	Dec. 14-21	2160	SantaMaria				3.81	3.50*	3.50	3.40*	3.67		600	2.398	2158.30
D-350	Jan. 21-21	3850	Belmont		3.09*	3.09						2.70*	3850	2.70	10395.00
D-352	Mar. 4-21	250	Ponto					2.34*		3.12	2.74*		250	2.09	522.50
D-353	Mar. 18-21	1370	Turlock		3.24*	3.25						3.24	1437	2.69	4026.93
D-355	Apr. 28-21	997	Redding	3.65	3.55	3.55*							997	2.40	2392.80
D-359	Apr. 6-21	1650	Williams		3.77	3.77*							1825	2.40	4380.00
D-363	June 28-21	550	Red Bluff	3.27	3.27*							3.43	550	2.27	1248.50
D-366	May 23-21	2800	SantaMaria	3.84	3.74	3.74	2.11*	3.40*	3.55	3.77	3.72		2829	2.11	6048.80
D-368	June 22-21	1256	Oakville	3.94	3.79*	3.79							1256	2.55	3352.80
D-375	Aug. 10-21	790	SantaMaria				3.40*	3.35*		3.55*	2.93*		790	2.25	1777.50
D-376	Nov. 4-21	1080	Marysville		2.93	2.93*							1080	2.25	2395.50
D-378	Aug. 27-21	2707	Mayfield			2.94*							2707	2.54	6875.78
D-384	Sept.15-21	700	Yolo		3.45**								313	2.45	765.85
D-385	Nov. 14-21	7760	Jamestown	3.78	3.78	3.78						3.78*	4176	2.40	10022.40
D-392	Oct. 4-21	623	Alturas		3.45**								623	2.45	1526.35
D-395	Oct. 8-21	535	SanAnselmo		3.45**								535	2.45	1311.75
D-400	Oct. 28-21	8600	Morgan Hill		2.84*	2.84						2.45*	5839	2.31	13795.09
D-401	Dec. 1-21	700	Wiles	2.84	2.84*	2.84						2.84	700	2.45	1624.00
D-404	Nov. 14-21	14600	Westmoreland				2.35	2.69	3.60	3.69	3.69*		17100	2.29	39159.00
D-406	Apr. 21-21	300	Healdsburg	3.11	3.11*	3.11							300	2.35	705.00
D-407	Nov. 15-21	2454	Merced		3.07	3.07*						3.07	2327	2.41	5608.07
D-410	Dec. 3-21	4385	Strader				3.45**	3.34*	3.35		2.94		4565	2.45	11194.25
M10-1459	Mar. 8-21	604	San Jose		2.70**								604	2.70	1630.80
M10-1461	Feb. 7-21	175	Merced		3.32*	3.32*	3.41	2.55*					175	2.70	472.50
M00-1461	Feb. 7-21	630	Bakersfield		3.65	3.65	3.24*	2.55*					630	2.80	1764.00
M10-1461	Jan. 7-21	250	Bakersfield				2.94*	2.35*		3.77			250	2.50	625.00
L00-1461 (1504)	Jan. 31-21	170	Fresno				3.35*						170	2.50	425.00
M10-1462	Mar. 16-21	300	Lankershim					2.35**'					300	2.35	705.00
M00-1487	Jan. 14-21	627	Williams		2.70**								627	2.70	1692.90
M00-1506	Jan. 20-21	1150	Lankershim				3.21	2.35**	3.45	3.23	3.17		1150	2.35	2702.50
M10-1524	Feb. 15-21	1087	Rodeo		2.70**								1087	2.70	2934.90
M00-1535	Mar. 16-21	200	Bakersfield				3.11	2.35*		3.77	3.04*		200	2.166	433.21
M10-1535	Mar. 18-21	251	Merced		2.70**								251	2.70	677.70
M00-1536	May 26-21	275	Castaic				2.25**	2.55*	3.36	2.55*			275	2.25	618.75
M10-1536	May 5 -21	500	Saugus				2.83	2.34*		3.10	2.81*		500	1.97	985.00
M10-1550	May 28-21	1500	Strader				2.99*	2.35*		3.67	3.12		1500	2.55	3825.00
M00-1555	May 10-21	252	Sacramento	3.14	3.04	3.04							232	2.41	559.12
M10-1558	May 10-21	275	Bakersfield				2.94*	2.55*	3.22		2.34*		275	2.50	687.50
M10-1558	Apr. 27-21	290	Fresno				3.16*						290	2.30	667.00
M10-1558	Mar. 30-21	200	Bakersfield								2.17**'		200	2.17	434.00
M00-1559	June 22-21	200	Oceanside					2.50**'					200	2.50	500.00
M00-1563	June 23-21	225	Sacramento		2.55**								225	2.55	573.75
M10-1564	Apr. 29-21	230	Merced	3.41	3.32	3.32	3.17*					3.32	230	2.28	524.80

* Successful Bidder
* Mill Base Price
* Emergency Purchase; competitive bids not taken
For key to bidders see last page of "Analysis of Cement Purchases in Year 1921"

ANALYSIS OF CEMENT PURCHASES IN YEAR 1921—Concluded.

Contract Number	Date of Award	Quantity bid on	Delivery Points	1	2	3	4	5	6	7	8	9	Quantities Delivered	Mill Base	Cost at Mill
M'CO-1558	May 25-21	25600	Reseda				2.00°+	2.55+	2.25+	2.55+	2.35+		21470	2.00	42940.00
M'CO-1579	Apr. 8-21	160	Alto		2.70°+*								160	2.70	432.00
M'CO-1581	May 4-21	1875	Rodeo		3.58	3.58°							1174	2.52	2958.48
M'CO-1612	June 22-21	175	Petaluma		2.55°+*								175	2.55	446.25
M'CO-1621	July 19-21	200	Ceres		3.08	3.08°	2.30+						200	2.51	502.00
M'CO-1621	May 23-21	3060	Ceres		3.23	3.23	2.20°+					3.23	3080	2.20	6776.00
M'CO-1623	June 1-21	3611	Delhi		3.27	3.27	3.15*					3.27	2938	2.22	6519.70
M'CO-1648	June 14-21	410	Oceanside					2.50°+	3.10	2.55+	3.12		410	2.50	1025.00
M'CO-1655	July 1-21	260	Colma		2.55°+*								260	2.55	663.00
M'CO-1656	June 22-21	200	Castaic					2.50+	3.33	2.55+	3.11°		200	2.18	436.00
M'CO-1660	Aug. 12-21	350	Dixon		2.55°+*								350	2.55	892.50
M'CO-1660	Oct. 14-21	160	Fiz		2.45°+*								160	2.45	392.00
M'CO-1660	Sept.28-21	200	Cordelia		2.45°+*								200	2.45	490.00
M'CO-1661	Sept.15-21	700	Fulton		2.45°+*								473	2.45	1159.85
M'CO-1662	Sept.28-21	75	San Juan									2.45°+*	75	2.45	182.75
M'CO-1654	Aug. 10-21	200	Lankershim				2.40+	2.35+		3.20	2.93°		200	2.25	450.00
M'CO-1676	Aug. 2-21	5780	Perry	2.94	3.08	2.94						2.94°	5134	2.55	13091.70
M'CO-1677	July 18-21	250	Altamont		2.55°+*								250	2.55	637.50
M'CO-1681	Aug. 28-21	2800	Merced			3.17°							2800	2.50	4200.00
M'CO-1682	Nov. 16-21	400	Strader				2.40+	2.40+	3.35	2.40+			400	2.40	960.00
M'CO-1682	July 26-21	8272	Strader				2.40°+	2.35+	3.25	2.55+	2.96		10130	2.40	24312.00
M'CO-1683	July 26-21	160	Carl					2.55+		2.55+	2.92°		160	2.27	363.20
M'CO-1684	Jan. 24-21	2150	N.Bastenchurry					2.43	2.47	2.33°	2.82		2150	1.90	4085.00
M'CO-1688	Aug. 1-21	3700	Dixon		2.73°	2.73							3700	2.45	9065.00
M'CO-1696	Aug. 5-21	800	Fulton			3.17°							789	2.30	1814.70
M'CO-1705	Aug. 12-21	750	Tracy		2.93	2.93						2.93°	732	2.49	1822.68
M'CO-1707	July 20-21	250	Jhestland		2.55°+*								250	2.55	637.50
M'CO-1720	Sept.15-21	1815	Ceres		2.98	2.98						2.98°	1500	2.41	3856.00
M'CO-1734	Oct. 28-21	2100	Dixon		2.73	2.73°							3779	2.20	8313.80
M'CO-1734	Nov. 4-21	350	Dixon		2.45°+*								350	2.45	857.50
M'CO-1745	Oct. 7-21	165	Fairfield		2.45°+*								165	2.45	404.25
M'CO-1748	Nov. 15-21	232	Merced			3.07°							232	2.40	556.80
M'CO-1748	Dec. 12-21	175	Fresno		2.45°+*								175	2.45	428.75
M'CO-1768	Nov. 23-21	625	Newmark				2.80	2.79°	2.80	2.40+	2.80		625	2.391	1566.10
M'CO-1780	Dec. 22-21	850	Fresno		2.45°+*								850	2.45	2082.50
M'CO-1789	Nov. 25-21	175	Strader				2.40°+	2.40+	3.35	2.40+			175	2.40	420.00
M'CO-1958	Mar. 31-21	260	Dougherty	2.74	2.74°	2.74	2.74					2.74	342	2.35	803.70
M'CO-1961	Mar. 17-21	150	Sausalito		2.35°+*								150	2.35	352.50
TOTALS													540127	2.280	1231801.11

* Successful Bidder
\+ Mill Base Price
° Emergency Purchase; competitive bids not taken

	NAME	LOCATION OF MILL	ADDRESS
1	Henry Cowell Lime & Cement Co.	Cowell	#2 Market St., San Francisco, Calif.
2	Pacific Portland Cement Co.	Cement	Pacific Bldg., San Francisco, Calif.
3	Santa Cruz Portland Cement Co.	Davenport	Crocker Bldg., San Francisco, Calif.
4	Monolith Portland Cement Co.	Monolith	Hibernian Bldg., Los Angeles, Calif.
5	California Portland Cement Co.	Colton	Douglas Bldg., Los Angeles, Calif.
6	Golden State Portland Cement Co.	Oro Grande	Marsh-Strong Bldg., Los Angeles, Calif.
7	Riverside Portland Cement Co.	Crestmore	Title Insurance Bldg., Los Angeles, Calif.
8	Southwestern Portland Cement Co.	Victorville	H. W. Hellman Bldg., Los Angeles, Calif.
9	Old Mission Portland Cement Co.	San Juan Bautista	Mills Bldg., San Francisco, Calif.

ANALYSIS OF CEMENT PURCHASES IN YEAR 1922.

No.	Date of Bid	Quantities Bid on	Delivery Points	1	2	3	4	5	6	7	8	9	Quantities Delivered	Hill Rate	Cost at Hill
[illegible]	[illegible]	23600	Santa Monica				2.98	2.97*	2.99	2.40-	2.97		645	2.38	1535.10
D-341	Jan. 9-22	720	Gilman	4.58	4.50*	4.58						4.58	720	2.35	1692.00
D-343	Jan. 9-22	7500	Cayuta				3.45-	3.61*		3.63	3.63		6468	2.34	14987.70
D-344	Jan. 9-22	3000	Colma	4.30	4.32	4.30	3.45-	3.61*	3.43	3.40-	3.63	4.30	3366	2.40	8064.00
D-346	Jan. 9-22	1000	Anderson	4.30	4.30	4.30*							675	2.35	1586.25
D-349	Jan. 20-22	8400	Colma	2.83*	2.84	2.84						2.45+	1000	2.44	2440.00
D-350	Feb. 28-22	35392	Butterworth				2.76*	2.81**		2.97	3.04			2.21	
D-352	Mar. 1-22	1104	Santa Maria	3.45	3.39*	3.44	3.35-	3.40-	3.61		3.61	3.44	850	2.29	1946.50
D-353	Mar. 10-22	700	Brickyard	3.98	3.98	3.98						3.98+		2.31	
D-355	Apr. 17-22	2250	Gilroy	2.74	2.74	2.74						2.34+	1000	2.34	2340.00
D-357	Apr. 28-22	300	San Lucas	3.07	3.07	3.07						2.34+	316	2.34	739.44
D-358	May 8-22	27840	Lonoak				2.35*	2.04**	2.99	2.40-			600	2.04	1224.00
D-359	May 17-22	700	Hildreth	2.78	2.78*	2.78							546	2.36	1289.03
D-360	May 17-22	13012	Cuyata	2.50	2.50	2.50		2.50*	2.40-	2.40-	2.88		900	2.29	2061.00
D-361	May 15-22	560	Ukiah	4.38	4.35*	4.35						2.35+	561	2.35	1318.35
D-362	June 9-22	14240	Sargent	2.74	2.74	2.74						2.35+		2.35	
D-363	May 31-22	1912	Santa Maria	3.49	3.39*		2.35-	2.31*	2.60-	2.40-		2.35+	1366	2.29	3128.14
D-364	Apr. 5-22	855	Redlick		3.35*+								855	2.35	1304.25
D-402	May 9-22	2250	Bradley									2.35*+	250	2.35	587.50
D-404	Apr. 17-22	9125	Montmorland				2.40	2.35*+		3.60			9975	2.35	23441.25
D-411	June 19-22	590	Rio Vista		2.40*+								325	2.40	780.00
D-413	Apr. 3-22	3600	Rosersfield				2.35*+	2.35+	2.35	2.40+			3530	2.35	8295.52
D-414	Jan. 25-22	3000	Suisun-Fairfield	2.52	2.52*	2.52							6177	2.31	14868.87
D-421	Jan. 25-22	235	Altamont	2.78	2.78	2.78						2.78*	220	2.35	541.00
D-424	Feb. 9-22	1040	Williams	2.92	2.92*	2.92							1472	2.35	3459.20
D-425	Jan. 26-22	375	Sacramento	2.69	2.69*	2.69							375	2.35	881.25
D-430	Mar. 14-22	750	Los Molinos	3.01	3.01*	3.01						3.11	314	2.35	737.90
D-431	Mar. 21-22	180	Pittsburg		2.35*								180	2.35	423.00
D-435	Apr. 10-22	4100	Petaluma	2.82	2.82*	2.82						2.82	4046	2.35	9508.10
D-436	June 26-22	384	Tinton		3.51*									2.59	
D-437	Apr. 29-22	780	Modera		3.52	3.52*							780	2.35	1833.00
D-438	May 11-22	200	Livingston	3.93	3.93*								450	2.35	1057.50
D-440	Apr. 29-22	4470	Hemo	2.74	2.74	2.74						2.35*+	837	2.35	1966.98
D-441	Apr. 3-22	10680	Stinder		2.97		2.35*+	2.35+	2.35	2.40+			9725	2.35	22853.75
D-442	Apr. 28-22	2990	Merced	2.97	2.97	2.97*	2.80+					2.97	3019	2.31	6793.69
D-443	May 11-22	797	Fergus		2.35*+								797	2.35	1872.95
D-438	May 11-22	1256	Sacramento		3.03*								1256	2.35	2951.60
D-442	June 23-22	175	Altamont	2.84	2.74*								175	2.30	402.50
D-443	June 20-22	450	Sheridan		2.35*+									2.35	
MTO-1839	June 26-22	316	Rio Siding		2.35*+								316	2.35	742.60
MTO-1843	Mar. 16-22	160	El Centro				2.40+	2.35+	3.64	2.40+	3.55*		160	2.20	352.00
MTO-1873	Mar. 10-22	400	Suisun-Fairfield		2.35*+								400	2.35	940.00
MTO-1874	Feb. 6-22	225	Petaluma		2.35*+								225	2.35	528.75
MTO-1883	Feb. 18-22	400	Hayfield	2.74	2.74	2.74						2.34*+	400	2.34	936.00
MTO-1889	Mar. 21-22	250	Thermalito		2.35*+								250	2.35	587.50
MTO-1907-17	Mar. 21-22	137	Ignacio		2.35*+								137	2.35	321.95
MTO-1928	May 17-22	160	Willows		2.35*+								160	2.35	376.00
MTO-1928	May 9-22	160	Williams		2.35*+								160	2.34	374.40
MTO-1930	June 26-22	200	Gonzales		3.47*								200	2.35	470.00
MTO-1931	May 15-22	615	Rosersfield		2.35*+								615	2.35	1445.25
MTO-1933	Apr. 26-22	315	Merced		2.35*+								315	2.35	740.25
MTO-1955	May 2-22	160	El Cajon				2.35-	2.35*+	3.27*	2.40+	3.35		160	2.27	363.20
MTO-1932	May 2-22	160	Lone-Arabim				2.35*+						160	2.35	376.00
MTO-1970	Apr. 10-22	424	Hillsides	2.74	2.74	2.74						2.74*	424	2.32	983.68
MTO-1998	May 12-22	402	Boulder Creek	3.16	2.80							2.80*	200	2.35	470.00
MTO-1965	May 4-22	1200	Castaic				2.45+	2.78*+	3.32	2.40+	3.21		900	2.28	2052.00
MTO-2074	June 30-22	1800	Santa Clara		3.11							3.11*		2.35	
TOTALS													70290	2.327	163611.64

* Successful Bidder
\+ Hill Rate Price
- Emergency Purchase; competitive bids not taken
For key to bidders see list in "Analysis of Cement Purchases in Year 1922"

Appendix N.

APPORTIONMENT OF RECEIPTS OF STATE MOTOR VEHICLE DEPARTMENT.

(a) Period August 1, 1920-January 31, 1921. Inclusive.

(b) Period February 1, 1921-July 31, 1921. Inclusive.

(c) Period August 1, 1921-January 31, 1922. Inclusive.

(d) Period February 1, 1922-July 31, 1922. Inclusive.

STATE MOTOR VEHICLE DEPARTMENT OF CALIFORNIA.

SEMI ANNUAL STATEMENT OF APPORTIONMENT OF RECEIPTS FOR PERIOD AUG 1, 1920 to JAN 31, 1921, Incl.

	AUTOMOBILES	MOTORCYCLES	AUTO DEALERS	MOTORCYCLE DEALERS	TRUCKS	TRAILERS	MISCELLANEOUS	TOTAL	REFUNDS	NET TOTAL RECEIVED	RATE 2.4434672% EXPENSE	NET TOTAL FOR APPORTIONMENT	AMOUNT DUE COUNTIES	AMOUNT DUE STATE
Alameda	15,351.85	389.80	165.50	11.90	1,369.70	34.00	595.25	18,356.00	403.60	17,952.40	5,463.04	12,489.36	6,244.68	
Alpine	2.00						6.00	8.00		8.00	2.65	5.35	2.63	
Amador	347.30	1.50	7.50		55.30	10.00	5.25	426.75		426.75	129.36	297.39	144.69	
Butte	2,426.85	22.00	41.25		352.65	22.00	57.75	2,922.50	63.00	2,859.50	870.18	1,989.32	994.66	
Calaveras	302.80				47.20	2.00	11.00	363.00	13.80	349.20	94.62	170.58	85.29	
Colusa	1,087.95	13.40	10.00		100.05	14.00	58.50	1,283.90	4.80	1,279.10	389.25	889.85	444.92	
Contra Costa	2,647.80	54.95	30.00		349.50	2.50	73.25	3,157.00	54.53	3,102.47	944.12	2,158.35	1,079.18	
Del Norte	141.30	2.00			6.90	2.00	4.00	156.20		156.20	47.52	97.18	48.59	
El Dorado	324.70	1.00			42.70		13.25	390.65	8.80	381.85	104.04	233.81	116.90	
Fresno	16,787.70	133.45	184.75		1,496.85	38.00	849.25	19,413.00	495.25	18,917.75	5,756.60	13,160.95	6,580.48	
Glenn	1,154.10	6.05	2.50		176.30	8.00	25.75	1,423.30	19.60	1,403.70	429.18	976.52	488.26	
Humboldt	1,807.10	28.75	21.25	2.50	199.20	2.00	70.50	2,178.30	55.10	2,123.20	655.25	1,467.95	748.97	
Imperial	4,040.85	4.00	18.00		322.15		109.25	4,601.25	110.65	4,490.60	1,386.83	3,104.07	1,552.04	
Inyo	819.75	12.00	10.50		57.15	6.00	26.75	934.15	4.90	929.25	322.18	607.80	303.90	
Kern	6,745.95	96.25	53.75		613.50	16.00	302.25	7,831.70	70.95	7,760.75	2,361.55	5,399.10	2,699.55	
Kings	2,286.70	22.00	25.00	5.00	269.85	34.50	122.75	2,759.80	47.90	2,711.90	825.25	1,886.65	943.32	
Lake	415.90	5.75			71.55		172.00	665.20		665.20	170.51	494.69	170.04	
Lassen	591.50	5.65			61.10		11.75	670.05	6.50	663.45	207.98	455.47	227.73	
Los Angeles	97,791.60	676.05	762.00	8.50	7,968.20	320.00	13,951.00	121,677.40	1,258.60	120,418.80	33,560.23	76,817.57	38,406.79	
Madera	1,019.90	14.60	27.50		120.15	4.00	39.50	1,225.65	29.70	1,191.95	367.72	809.23	414.61	
Marin	1,304.75	8.90	12.50		92.15	6.00	30.25	1,454.55	43.00	1,410.55	398.82	911.73	455.87	
Mariposa	312.40	4.50			29.10		8.50	401.50	61.20	340.30	103.57	236.73	118.36	
Mendocino	1,130.90	9.50	17.50		98.00	2.00	28.00	1,290.10	34.55	1,255.55	347.77	1,080.78	540.39	
Merced	2,044.20	12.50	47.50		253.35	4.00	68.00	2,431.55	17.60	2,413.95	734.60	1,679.35	839.68	
Modoc	51.35	2.00			51.35			419.65	8.70	411.15	128.10	286.03	143.01	
Mono	67.50						1.75	69.35		69.35	21.10	48.25	24.13	
Monterey	2,156.45	25.40	33.75		291.55	8.00	47.00	2,564.15	51.50	2,512.65	764.65	1,748.00	874.00	
Napa	1,107.60	13.75	6.25		198.45		27.75	1,353.80	42.60	1,308.90	398.30	910.60	455.30	
Nevada	366.10	1.25			14.75		4.50	386.10	6.80	379.30	114.83	264.47	132.23	
Orange	7,673.45	81.70	55.00		436.65	30.00	223.25	8,525.05	70.50	8,454.55	2,571.87	5,879.68	2,939.84	
Placer	1,591.90	7.90	10.00		134.90	2.00	58.75	1,805.45	20.80	1,784.65	543.09	1,241.56	620.78	
Plumas	284.45	2.00			113.60	2.00	2.00	404.05	8.50	395.55	120.81	274.44	139.22	
Riverside	3,844.95	66.05	27.50		253.30	14.00	123.00	4,328.80	90.50	4,238.30	1,314.07	3,004.13	1,502.07	
Sacramento	5,878.45	79.25	97.50		670.15	18.00	663.70	7,385.05	194.25	7,190.80	2,412.54	5,518.11	2,759.06	
San Benito	779.00	17.50	12.50		176.20	2.00	8.50	995.70	38.25	960.45	292.38	668.19	334.09	
San Bernardino	5,844.25	99.00	73.75	1.50	340.40	36.00	158.75	6,545.65	111.65	6,434.00	1,957.92	4,476.08	2,238.04	
San Diego	13,284.75	163.45	98.75		743.50	10.50	278.50	14,579.45	98.30	14,481.15	4,404.21	9,863.94	4,931.47	
San Francisco	22,147.55	224.20	433.75	1.25	1,936.85	70.00	1,322.00	26,135.80	685.45	25,450.15	6,971.54	19,138.61	9,569.30	
San Joaquin	7,156.25	96.40	87.50		719.05	14.50	306.50	8,380.20	146.10	8,234.10	2,506.26	5,727.84	2,863.92	
San Luis Obispo	2,166.05	14.75	6.25		201.35	16.00	54.75	2,459.15	27.60	2,431.55	739.95	1,691.60	845.80	
San Mateo	1,620.90	41.15			334.90	8.00	50.25	2,055.20	17.60	2,037.60	620.07	1,417.53	708.77	
Santa Barbara	4,028.65	37.50	17.50		228.20	12.50	100.75	4,425.10	38.50	4,386.60	1,328.86	3,057.74	1,528.87	
Santa Clara	6,794.90	165.50	37.50		1,206.05	70.00	225.00	8,498.95	208.35	8,494.15	2,584.84	5,909.31	2,954.65	
Santa Cruz	1,722.95	50.05	12.50		368.60	8.00	55.00	2,217.10	71.45	2,145.65	652.94	1,492.71	746.36	
Shasta	970.75	1.00	22.50		360.90	2.00	60.50	1,416.65	13.40	1,403.25	427.03	976.22	488.11	
Sierra	88.50	1.90			138.30			228.80	4.40	224.40	68.29	156.11	78.05	
Siskiyou	1,429.05	19.50	6.25		266.80	2.00	27.00	1,847.60	6.60	1,841.00	499.37	1,141.63	570.82	
Solano	1,777.85	31.65	98.75		169.50	12.00	75.25	2,365.00	111.10	2,253.90	709.15	1,544.75	903.37	
Sonoma	4,739.15	41.40	40.00		667.00	4.00	110.50	5,602.05	102.15	5,499.90	1,673.66	3,826.24	1,913.12	
Stanislaus	4,996.00	59.40	8.75		549.15	20.00	169.75	5,803.05	156.95	5,646.10	1,718.17	3,927.93	1,963.97	
Sutter	967.40	3.50			149.95	2.00	39.75	1,162.60	8.80	1,153.80	351.10	802.70	401.35	
Tehama	969.00	10.00	5.00		130.30	2.00	34.25	1,150.55		1,150.55	350.13	800.42	400.21	
Trinity	36.00						2.00	38.00		38.00	11.57	26.43	13.21	
Tulare	5,573.75	39.20	42.50		474.85	38.00	237.25	7,405.55	207.70	7,197.85	2,190.36	5,007.49	2,503.75	
Tuolumne	191.85				50.50		10.50	452.85	20.40	432.45	131.60	300.85	150.42	
Ventura	3,240.05	30.50	70.00		295.60	8.00	73.00	3,477.15	40.10	3,437.05	1,045.93	2,391.12	1,195.56	
Yolo	1,389.40	29.25	7.50		193.45	8.00	76.55	1,668.15	18.90	1,649.25	469.02	1,078.23	538.12	
Yuba	1,098.60	5.40	20.00		265.35	12.00	57.75	1,459.10	37.90	1,421.20	432.48	988.72	494.36	
Totals	279,016.20	3,072.60	2,621.25	30.65	29,472.80	995.00	11,202.75	326,411.45	5,764.43	320,647.02	97,575.12	223,071.90	111,535.95	111,535.95

STATE MOTOR VEHICLE DEPARTMENT OF CALIFORNIA.

SEMI ANNUAL STATEMENT OF APPORTIONMENT OF RECEIPTS FOR PERIOD FEB 1, 1923 TO JULY 31, 1923, incl.

	AUTOMOBILES	MOTORCYCLES	AUTO STAGES	MOTORCYCLE STAGES	TRUCKS	TRAILERS	MISCELLANEOUS	TOTAL	REFUNDS	NET TOTAL RECEIVED	EXPENSE RATE 4.7833.2%	NET AMOUNT FOR APPORTIONMENT	COUNTIES' SHARE	TO CORRECT ERROR 1st HALF 1923 APPORTIONMENT	CORRECT APPORTION-MENT TO COUNTIES	AMOUNT DUE STATE
Alameda	373,362.70	3,108.60	3,288.75	99.00	37,889.90	176.00	716.90	418,521.45	574.05	417,947.40	19,991.47	397,955.93	198,977.96	5.26	198,984.22	
Alpine	400.30	2.00			80.85			483.15		483.15	23.11	460.04	230.02	60.61	169.42	
Amador	7,694.70	8.00	165.00		1,434.75	9.75	8,877.15	8.80	8,868.35	424.23	8,444.12	4,220.41	21.53	4,242.06		
Butte	53,373.35	216.90	660.00	14.00	5,363.60	88.00	88.75	60,085.80	69.30	59,996.50	2,869.78	57,126.72	28,563.36	29.99	28,593.35	
Calaveras	7,230.75	25.00	55.00		1,254.30		6.75	8,389.80		8,389.80	401.30	7,988.50	3,994.25	30.59	4,024.84	
Colusa	21,527.45	80.00	378.75		2,210.35	42.50	51.75	24,370.80	15.50	24,355.30	1,164.97	23,190.33	11,595.17	1,279.61	10,315.56	
Contra Costa	93,263.80	378.00	550.00	50.00	7,138.60	14.00	106.00	101,727.30	163.20	101,564.10	4,858.40	96,705.70	48,352.85	103.75	48,456.60	
Del Norte	2,898.40	9.00	55.00		369.15		6.00	3,265.15	2.40	3,262.75	156.02	3,106.73	1,553.32	1.00	1,554.32	
El Dorado	8,896.36	26.00	110.00	2.00	709.10	2.00	30.00	9,937.11	10.40	9,926.71	474.82	9,451.89	4,725.94	38.79	4,687.15	
Fresno	287,343.21	1,414.55	2,680.00		28,987.30	162.00	998.50	321,585.56	31.30	321,554.26	15,379.53	306,200.03	153,099.97	1,036.45	153,714.97	
Glenn	23,949.61	95.40	253.75	5.00	2,334.40	69.00	52.00	26,789.16		26,789.16	1,281.39	25,507.77	12,753.68	172.38	12,926.06	
Humboldt	44,739.70	187.75	715.00	8.00	5,697.85	18.00	60.70	51,503.00	43.20	51,459.80	2,462.32	48,997.48	24,498.74	105.27	24,603.47	
Imperial	68,944.66	84.00	710.00	7.50	6,341.30		71.00	76,158.46	101.90	76,056.56	3,638.17	72,363.09	36,181.55	45.45	36,136.10	
Inyo	11,774.45	11.00	140.00		760.20	14.00	15.00	12,714.65	8.00	12,706.65	607.14	12,099.51	6,049.76	129.17	5,920.59	
Kern	133,578.88	769.90	1,575.00	21.00	15,550.40	100.00	243.50	151,838.68	130.05	151,868.63	7,261.38	144,547.25	72,273.62	98.85	72,174.77	
Kings	42,679.15	166.40	563.78		3,822.45	104.50	97.25	47,432.10	31.25	47,400.85	2,249.12	44,771.73	22,385.87	9.73	22,376.14	
Lake	14,847.75	46.00	110.00		1,185.50	5.00	13.75	16,208.00	27.40	16,180.60	774.38	15,406.22	7,703.11	4.67	7,698.44	
Lassen	10,750.30	34.00	112.50		1,273.70	12.75	27.00	12,210.25	20.00	12,190.25	582.92	11,607.33	5,803.66	136.01	5,667.65	
Los Angeles	1,735,151.65	11,263.55	18,517.25	203.25	199,252.50	1,999.00	3,319.75	1,969,705.95	1,885.00	1,967,820.95	93,744.14	1,874,076.81	937,038.41	155.88	936,882.53	
Madera	14,796.40	116.25	220.00		2,293.00	18.00	55.75	24,260.40	5.00	24,261.20	1,160.47	23,100.73	11,550.37	8.58	11,559.05	
Marin	28,580.65	134.00	275.00	5.00	2,660.75	30.00	48.25	31,653.65	53.40	31,600.25	1,511.53	30,088.72	15,044.32	17.83	15,062.28	
Mariposa	3,179.05	12.00	45.00		705.75		4.75	4,016.56	8.80	4,007.75	191.70	3,816.05	1,908.02	7.90	1,915.92	
Mendocino	24,718.56	76.00	330.00	5.00	3,343.30	6.00	47.00	28,530.30	38.40	28,491.90	1,364.36	27,127.54	13,563.77	44.43	13,519.34	
Merced	40,818.35	150.30	610.00		3,623.65	32.00	107.25	45,341.55	29.20	45,312.35	2,167.69	43,144.66	21,572.58	19.78	21,552.80	
Modoc	7,530.45	17.00	70.00		424.35		8.00	8,049.80	7.30	8,042.50	384.70	7,657.80	3,828.90	176.90	3,652.00	
Mono	1,689.65	3.00	140.00		140.00			1,972.65		1,972.65	52.30	1,920.35	960.17	30.44	930.61	
Monterey	42,791.05	256.40	740.00	6.00	4,315.45	52.00	72.50	48,234.30	30.00	48,204.30	2,305.93	45,898.37	22,949.39	2.97	22,946.42	
Napa	28,763.35	192.90	378.75	5.00	2,855.80	26.00	52.25	32,274.05	15.00	32,259.05	1,543.20	30,715.85	14,357.95	19.41	14,377.36	
Nevada	8,688.10	15.00	145.00		1,253.00		10.00	10,111.10	10.40	10,100.70	483.29	9,617.41	4,808.71	32.77	4,841.50	
Orange	149,031.80	1,125.20	1,802.50	41.00	9,036.50	331.70	229.75	161,598.25	179.60	161,418.65	7,722.00	153,696.65	76,844.04	256.27	77,100.31	
Placer	29,780.10	119.00	327.50	6.00	3,801.65	4.00	51.00	34,089.25	62.85	32,776.40	1,568.74	31,207.66	15,613.83	1,360.48	14,253.35	
Plumas	4,131.45	10.00	63.75		899.40	6.00	10.00	7,163.60	6.00	7,157.60	341.76	6,815.84	3,407.91	11.86	3,419.81	
Riverside	82,821.93	653.00	1,005.00	16.00	8,584.40	132.00	140.00	93,453.33	63.65	93,389.68	4,468.79	88,920.89	43,985.46	195.74	43,981.20	
Sacramento	96,256.36	1,001.45	1,650.00	30.00	12,673.75	114.00	377.50	112,097.06	144.15	111,952.91	5,362.00	106,590.91	53,295.45	49.24	53,246.21	
San Benito	16,033.35	87.00	225.00	6.00	1,973.60	10.00	14.25	18,358.20	5.60	18,354.60	877.96	17,476.64	8,738.32	20.39	8,717.93	
San Bernardino	113,913.60	1,189.55	1,915.00	32.00	8,530.90	178.00	203.75	125,961.80	93.40	125,868.40	6,027.54	119,840.86	59,920.07	209.07	59,711.00	
San Diego	182,663.45	1,536.20	1,925.00	32.00	16,249.75	70.00	327.00	202,803.40	179.60	202,623.80	9,698.05	192,925.75	96,454.84	5,016.71	91,438.13	
San Francisco	298,774.80	1,746.00	2,640.00	67.25	36,476.50	537.50	1,179.50	341,421.55	1,457.20	339,964.35	16,264.68	323,699.67	161,849.83	2,849.78	158,999.95	
San Joaquin	143,496.16	946.25	1,301.75	36.00	15,162.50	248.50	310.00	161,470.16	534.40	161,135.76	7,707.08	153,428.68	76,707.84	149.78	76,709.62	
San Luis Obispo	41,565.15	138.00	581.25		3,393.50	22.00	87.00	45,416.90	58.00	45,358.90	2,170.63	43,188.27	21,594.14	16.41	21,577.73	
San Mateo	43,786.25	373.40	352.50	13.00	6,582.70	56.00	68.75	51,176.60	69.35	51,107.25	2,444.60	48,662.65	24,331.32	111.61	24,219.71	
Santa Barbara	76,997.60	406.00	1,017.15	20.00	4,877.35	64.50	124.75	83,507.35	38.40	83,468.95	3,991.50	79,477.37	39,738.69	297.50	40,036.19	
Santa Clara	170,870.20	1,370.45	1,741.75	45.00	10,738.05	362.00	591.25	183,779.05	170.85	183,608.70	8,780.70	174,816.00	87,413.62	71.39	87,341.83	
Santa Cruz	46,384.81	290.50	1,033.78	12.00	5,027.65	32.00	69.00	47,850.01	60.80	47,843.61	2,289.33	47,164.68	23,582.34	21.44	23,560.68	
Shasta	18,968.35	96.00	220.00		2,949.05	4.00	47.50	22,283.90	25.00	22,258.90	1,039.92	21,218.98	10,609.34	30.64	10,579.30	
Sierra	1,371.15	5.50	70.00		228.40		1.75	2,273.80		2,273.80	108.77	2,165.03	1,082.52	68.62	1,151.14	
Siskiyou	29,777.45	65.50	330.00	14.00	2,453.80	14.00	61.75	32,716.50	97.15	32,619.35	1,563.34	31,056.02	15,527.99	132.95	15,660.94	
Solano	37,422.92	269.40	845.00	15.00	4,397.90	10.00	79.25	43,190.35	56.30	43,134.05	2,037.34	41,096.71	20,548.45	170.09	20,718.54	
Sonoma	93,115.79	638.05	1,609.00	15.00	11,274.30	134.00	194.50	107,080.64	125.20	106,955.44	5,097.11	101,858.19	50,929.09	34.10	50,963.19	
Stanislaus	104,946.63	615.50	1,280.00	18.00	7,291.35		222.50	114,568.73	161.50	114,407.23	5,472.39	108,934.84	54,467.42	294.40	54,173.02	
Sutter	19,220.55	57.50	40.00		2,542.65	32.00	31.75	21,924.65	30.10	21,894.55	1,047.98	20,847.57	10,423.64	88.58	10,335.06	
Tehama	21,265.20	58.00	360.00		1,729.90	54.00	27.00	23,381.99	20.40	23,361.59	1,117.53	22,244.06	11,121.87	65.02	11,056.85	
Trinity	1,114.00		70.00		114.00		2.00	1,300.00	4.50	1,295.50	60.80	1,234.70	617.10	58.52	559.58	
Tulare	123,909.22	403.40	1,370.00	5.00	11,538.70	244.50	240.00	141,730.82	137.95	141,592.91	6,772.69	134,820.22	67,410.11	11.10	67,399.01	
Tuolumne	7,182.45	30.50	110.00		1,000.70	8.00	15.75	10,381.40	10.30	10,371.10	491.35	9,879.80	4,869.90	25.58	4,844.32	
Ventura	50,032.35	168.90	745.00	6.25	3,810.30	125.50	78.50	54,970.80	29.60	54,941.20	2,628.02	52,314.18	26,157.09		26,157.09	
Yolo	39,663.15	216.50	370.00	8.00	3,924.15	57.00	66.00	40,313.75	78.55	40,235.20	1,924.60	38,311.60	19,155.80	2,689.15	16,466.65	
Yuba	18,592.45	40.00	403.75		2,304.80	18.00	44.75	21,823.80	8.00	21,815.80	1,043.36	20,772.44	10,386.22	80.19	10,306.03	
Totals	5,413,969.02	33,598.05	63,180.63	799.50	606,563.50	5,750.00	10,951.25	6,134,741.97	7,898.30	6,126,843.67	293,062.43	5,833,781.24	2,916,890.62	- Total 8,973.02	2,916,890.62	2,916,890.62

STATE MOTOR VEHICLE DEPARTMENT OF CALIFORNIA.

SPECIAL STATEMENT OF FEES COLLECTED FOR THE FISCAL YEAR ENDING JUNE 30, 1921

	AUTOS	MOTORCYCLES	AUTO STAGE	MOTORCYCLE DEALERS	TRUCKS	TRAILERS	MISCELLANEOUS	TOTAL	REFUNDS	NET TOTAL RECEIVED	DEDUCT 10% OF 1921-07 (AUTO STAGES & MOTORCYCLE DEALERS)	NET AMOUNT PAY-ABLE COUNTIES	DIRECTORY SALES	TOTAL FOR APPORTIONMENT	ONE-HALF TO COUNTIES	ONE-HALF TO STATE
Alameda	1,[illegible]	25.00	120.00		1,[illegible]	30.00	730.00	13,598.28	598.75	14,307.50	8.00	14,299.50	899.12	15,198.62	7,599.31	7,599.31
Alpine	2[illegible]				[illegible]			2.00		2.00		2.00		2.00	1.00	
Amador	225.00				27.00		11.00	333.00	10.00	319.15	1.85	317.30	14.54	331.84	165.92	
Butte	752.00	18.00	20.00		117.00	4.00	150.00	1,061.00	43.00	1,018.00	1.50	1,016.50	138.09	1,154.59	577.29	
Calaveras	415.00	3.00			31.00		10.75	492.05	4.00	488.25	1.25	487.00	81.39	568.39	284.19	
Colusa	366.00	5.00	5.00		41.00	2.00	40.00	459.00		459.00		459.00		459.00	229.50	
Contra Costa	1,[illegible]5.00	30.00	60.00		1[illegible]	8.00	1,174.00	3,[illegible]	42.75	3,[illegible]	1.50	3,[illegible]	53.04	3,[illegible]	1,[illegible]	
Del Norte	1,[illegible]	5.00			1[illegible]	2.00	1[illegible]	1,[illegible]		1,[illegible]	1.00	1,[illegible]	1[illegible]	1,[illegible]	1,[illegible]	
El Dorado	5[illegible]				[illegible]		[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Fresno	4,[illegible]	10.75	115.00		1,[illegible]	50.00	1,[illegible]	13,[illegible]	1.50	13,477.10	6,[illegible]	7,[illegible]	1[illegible]	8,[illegible]	4,[illegible]	
Glenn	1,[illegible]	14.00	15.00		1[illegible]	4.00	30.00	1,[illegible]	.60	1,[illegible]		1,[illegible]	1[illegible]	1,[illegible]	1[illegible]	
Humboldt	1,[illegible]	19.00	30.00		1[illegible]	4.00	1,[illegible]	1,[illegible]	1.50	1,[illegible]	1.[illegible]	1,[illegible]	1[illegible]	1,[illegible]	1[illegible]	
Imperial	1,[illegible]	17.00	30.00		1[illegible]	4.00	1,[illegible]	1,[illegible]	4.00	1,[illegible]	1.[illegible]	1,[illegible]	1[illegible]	1,[illegible]	1[illegible]	
Inyo	1[illegible]		5.00		[illegible]		[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Kern	4,[illegible]	58.00	115.00		3[illegible]	30.00	1,[illegible]	9,[illegible]	11.65	9,[illegible]	3.[illegible]	9,[illegible]	1[illegible]	9,[illegible]	4,[illegible]	
Kings	1,[illegible]	17.00	10.00		2[illegible]	8.00	2[illegible]	1,[illegible]	44.85	1,[illegible]	1.[illegible]	1,[illegible]	1[illegible]	1,[illegible]	1,[illegible]	
Lake	1[illegible]	1.00			[illegible]		[illegible]	[illegible]	7.[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Lassen	2[illegible]	4.00			[illegible]		[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Los Angeles	11,[illegible]	1,[illegible]	1,531.00	5.00	8,[illegible]	141.00	2,[illegible]	1[illegible]	1,[illegible]	1[illegible]	129.[illegible]	51,[illegible]	7[illegible]	5,[illegible]	2,[illegible]	
Madera	3[illegible]	11.00			[illegible]	1.00	[illegible]	[illegible]	.60	1,[illegible]		1,[illegible]	[illegible]	1,[illegible]	[illegible]	
Marin	1,[illegible]	1.00	10.00		1[illegible]		3[illegible]	1,[illegible]	7.50	1,[illegible]		1,[illegible]	[illegible]	[illegible]	[illegible]	
Mariposa	1[illegible]		15.00		[illegible]		[illegible]	[illegible]	.50	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Mendocino	1,[illegible]	1.00	40.00		1[illegible]		2[illegible]	1,[illegible]	4.[illegible]	1,[illegible]		1,[illegible]	[illegible]	[illegible]	[illegible]	
Merced	1,[illegible]	8.00			[illegible]	6.00	[illegible]	[illegible]	14.80	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Modoc	1[illegible]				[illegible]		[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Mono	53.[illegible]				[illegible]		[illegible]	53.[illegible]		53.[illegible]		53.[illegible]	[illegible]	[illegible]	[illegible]	
Monterey	2,[illegible]	28.00			1[illegible]		[illegible]	[illegible]	14.[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Napa	1,[illegible]	11.50	10.00		3[illegible]	2.00	[illegible]	[illegible]	60.00	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Nevada	1,[illegible]				[illegible]		[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Orange	9,[illegible]	109.75	100.00		9[illegible]	39.00	2[illegible]	[illegible]	88.00	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Placer	1,[illegible]	15.50	35.00		2[illegible]	4.00	1[illegible]	[illegible]	72.15	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Plumas	1,[illegible]	2.00			[illegible]		[illegible]	[illegible]	1.[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Riverside	4,[illegible]	43.00	90.00		1[illegible]	22.00	1[illegible]	[illegible]	1[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Sacramento	6,[illegible]	81.50	40.00		1[illegible]	40.00	1[illegible]	[illegible]	1[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
San Benito	1[illegible]	1.00	10.00		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
San Bernardino	7,[illegible]	100.15	125.00		5[illegible]	49.50	1[illegible]	[illegible]	59.45	8,[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
San Diego	12,[illegible]	203.00	180.00		1[illegible]	45.00	1[illegible]	[illegible]	31.70	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
San Francisco	31,[illegible]	1[illegible]	1[illegible]		4[illegible]	1[illegible]	[illegible]	[illegible]	1,[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
San Joaquin	3[illegible]	42.00	100.00		1[illegible]	26.00	1[illegible]	[illegible]	64.50	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
San Luis Obispo	2,[illegible]	9.00	60.00		1[illegible]		[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
San Mateo	2,[illegible]	27.50	10.00		1[illegible]	6.00	[illegible]	[illegible]	37.90	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Santa Barbara	4,[illegible]	61.15	84.00		1[illegible]	6.00	1[illegible]	[illegible]	66.[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Santa Clara	7,[illegible]	145.70	155.00		1,[illegible]	56.00	2[illegible]	[illegible]	186.[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Santa Cruz	2,[illegible]	42.00	20.00		[illegible]	10.00	[illegible]	[illegible]	59.[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Shasta	9[illegible]	2.00	10.00		1[illegible]	2.00	[illegible]	[illegible]	17.30	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Sierra	1[illegible]				[illegible]		[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Siskiyou	1,[illegible]	5.00	10.00		9[illegible]		[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Solano	1,[illegible]	30.00	30.00		2[illegible]	6.50	[illegible]	[illegible]	14.70	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Sonoma	4,[illegible]	20.50	15.00		5[illegible]	1.00	[illegible]	[illegible]	41.[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Stanislaus	4,[illegible]	39.75	70.00		1[illegible]	10.00	[illegible]	[illegible]	82.[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Sutter	7[illegible]	4.00			1[illegible]	6.00	3[illegible]	[illegible]	14.30	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Tehama	7[illegible]	10.90	15.00		[illegible]	6.00	1[illegible]	[illegible]	12.70	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Trinity	1[illegible]				[illegible]		[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Tulare	5,[illegible]	54.00	60.00		3[illegible]	39.00	2[illegible]	[illegible]	139.60	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Tuolumne	9[illegible]	6.50			[illegible]	4.00	[illegible]	[illegible]	17.30	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Ventura	3,[illegible]	22.40	15.00		4[illegible]	18.50	1[illegible]	[illegible]	55.80	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Yolo	1,[illegible]	9.00	15.00		[illegible]	2.00	[illegible]	[illegible]	9.10	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Yuba	1[illegible]	2.00	10.00		1[illegible]		[illegible]	[illegible]	13.00	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Totals	284,[illegible]	2,869.50	3,945.00	5.00	29,[illegible]	1,190.00	41,[illegible]	[illegible]	5,719.05	337,910.75		156,697.27	197,213.48	15,[illegible]	202,603.48	101,301.74	101,301.74

STATE MOTOR VEHICLE DEPARTMENT OF CALIFORNIA.

SEMI ANNUAL STATEMENT OF APPORTIONMENT OF RECEIPTS FOR THE PERIOD FEB 1, 1922 TO JULY 31, 1922, inc.

	AUTOMOBILES	MOTORCYCLES	AUTO TRAILERS	MOTORCYCLE TRAILERS	TRUCKS	TRAILERS	MISCELLANEOUS	TOTAL	REFUNDS	NET TOTAL	EXPENSES $34,580.50 4.3467536%	NET AMOUNT FOR APPORTIONMENT OF FEES	MISCELLANEOUS INCOME $257.00 .0323305%	TOTAL FOR APPORTIONMENT	ONE-HALF TO COUNTIES	ONE HALF TO STATE
Alameda	453,509.70	2,863.90	3,072.50	76.25	44,215.25	278.00	1,132.75	[illegible]	1,130.05	504,018.30	21,404.42	482,613.88	67.16	482,681.04	241,340.52	
Albine	216.40				50		25.00	241.90		216.90	9.21	207.69	.04	207.73	103.86	
Amador	8,874.30	5.50	85.00		1,058.40	2.00	4.50	10,029.70	15.05	10,014.65	435.30	9,579.35	1.34	9,580.69	4,790.34	
Butte	59,796.75	205.00	525.00	12.00	1,333.90	138.50	68.75	61,079.90	136.50	60,943.40	2,784.06	58,159.34	9.73	58,781.97	31,390.99	
Calaveras	6,372.20	25.50	40.00		382.75	2.00	6.00	9,410.45	14.30	9,396.15	399.03	8,997.12	1.55	8,998.37	4,499.16	
Colusa	22,879.15	50.50	295.00		2,693.10	52.00	41.75	25,947.50	48.40	25,894.10	1,099.66	24,794.44	3.45	24,797.89	12,398.95	
Contra Costa	67,436.80	521.40	665.00		7,506.15	18.00	69.00	76,216.35	140.30	76,116.05	3,330.46	72,785.59	10.14	72,693.73	36,446.86	
Del Norte	4,186.10	8.00	40.00	5.00	645.00	2.00	4.50	4,890.60	9.60	4,880.70	212.50	4,668.20	.65	4,668.76	2,334.18	
El Dorado	9,553.40	31.00	110.00		1,547.00		11.50	11,326.80	21.50	11,305.30	489.10	10,816.20	1.51	10,816.41	5,413.31	
Fresno	322,054.80	1,141.50	2,340.00	34.00	32,595.35	300.50	716.75	359,177.90	620.90	358,557.00	15,538.53	343,283.47	47.90	343,283.37	171,784.53	
Glenn	24,468.90	70.00	301.25		2,298.60	50.00	38.00	27,226.75	32.70	27,194.05	1,154.87	26,039.18	3.62	26,042.80	13,021.40	
Humboldt	54,535.35	181.00	675.00		6,045.50	30.00	86.75	61,253.60	105.00	61,145.10	2,596.66	58,548.42	8.15	58,556.57	29,278.29	
Imperial	27,681.70	61.25	650.00		6,381.85	64.50	160.75	90,385.05	48.10	90,336.95	3,910.44	86,426.51	10.79	86,433.66	43,216.83	
Inyo	11,557.40	14.50	45.00		1,558.45	14.00	18.75	13,701.40	8.85	13,692.55	592.15	13,100.44	1.69	13,102.13	6,079.57	
Kern	164,116.65	598.00	1,345.00	15.00	18,898.95	201.50	269.00	185,334.10	516.00	184,818.10	7,849.77	176,969.33	24.63	176,993.96	88,496.98	
Kings	48,898.00	172.50	467.50		4,181.20	144.00	83.00	53,893.20	24.20	53,869.00	2,287.68	51,581.32	7.18	51,588.50	25,794.25	
Lake	9,907.70	16.00	113.75		1,117.90	2.00	3.75	10,743.70		10,743.70	456.26	10,287.44	1.43	10,288.87	5,144.43	
Lassen	13,736.45	17.00	210.00		364.00		31.00	13,878.95	14.30	13,864.65	588.67	13,276.98	1.85	13,278.83	6,639.41	
Los Angeles	2,270,190.93	10,276.50	19,018.50	185.50	214,259.25	2,765.00	3,908.00	2,520,551.68	2,570.16	2,517,981.52	106,932.47	2,411,049.05	335.50	2,411,384.55	1,205,692.28	
Madera	26,041.40	103.65	140.00		2,404.80	18.00	44.00	28,818.85	44.00	28,774.85	1,222.00	27,552.85	3.83	27,556.68	13,778.34	
Marin	36,072.30	142.00	350.00	5.00	3,376.80	8.00	60.25	40,014.35	85.30	39,929.05	1,695.69	38,233.36	5.32	38,238.68	19,119.34	
Mariposa	3,990.58	10.00	10.00		241.30		4.75	4,257.70	3.70	4,254.00	197.64	4,056.36	.62	4,056.98	2,028.49	
Mendocino	29,990.45	78.75	515.00	4.00	4,000.70	4.00	44.00	34,580.90	22.15	34,558.75	1,467.63	33,091.12	4.60	33,095.72	16,547.86	
Merced	74,308.06	162.15	450.00		4,298.50	66.00	88.00	54,372.65	45.40	54,327.25	2,307.15	52,020.10	7.24	52,027.34	26,013.67	
Modoc	6,662.70	14.63	135.00		392.15	2.00	6.00	7,001.53	23.90	6,977.95	301.27	6,676.68	1.20	6,597.88	4,298.94	
Mono	1,030.75	3.75			47.55		1.50	1,083.55		1,083.55	46.02	1,037.53	.15	1,037.68	518.84	
Monterey	49,937.80	190.00	675.00	6.00	4,561.05	72.00	53.25	55,497.50	76.70	55,420.80	2,353.59	53,067.21	7.38	53,074.59	26,537.29	
Napa	31,115.25	141.15	325.00		3,265.65	30.00	48.25	37,084.80	75.10	37,009.70	1,571.71	35,437.99	4.93	35,442.92	17,721.46	
Nevada	10,710.35	14.00	165.00	10.00	1,781.65	6.75	11,689.75	12.40	11,663.35	495.31	11,168.04	1.56	11,169.60	5,584.80		
Orange	134,736.75	1,021.00	1,180.00	41.00	12,720.85	447.50	308.25	154,677.39	192.30	153,985.19	9,084.03	204,841.16	28.50	204,869.66	102,424.83	
Placer	34,241.40	124.00	310.00	6.00	3,383.35	16.00	59.75	38,740.50	83.10	38,657.40	1,641.68	37,015.72	5.15	37,020.87	18,510.43	
Plumas	2,526.30	1.50	20.00		304.10	4.00	14.00	7,531.90	3.10	7,528.80	326.25	7,202.55	1.00	7,203.55	3,601.78	
Riverside	99,060.44	542.15	1,020.00	17.00	6,449.25	218.00	178.25	107,461.79	68.80	107,392.99	4,560.69	102,831.60	14.31	102,845.91	51,422.95	
Sacramento	171,078.20	839.15	1,745.00	17.00	21,668.70	178.50	539.75	196,866.30	549.95	196,316.35	8,337.27	187,979.08	26.16	188,005.44	94,002.72	
San Benito	18,252.70	74.63	215.00	5.00	1,944.00	20.00	13.00	21,109.30	12.40	21,096.90	895.89	20,200.81	2.81	20,202.82	10,101.41	
San Bernardino	145,924.15	1,118.90	1,280.00	22.00	10,342.55	255.50	189.75	159,143.60	161.35	158,982.25	6,750.18	152,132.07	21.18	152,221.25	76,110.13	
San Diego	228,062.20	1,612.75	1,835.00	27.00	17,544.60	84.00	561.25	249,726.80	1,345.80	248,381.00	10,545.76	237,835.24	33.09	237,868.33	118,934.17	
San Francisco	376,678.70	2,416.60	2,785.00	50.00	29,786.30	355.00	1,564.25	687,156.10	1,881.82	684,689.31	29,651.56	655,035.81	91.15	655,126.96	327,563.48	
San Joaquin	164,424.00	838.70	1,753.75	31.00	19,266.50	303.00	1,084.50	184,950.70	976.05	183,974.65	7,940.83	176,033.82	24.49	176,058.31	88,029.16	
San Luis Obispo	31,734.75	112.30	260.00		3,263.65	32.00	54.75	55,049.45	47.50	55,001.95	2,335.80	52,666.15	7.33	52,673.48	26,336.74	
San Mateo	55,705.10	344.00	410.00	7.80	7,429.85	76.00	102.25	64,074.70	131.00	63,941.50	2,715.44	61,226.06	8.52	61,234.58	30,617.29	
Santa Barbara	68,269.03	363.50	975.00	15.00	6,305.75	72.00	76.00	76,074.28	130.00	75,944.28	4,073.66	71,870.62	12.78	71,883.40	35,941.70	
Santa Clara	201,962.40	1,398.60	2,111.75	51.00	22,972.30	439.00	252.00	229,184.05	590.30	228,193.75	9,733.29	219,460.46	30.54	219,491.00	109,745.50	
Santa Cruz	53,797.70	218.00	675.00	11.00	5,365.30	60.00	85.00	61,206.00	106.50	61,099.50	2,607.29	58,492.21	8.17	58,500.38	29,250.54	
Shasta	22,730.30	43.65	250.00	6.00	3,131.95	16.00	54.25	26,237.15	28.10	26,209.05	1,113.03	25,096.02	3.49	25,099.51	12,549.76	
Sierra	2,031.00	5.50	30.00		153.60		1.25	2,211.55	10.40	2,201.15	93.48	2,107.67	.29	2,107.96	1,053.98	
Siskiyou	24,244.30	52.25	395.00		2,366.05	6.50	41.50	27,005.60	44.50	26,961.10	1,234.14	27,826.71	3.87	27,830.58	13,915.29	
Solano	53,330.15	222.25	1,020.00	19.00	4,462.75	48.00	93.00	59,135.60	126.30	59,009.30	2,516.69	56,789.91	7.90	56,797.81	28,398.90	
Sonoma	113,494.20	380.00	1,362.50	10.00	12,716.80	50.00	168.00	128,477.55	198.00	128,279.55	5,444.96	122,834.59	17.08	122,851.67	61,425.79	
Stanislaus	115,051.55	511.00	1,190.00	23.00	7,834.50	268.50	152.50	125,031.05	196.45	124,834.60	5,301.42	119,533.18	16.63	119,549.81	59,774.90	
Sutter	22,714.65	37.25	30.00		3,126.25	44.50	31.25	25,993.90	2.10	25,991.80	1,103.81	24,887.99	3.46	24,891.45	12,445.73	
Tehama	23,164.50	77.50	245.00		1,842.35	34.50	45.50	25,409.15	38.00	25,365.25	1,077.30	24,288.05	3.38	24,291.43	12,145.71	
Trinity	1,731.80	3.00	45.00		194.66		5.75	1,956.65		1,956.65	83.09	1,873.56	.26	1,873.82	936.91	
Tulare	147,224.55	374.50	1,240.00		12,385.75	243.75	163.50	161,631.83	166.36	162,199.49	6,900.35	155,298.54	21.62	155,620.16	77,810.10	
Tuolumne	11,556.25	29.50	115.00		1,102.60	10.00	14.00	12,827.45	28.40	12,801.05	543.63	12,257.42	1.71	12,259.13	6,129.56	
Ventura	61,981.20	171.00	645.00		5,066.45	164.00	70.25	68,119.90	102.70	68,017.20	2,888.52	65,128.68	9.06	65,137.74	32,568.87	
Yolo	39,367.20	161.50	385.00	7.00	4,477.05	67.00	61.00	44,446.75	25.60	44,421.15	1,886.41	42,534.66	5.92	42,540.61	21,269.83	
Yuba	20,878.70	23.50	285.00		2,689.54	24.00	39.00	24,139.74	70.30	24,069.44	1,022.17	23,047.27	3.21	23,050.48	11,525.24	
TOTALS	6,630,709.82	30,294.20	60,875.50	724.25	677,459.07	7,931.00	12,079.25	7,420,073.09	12,520.66	7,407,552.43	314,580.50	7,092,971.93	987.00	7,093,958.93	3,546,979.46	3,546,979.46

Statement of Registration by Years, of Motor Vehicles in the State of California. From the Records of the Motor Vehicle Department.

Year	Autos and trucks (including exemptions)			Trailers	Motorcycles	Non-residents	Dealers
	Total	Yearly increase	Per cent increase over previous year				
Previous to 1907	10,020						
1907	14,051	4,031	40.2				
1908	19,561	5,510	39.2				
1909	28,633	9,072	46.3				
1910	44,122	15,489	54.0				
1911	60,779	16,657	37.7				
1912	91,194	30,415	50.0				
1913	119,716	28,522	31.2				
1914	123,516	3,800	3.17		24,709		
1915	163,795	40,279	32.6		26,401		
1916	235,440	71,645	43.7		30,999		
1917	310,916	75,476	32.0		30,417		
1918	370,800	59,884	19.3	674	25,973		
1919	493,463	112,364	30.3	1,674	28,028		
1920	583,623	100,459	20.8	2,300	20,564	13,000	
1921	691,344	107,721	18.4	3,828	18,582	22,923	10,445
1922	816,426	111,582	16.1	4,570	15,631	23,000	
Average			32.2				

Distribution for 1922, to November 1.

Automobiles	765,093
Trucks	37,833
Exemptions	13,500
Total	816,426
Trailers	4,570
Non-residents	23,000
Motorcycles	15,631

Appendix O.

ANALYSIS OF MAINTENANCE EXPENDITURES.

All costs for repairs of the state highways and of their maintenance are paid out of the Motor Vehicle Fund.

The Vehicle Act passed in 1915 (Chapter 188), amended 1917 (Chapter 218), amended 1919 (Chapter 147), amended 1921 (Chapter 61), superseded the older "Motor Vehicle Act," chapter 326 of the Statutes of 1913. Both the 1913 and the 1915 laws created a "Motor Vehicle Fund," but the distribution of the fund differs in the two acts.

Previous to the passage of the Motor Vehicle Act of 1913, chapter 612, Statutes of 1905, was in force, but it provided merely for the collection of nominal registration fees. No portion of the money collected was available for direct expenditure on the highways; the receipts went into the general fund of the state and none of the money was available to the California Highway Commission.

The Motor Vehicle Act of 1913 provided that the state's portion of the fund should be expended through the Advisory Board of the State Department of Engineering. It was the custom of that board to apportion a part of the fund to be expended by the State Engineer on roads taken over by the legislature and on roads in state parks, and a part to the California Highway Commission for expenditure on roads taken over under the State Highway Act. This practice continued until July 27, 1917, when all roads formerly under the control of the State Engineer were turned over to the California Highway Commission.

The Motor Vehicle Fund now has paid into it all moneys received by the Motor Vehicle Department except the moneys received by it for transfers and for operators' and chauffeurs' licenses. The transfer and operators' license fund, plus so much of the other receipts of the department as are needed, up to a maximum limit of 10 per cent of the receipts of the year, is available for expenditure by the Motor Vehicle Department for carrying out the provisions of the Vehicle Act. One-half of the net balance remaining in the Motor Vehicle Fund is credited to the counties from which the money was received and the other half, "in addition to all sums that have heretofore and that may be appropriated hereafter by the legislature for the same purpose," is available for expenditure under the direction of the California Highway Commission for the maintenance and improvement of the state roads and highways under the jurisdiction of the California Highway Commission and for the maintenance and improvement of roads and highways in state parks.

STATE MOTOR VEHICLE DEPARTMENT OF CALIFORNIA.

County Apportionment of Motor Vehicle Funds - January 1 1914 to July 31, 1922 Inclusive.

County	1914	1915	1916	1917	1918	1919	1920	1921	1922	Total County Apportionment
Alameda	40,410.82	60,129.61	87,622.34	85,471.52	97,82.16	136,098.74	169,193.13	204 770.88	241 340.52	1,110,614.01
Alpine	59.66	79.68	41.72	84.16	76.20	55.67	87.44	300.13	103.86	820.34
Amador	757.97	1,241.07	1,63.96	1,[illegible]	1,[illegible]	2,586.51	3,[illegible]	4,755.36	4,570.44	24,870.44
Butte	4,930.93	7,092.11	7,[illegible]	10,[illegible]	13,[illegible]	19,183.71	25,542.36	30,467.62	31,290.99	150,040.89
Calaveras	704.76	1,15[illegible]	1,[illegible]	1,[illegible]	1,[illegible]	2,653.02	3,[illegible]	4,[illegible]	4,490.18	22,155.87
Colusa	1,993.09	3,[illegible]	3,[illegible]	4,[illegible]	6,650.87	9,[illegible]	11,[illegible]	14,[illegible]	14,[illegible]	64,876.31
Contra Costa	4,[illegible]	6,[illegible]	8,[illegible]	11,[illegible]	14,[illegible]	22,[illegible]	29,[illegible]	36,[illegible]	37,[illegible]	161,748.12
Del Norte	1,[illegible]	1,[illegible]	1,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9,135.70
El Dorado	2,[illegible]	3,[illegible]	3,[illegible]	4,[illegible]	5,[illegible]	7,[illegible]	9,[illegible]	11,[illegible]	11,[illegible]	54,072.30
Fresno	21,458.66	33,[illegible]	39,[illegible]	51,[illegible]	63,[illegible]	93,[illegible]	111,[illegible]	157,[illegible]	171,[illegible]	778,049.59
Glenn	2,[illegible]	3,[illegible]	3,[illegible]	4,[illegible]	5,[illegible]	8,[illegible]	11,[illegible]	13,[illegible]	14,[illegible]	71,107.07
Humboldt	5,[illegible]	7,[illegible]	7,[illegible]	9,[illegible]	11,[illegible]	16,[illegible]	21,[illegible]	26,[illegible]	29,[illegible]	133,794.48
Imperial	3,[illegible]	5,[illegible]	11,[illegible]	9,[illegible]	12,[illegible]	20,[illegible]	37,[illegible]	39,[illegible]	38,[illegible]	208,956.45
Inyo	653.31	1,[illegible]	1,[illegible]	1,[illegible]	1,[illegible]	2,[illegible]	3,[illegible]	4,[illegible]	4,[illegible]	21,690.36
Kern	11,576.83	15,[illegible]	22,[illegible]	31,[illegible]	39,[illegible]	46,[illegible]	57,[illegible]	71,[illegible]	68,[illegible]	365,983.43
Kings	3,[illegible]	5,[illegible]	6,[illegible]	10,[illegible]	12,[illegible]	17,[illegible]	21,[illegible]	22,[illegible]	25,[illegible]	127,454.43
Lake	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24,714.91
Lassen	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	28,184.59
Los Angeles	314,[illegible]	[illegible]	313,[illegible]	[illegible]	416,[illegible]	582,[illegible]	787,[illegible]	978,[illegible]	1,224,[illegible]	5,101,983.89
Madera	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	59,062.48
Marin	[illegible]	4,[illegible]	5,[illegible]	6,[illegible]	7,[illegible]	10,[illegible]	12,[illegible]	15,[illegible]	19,[illegible]	84,391.38
Mariposa	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10,055.96
Mendocino	[illegible]	3,[illegible]	3,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	71,688.53
Merced	[illegible]	4,[illegible]	4,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	114,155.68
Modoc	661.95	1,[illegible]	1,[illegible]	1,[illegible]	2,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22,701.45
Mono	61.45	84.[illegible]	94.54	180.49	218.74	247.[illegible]	[illegible]	[illegible]	[illegible]	2,457.47
Monterey	4,[illegible]	6,[illegible]	7,[illegible]	9,[illegible]	13,[illegible]	17,[illegible]	23,[illegible]	27,[illegible]	[illegible]	125,184.94
Napa	3,[illegible]	4,[illegible]	4,[illegible]	6,[illegible]	8,[illegible]	11,[illegible]	15,[illegible]	17,[illegible]	[illegible]	82,939.76
Nevada	2,[illegible]	3,[illegible]	3,[illegible]	4,[illegible]	5,[illegible]	7,[illegible]	9,[illegible]	11,[illegible]	[illegible]	52,945.15
Orange	17,388.85	26,968.30	25,814.74	33,442.90	36,477.74	48,[illegible]	59,[illegible]	80,[illegible]	[illegible]	431,806.01
Placer	2,[illegible]	3,[illegible]	3,[illegible]	4,[illegible]	6,707.19	9,[illegible]	13,[illegible]	14,[illegible]	[illegible]	78,330.28
Plumas	1,[illegible]	1,[illegible]	1,[illegible]	1,[illegible]	2,[illegible]	3,[illegible]	4,[illegible]	5,[illegible]	[illegible]	16,796.98
Riverside	9,[illegible]	14,[illegible]	15,[illegible]	20,[illegible]	24,[illegible]	32,[illegible]	43,[illegible]	51,[illegible]	[illegible]	247,432.63
Sacramento	16,[illegible]	23,[illegible]	25,[illegible]	33,[illegible]	37,[illegible]	53,[illegible]	73,[illegible]	74,[illegible]	[illegible]	429,[illegible]
San Benito	2,[illegible]	3,[illegible]	3,[illegible]	4,[illegible]	5,[illegible]	8,[illegible]	11,[illegible]	14,[illegible]	[illegible]	68,062.91
San Bernardino	15,114.34	23,746.27	26,[illegible]	30,[illegible]	42,662.44	61,[illegible]	83,[illegible]	91,[illegible]	[illegible]	360,493.08
San Diego	47,757.78	70,[illegible]	78,[illegible]	44,[illegible]	46,[illegible]	65,[illegible]	93,[illegible]	121,[illegible]	[illegible]	558,346.00
San Francisco	91,[illegible]	142,[illegible]	111,[illegible]	138,[illegible]	174,[illegible]	20[illegible]	25[illegible]	29[illegible]	[illegible]	1,648,961.79
San Joaquin	11,[illegible]	21,[illegible]	[illegible]	31,[illegible]	[illegible]	53,[illegible]	69,[illegible]	73,[illegible]	[illegible]	416,957.26
San Luis Obispo	3,[illegible]	5,[illegible]	[illegible]	[illegible]	[illegible]	13,[illegible]	17,[illegible]	20,[illegible]	[illegible]	114,864.20
San Mateo	5,[illegible]	8,[illegible]	9,[illegible]	11,[illegible]	13,[illegible]	17,[illegible]	20,[illegible]	24,[illegible]	[illegible]	143,[illegible]
Santa Barbara	8,[illegible]	13,[illegible]	15,[illegible]	1[illegible]	21,[illegible]	30,[illegible]	42,[illegible]	51,[illegible]	[illegible]	257,135.05
Santa Clara	19,[illegible]	30,[illegible]	31,[illegible]	41,[illegible]	48,[illegible]	62,[illegible]	85,[illegible]	103,[illegible]	[illegible]	514,[illegible]
Santa Cruz	4,[illegible]	6,[illegible]	6,[illegible]	8,[illegible]	10,[illegible]	14,[illegible]	19,[illegible]	25,[illegible]	[illegible]	125,[illegible]
Shasta	1,[illegible]	2,[illegible]	2,[illegible]	3,[illegible]	5,[illegible]	7,[illegible]	9,[illegible]	12,[illegible]	[illegible]	54,540.93
Sierra	329.15	4[illegible]	3[illegible]	4[illegible]	5[illegible]	7[illegible]	9[illegible]	1,[illegible]	[illegible]	6,[illegible]
Siskiyou	1,[illegible]	3,[illegible]	3,[illegible]	4,[illegible]	6,[illegible]	9,[illegible]	10,[illegible]	13,[illegible]	[illegible]	61,[illegible]
Solano	3,[illegible]	5,[illegible]	6,[illegible]	8,[illegible]	11,[illegible]	16,[illegible]	22,[illegible]	25,[illegible]	[illegible]	132,[illegible]
Sonoma	9,[illegible]	14,[illegible]	14,[illegible]	18,[illegible]	23,[illegible]	32,[illegible]	43,[illegible]	51,[illegible]	[illegible]	265,[illegible]
Stanislaus	8,[illegible]	13,[illegible]	14,[illegible]	18,[illegible]	24,[illegible]	33,[illegible]	45,[illegible]	55,[illegible]	[illegible]	289,086.50
Sutter	1,[illegible]	2,[illegible]	2,[illegible]	3,[illegible]	4,[illegible]	6,[illegible]	8,[illegible]	10,[illegible]	[illegible]	55,[illegible]
Tehama	2,[illegible]	3,[illegible]	3,[illegible]	4,[illegible]	5,[illegible]	8,[illegible]	9,[illegible]	11,[illegible]	[illegible]	60,[illegible]
Trinity	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4,[illegible]
Tulare	11,[illegible]	16,[illegible]	19,[illegible]	27,[illegible]	33,[illegible]	45,[illegible]	58,[illegible]	69,[illegible]	[illegible]	353,[illegible]
Tuolumne	1,[illegible]	1,[illegible]	2,[illegible]	2,[illegible]	3,[illegible]	4,[illegible]	6,[illegible]	7,[illegible]	[illegible]	29,[illegible]
Ventura	6,[illegible]	10,[illegible]	9,[illegible]	13,[illegible]	14,[illegible]	20,[illegible]	27,[illegible]	34,[illegible]	[illegible]	159,[illegible]
Yolo	3,[illegible]	5,[illegible]	6,[illegible]	9,[illegible]	11,[illegible]	17,[illegible]	23,[illegible]	29,[illegible]	[illegible]	110,[illegible]
Yuba	1,[illegible]	2,[illegible]	2,[illegible]	3,[illegible]	4,[illegible]	5,[illegible]	7,[illegible]	9,[illegible]	[illegible]	54,[illegible]
TOTALS	591,088.72	918,492.79	964,784.65	1,147,268.80	1,421,319.79	1,924,799.77	2,434,800.56	3,018,192.16	4,545,979.45	16,981,366.90
% increase by years		55.[illegible]	5.46	18.38	13.95	35.39	26.51	23.96	17.52	



Plate LXXXVII. State Highway, Mendocino County, steam shovel in operation on heavy construction.



Plate LXXXVIII. State Highway, Mendocino County, steam shovel in operation on heavy construction.

The portion of the Motor Vehicle Fund set aside by the State Controller available for expenditure each year, under the direction of the California Highway Commission, follows:

1914*	$591,228 72
1915*	932,492 79
1916*	964,784 65
1917*	1,247,268 80
1918	1,421,319 79
1919	1,924,299 77
1920	2,434,800 56
1921	3,018,192 36
1922 (first six months)	3,546,979 46
Total	$16,081,366 90
Expended under direction of State Engineer	541,831 15
Total available for use by California Highway Commission	$15,539,535 75

*Includes amounts allotted to State Engineer.

EXPENDITURES.

Upon page 147 of this report is given a statement of total expenditures from the California Highway Commission portion of the Motor Vehicle Fund, from the creation of said fund to June 30, 1922. This statement lists the expenditures under nineteen accounts, the total amount expended to June 30, 1922, being $11,902,862.76.

It should be understood that the several state highway funds provide for the construction of certain specific roads named in the state highway acts, and that the Motor Vehicle Fund also provides for the improvement, in addition to the maintenance, of all roads under the jurisdiction of the California Highway Commisson; no matter how such roads came under its jurisdiction. Consequently, there is some overlapping of classes of work done under the various funds, as for instance:

Oiling plants have been constructed under both funds; the land for maintenance yards has been purchased under both funds; construction equipment, engineering equipment, furniture and fixtures, stable equipment, automobile equipment, camp equipment, and shop equipment—all have been purchased under both funds. The equipment, etc., purchased out of state highway fund moneys eventually becomes available for maintenance, but the Motor Vehicle Fund is not charged therewith. Likewise, equipment purchased under the Motor Vehicle Fund is also available for use on work done under the state highway funds.

So the $11,902,862.76 stated above as the total expenditure to June 30, 1922, from the Motor Vehicle Fund, does not represent all the maintenance expenditures upon the state highways, but it does cover all ordinary maintenance expenditures, together with certain improvement costs.

Account 135, Stores, covers the purchase of materials for future use, and, when actually issued for use on a particular job, the materials are then charged to the job.

Account 145, County Expense, includes the cost of surveys and plans made for the improvement of state roads, which are not included in any of the state highway acts.

All of the expenditures made under accounts 105, 107, 110, 111, 120, 121, 122, 123, 124, 125, 126, 128, 140, 141, 146, and 147, are of such nature that no distribution can be made easily to the various sections. Account 135 represents goods on hand which are further distributed as issued for use. Account 145 is segregated in the detailed accounts by county, route and section and has no practical bearing on the maintenance of highways. For this reason no further analysis of these accounts is made herein. The total expenditures included in these eighteen accounts amount to $1,020,435.82, or about 8.5 per cent of the total motor vehicle fund expenditures.

THE MAINTENANCE TABULATIONS.

Account 103, Highway Maintenance, includes all other expenditures, totaling $10,882,426.94, and the detailed figures are given on pages 240–250.

This account 103 covers all direct expenditures on the roads for general maintenance, improvement, and reconstruction, including supervision, administration, injuries to employees, repairs to equipment, and other items of a general nature, all of such items as supervision, repairs to equipment, etc., being distributed in proportion to the direct charges on each section.

The highways are listed by counties, the division, route and section being given, as well as a brief description of termini of the various sections, and the expenditures are segregated under three classifications, viz.: "General Maintenance," "Improvement" and "Reconstruction." These three classifications are further broken up into three other subdivisions—"Pavement Base," "Pavement Surface" and "Miscellaneous"—all of which are defined as follows:

"General Maintenance" includes the expenditures to maintain the roads and make minor repairs so as to keep the roads in approximately the same condition as when constructed.

"Improvement" includes expenditures for new construction or betterment, such as changes in line, grade, or type of construction. (See page 239 for further details.)

"Reconstruction" includes expenditures for the rebuilding with original type over large areas, and the rebuilding of an entire unit of construction, even though small. (See page 239 for further details.)

"Pavement Base" includes repairs to concrete, macadam, or other base courses of pavement on top of subgrade.

"Pavement Surface" includes repairs to oil, asphalt, gravel, or other surfaces, and also includes the maintenance of a smooth surface on earth roads. (Repairs to concrete base roads such as the oiling of cracks, etc., have in many cases been charged to "Pavement Surface"—an apparent inconsistency, but, due to the opening of concrete base roads to traffic before the wearing surface was applied, the concrete base became temporarily a pavement surface.)

"Miscellaneous" includes all the other expenditures which are listed on the detailed accounting books as:

"Shoulders" includes all work on earth, oil, macadam, or other shoulders of a temporary or semipermanent nature. (Work on concrete shoulders, which are virtually a widening of the pavement, is not



Plate LXXXIX. State Highway, Los Angeles County, curing concrete base.



Plate XC. State Highway, Los Angeles County, hauling aggregate.

charged to this account, but is charged to "Pavement Base" or "Pavement Surface," as the case may be.)

"Culverts and Drainage" includes all work on drainage ditches, culverts, drains, bridges, trestles, and other drainage structures.

"Guard Rail" includes all work on guard rails, parapet walls, and stone markers.

"Road Sides" includes eradication of noxious weeds, trimming of slopes, elimination of burrowing animals, removal of minor slides and other work of like nature.

"Grading" includes original grading, grade and line changes and restoring the road after slides or washouts, which removed the roadbed.

"Trees" includes the planting, watering and care of trees.

"Signs" includes road signs, highway lighthouses, traffic buttons, and all other signs and signals for the protection of the highway and of traffic thereon.

Under the column headed "Type" appear symbols indicating the character of the construction as of date June 30, 1922, and they have the following significance:

e=earth
oe=oiled earth
g=gravel
og=oiled gravel
c=Portland cement concrete
oc=oiled concrete
om=oiled macadam
or=oiled rock
b=bridge
tc=Topeka surface on concrete
te=Topeka surface on earth
tm=Topeka surface on macadam
p=plank road oiled
w=Willite
wc=Willite surface on concrete
pt=pile trestle
bc=Bitucrete surface on concrete
ac=asphalt concrete

The column headed "Miles under Maintenance" shows only the mileage of each section which is actually being maintained by the California Highway Commission, the figures being in many cases less than the distance between termini of the sections, due to exceptions not yet taken over, awaiting right of way to be secured by the counties for proposed line changes, awaiting the construction of bridges, overhead or underpass crossings, etc., and roads in incorporated cities.

The "Date Completed" column gives the date the roads were considered to be constructed and turned over to maintenance. In this

column also appear the following symbols where no dates are shown; these symbols have the following significance:

* Taken over from the State Engineering Department
\+ In progress
o Established by Statute
= Taken over from County
: Special Legislative Act

Some maintenance expenditures have been made on completed portions of roads under contract. The contracts provide for the taking over and maintaining by the state of completed sections not less than one mile in length and a similar policy has been adopted on day labor work, wherever it was necessary to care for traffic during the construction period. Moreover, on some of the mountain roads constructed by day labor, the roadbed is completed and thrown open for traffic and the minor details, such as culvert headwalls and guard rail, constructed at a later date. The expenses of keeping the road in condition for traffic during the interim are proper maintenance charges.

IMPROVEMENT.

The expenditures listed under "Improvement" cover, mostly, the surfacing of earth roads with local material; the surfacing of concrete base with thin bituminous carpet or asphaltic concrete mixture; the construction of gravel, oil macadam, and concrete shoulders; the minor improvements such as guard rail, widening cuts, line and grade changes, etc.

All improvements made on roads under the jurisdiction of the California Highway Commission and not named in the state highway acts, have necessarily been made under the Motor Vehicle Fund.

RECONSTRUCTION.

Under this heading the larger expenditures are for the reconstruction of oil macadam roads taken over from the counties, and for restoring and strengthening concrete bases which started to fail, due to heavy traffic, changed drainage conditions, poor subgrade, etc. The concrete base reconstruction consists of repairing the original base and adding an additional slab of concrete on top, reinforced in some cases—this work being really an "Improvement" as well as "Reconstruction," although listed under the latter heading.

In a few cases, bridges, constructed by the counties and afterwards taken over by the California Highway Commission, and which had insufficient waterway to carry extreme floods or were destroyed by floods, have been reconstructed under the Motor Vehicle Fund and the expenditures listed under "Reconstruction." The San Luis Rey bridge near Oceanside, in San Diego County, is the largest instance of this class of work.

MOTOR VEHICLE FUND EXPENDITURES.

Dist.	County	Rte	Sec	From	To	Type	Miles under Maint.	Date Completed	General Maintenance				Improvement				Reconstruction			
									Total	Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total
IV	Alameda	5	A	Easterly Boundary	Livermore	ac	6.02	10-16-15	94,170.90	15,596.95	16,761.81	32,850.51	65,011.27	7,413.71	1.00	19,346.44	26,761.15	1,673.29	303.90	423.29	2,400.48
						c	3.59	9-25-18													
						ac	4.97	7-20-15													
	"	5	B	Livermore	Hayward	c	5.82	8-24-16	148,075.45	84,333.16	34,672.95	18,737.29	137,744.41		4.90	1,497.46	1,502.36	3,944.81	2,948.89	1,935.98	8,829.68
						c	3.27	6-13-18													
						ac	2.67	"													
						cm	5.42	"													
	"	5	C	Hayward	Southerly Boundary	ac	9.46	7-9-15	39,714.82	13,033.07	10,101.74	14,454.68	38,448.89			976.75	976.75		287.18		287.18
						c	8.70	9-23-19													
	"	5	D	Oakland	Hayward	te	.34	12-22-14	15,865.12	5,696.86	4,779.75	4,051.84	14,478.45					918.80	457.87		1,376.67
						te	4.72	12-22-14													
III	Alpine	23	A	S. E. Boundary	Silver King Valley	e	8.00	"	641.65			641.65	641.65								
	"	23	B	Silver King Valley	Route 24	e	10.00	"	760.70		74.49	706.21	780.70								
	"	23	C	Route 24	Markleeville	e	9.00	"	6,737.03		2,058.56	4,646.17	6,704.73			92.96	92.96				
	"	23	D	Markleeville	Woodfords	e	6.6	"	6,791.76	93.40	905.66	5,545.64	6,544.70			246.66	246.66				
	"	23	E	Woodfords	Pickett's (Rte 34)	e	6.4	"	5,191.21		1,163.40	3,484.09	4,647.49			68.86	68.86		474.86		474.86
	"	23	F	Pickett's (Rte 34)	Easterly Boundary	e	2.2	"	1,476.38		193.60	831.28	1,024.88			329.84	329.84		121.66		121.66
	"	24	A	Westerly Bdy (Blonde)	Summit Pacific Grade	e	10.8	"	3,018.61		1,537.01	1,481.60	3,018.61								
	"	24	B	Summit Pacific Grade	Ebbett's Pass	e	8.0	"	1,899.54		628.32	1,250.50	1,878.82			20.82	20.82				
	"	24	C	Ebbett's Pass	Silver Creek (Rte 73)	e	10.1	"	12,162.44	19.41	2,471.23	4,488.73	6,979.37		99.62	5,083.45	5,183.07				
	"	34	A	Westerly Bdy-Kirkwoods	Carson Pass	e	5.6	"	3,418.05		1,381.99	1,994.09	3,376.08			41.97	41.97				
	"	34	B	Carson Pass	Picketts (Rte 23)	e	8.4	"	3,218.89	19.02	1,251.02	1,707.64	2,977.68			241.21	241.21				
	Amador	34	A	Westerly Boundary	Ione	e	5.932	4- -22	68.66	7.83	57.43	.40	68.66								
	"	34	B	Ione	Jackson	e	10.741	"	356.77		1.34	355.43	356.77								
	"	34	C	Jackson	Pine Grove	e	8.4	"	6,782.63		2,077.36	3,645.27	5,722.63								
	"	34	D	Pine Grove	Chaparone	g	10.2	"	41,914.27	3,626.71	16,825.74	9,956.30	30,408.75	11,127.24	153.91	224.37	11,505.52				
	"	34	E	Chaparone	Cook's Station	e	9.0	"	5,850.88		3,583.06	2,267.82	5,850.88								
	"	34	F	Cook's Station	6 Mi.East of Mans	e	10.0	"	3,165.63		1,299.92	1,865.71	3,165.63								
	"	34	G	6 Mi. East of Mans	Tragedy Springs	e	12.0	"	9,051.69		4,986.57	4,325.12	9,021.69								
	"	34	H	Tragedy Springs	Easterly Boundary	e	9.0	"	5,473.29		3,047.53	1,882.91	4,930.44			542.85	542.85				
	Butte	3	A	Southerly Boundary	Biggs	c	7.701	8-13-19	22,466.16	1,631.01	1,362.97	6,723.53	9,717.51		7,310.42	5,440.23	12,750.65				
	"	3	B	Biggs	Nelson	c	12.738	10-1-20	5,264.02	1,342.22	129.59	3,792.21	5,264.02								
	"	3	C	Nelson	Chico	c	13.793	9-26-16	24,234.16	4,606.75	948.48	18,678.93	24,234.16								
	"	3	D	Chico	Northerly Boundary	c	12.902	1-11-16	12,482.14	3,315.34	814.95	8,351.85	12,482.14								
	"	21	A	Oroville	Shippee Road	c	6.42	12-15-19	8,825.82	317.65	350.97	2,593.41	3,262.05								
						b	.232	4- -22										5,556.77		5.40	5,563.77
	"	45	A	Westerly Boundary	Biggs	e	9.79	"	3,428.40		1,276.33	2,143.73	3,422.06			6.34	6.34				
	"	47	A	Westerly Boundary	Chico	e	17.42	"	965.06	110.55	687.22	167.29	965.06								
						c	1.594	1- -22													
	Calaveras	24	A	Westerly Boundary	Valley Springs	g	10.006	8-13-19	3,457.03	46.29	3,064.34	346.40	3,457.03								
	"	24	B	Valley Springs	San Andreas	g	9.996	4-27-18	26,987.53		8,908.51	14,734.52	23,643.03		72.76	3,271.74	3,344.50				
	"	24	F	Big Trees	Black Springs	e	10.8	"	8,749.15		3,352.68	5,396.47	8,749.15								
	"	24	G	Black Springs	Easterly Boundary	e	12.3	"	8,415.71	5.94	1,614.27	3,795.60	5,415.71								

MOTOR VEHICLE FUND EXPENDITURES.

Dist.	County	Rte	Sec	From	To	Type	Miles under Maint.	Date Completed	General Maintenance				Improvements				Reconstruction			
									Macadam Base	Macadam Surface	Miscellaneous	Total	Macadam Base	Macadam Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total
	Colusa	7	A	Southerly Boundary	Geneva	oc	10.671	10-30-15	3,935.70	1,469.39	3,538.15	8,943.24	9,382.42			253.38				
	"					tc	.312	12-21-15												
	"	7	B	Geneva	Cortina	oc	11.72	8-24-16	44,397.21	12,146.65	6,196.53	9,235.17	27,578.35	947.55	6,659.67		7,607.22	8,995.78	13.86	9,009.64
	"	7	C	Cortina	Northerly Boundary	oc	10.725	8-24-16	43,290.60	20,936.16	9,288.60	7,812.99	33,982.75	686.31	63.78		950.09	8,117.15		8,357.76
	"	15	A	Williams	Colusa	oc	8.622	7-31-16	31,575.08	2,907.27	2,779.80	6,914.06	12,751.13	145.76	4,672.65	183.73	4,402.14	14,421.81		14,421.81
						s	.119	7-21-16												
IV	Contra Costa	14	A	Southerly Boundary	Pinole	tc	2.56	9-26-17	31,214.63	7,575.77	9,805.04	7,322.60	23,454.41		1,045.68	3,001.28	4,096.96	1,399.11	246.20	1,653.46
	"					s	7.37	12-7-15												
	"	14	B	Hercules	Martinez	c	17.14	12-10-18	107,166.53	28,723.75	2,413.74	30,437.42	70,314.91	1,066.80	3,621.29	15,622.11	21,332.20	15,120.84	4.67	387.91	15,513.42
I	Del Norte	1	B	Wilson Creek	Crescent City	s	14.98	11-1-20	30,302.65		1,342.13	28,960.53	30,302.66							
III	El Dorado	11	A	Westerly boundary	Shingle Springs	c	10.290	7-26-19	19,961.22	223.91	1,456.15	18,281.11	19,961.22							
	"	11	B	Shingle Springs	El Dorado	oc	5.270	7-31-15	6,710.95	573.68	2,203.03	3,934.44	6,710.95							
	"	11	C	El Dorado	Placerville	oc	6.566	7-25-15	12,327.57	357.57	7,170.12	4,799.84	12,327.53	38.14		938.82	966.96	4.77		1,024.36	1,029.13
	"	11	D	Placerville	H H King & South Flat	s	1.602	"	7,471.01	117.07	3,269.69	4,084.25	7,471.01							
	"	11	E	H H King & South Flat	Sportsmen's Hall	s	6.211	"	41,566.43	793.34	17,571.22	23,245.87	41,566.43							
						c	2.367	5- -22												
	"	11	F	Sportsmen's Hall	Riverton	s	13.8	"	73,469.00	60.46	10,412.12	9,147.93	21,620.91		405.18	1,442.91	1,848.09			
	"	11	G	Riverton	Kyburz	s	9.8	"	14,689.69	44.49	8,714.57	4,608.87	13,365.93			1,333.96	1,333.96			
	"	11	H	Kyburz	Strawberry	s	10.2	"	10,893.01	98.88	6,464.53	4,369.75	10,873.16			19.85	19.85			
	"	11	I	Strawberry	Caycos	s	9.9	"	17,285.68	156.57	6,797.29	9,600.29	16,554.15		162.19	549.34	711.53			
	"	11	J	Caycos	Junc. of 50 near Myers	s	1.4	"	2,392.49	59.41	859.53	1,532.45	2,392.49							
	"	11	K	Jct. 50 near Myers	Nevada State Line	s	6.4	"	2,450.90	39.02	711.86	1,700.40	2,450.90							
	"	23	A	Alpine Co. line	Caycos	s	9.2	"	6,183.07	15.00	1,519.08	4,153.00	5,688.08					494.99		494.99
	"	38	A	Ste. 11 near Myers	1 Mi.W. of Tallac	s	8.0	"	5,707.37	10.55	1,887.12	3,639.70	5,537.37							
	"	38	B	1 Mi.W. of Tallac	Rubicon Point	s	8.0	"	18,196.26	8.59	8,707.13	6,167.82	10,453.54		1,323.60	4,418.12	5,741.72			
	"	38	C	Rubicon Point	Northerly Boundary	s	8.3	"	6,402.21	8.60	2,813.13	3,580.48	6,402.21							
	"	65		Succession Bridge	Cool	s	13.4	"	7,138.36	25.28	1,200.56	917.42	2,138.26							
VI	Fresno	4	A	Kingsburg	Fowler	oc	9.209	1-12-15	43,753.48	7,960.39	9,907.54	9,595.37	27,563.30			16,170.18	16,170.18			
	"	4	B	Fowler	Fresno	oc	5.503	11-24-14	30,371.46	3,210.30	20,909.56	8,039.45	31,749.43		27,612.03		27,612.03			
						tc	2.692	4-24-18												
	"	4	C	Fresno	Northerly Boundary	oc	9.695	1-21-14	23,444.06	6,448.94	3,220.16	8,595.76	18,258.86	1,527.32	999.83	5,213.73	7,740.88		647.32	647.32
	"	10	D	Coalinga	Oil City School	c	8.168	3-24-20	2,610.87	836.01	611.08	963.78	2,410.87							
	"	10	F	Huron Road	Easterly Boundary	c	8.073	7- -22	6.55	6.55			6.55							
	"	41	A	General Grant Park	Dunc	s	10.5	"	9,065.53		2,652.56	4,381.47	7,033.78					2,031.55		2,031.55
	"	41	B	Dunc	Kaiser River canyon	s	4.0	"	2,390.57	1.03	585.58	1,703.96	2,390.57							
III	Glenn	7	A	Southerly Boundary	Willows	oc	4.645	8-24-16	138,145.29	16,662.39	7,324.06	8,349.14	32,335.59	100,774.97	3,692.13	23.05	103,990.15	1,819.53		1,819.53
						sm	3.939	12-1-21												
	"	7	B	Willows	Grapit	oc	10.426	4-18-16	22,926.60	12,278.68	6,156.64	4,475.05	22,910.37		1.61	3.80	5.41	10.62		10.62
	"	7	C	Grapit	Northerly Boundary	oc	6.997	1-2-15	6,778.18	2,150.84	803.30	3,663.61	6,617.75	3.99	136.44		140.43			
	"	45	A	Willows	Glenn	s	9.47	"	5,989.76	3.55	3,485.90	2,479.40	5,968.85		20.91		20.91			
	"	45	B	Glenn	Sacramento River	s	6.21	"	8,457.77	133.18	1,482.43	6,772.95	8,388.56			39.21	39.21			
	"	45	C	Sacramento River	Easterly Boundary	s	6.65	"	4,764.47		935.13	3,829.34	4,764.47							

MOTOR VEHICLE FUND EXPENDITURES.

Dist.	County	Rte.	Sec.	From	To	Type	Miles under Maint.	Date Completed	Total	General Maintenance				Improvement				Reconstruction			
										Pavement Base	Pavement Surface	Diesel-Isoseal	Total	Pavement Base	Pavement Surface	Diesel-Isoseal	Total	Pavement Base	Pavement Surface	Diesel-Isoseal	Total
1	Mendocino	1	A	Southerly Boundary	Cahtersville	rc	10.19	11-34-14	67,670.40		5,972.21	33,442.53	39,414.74		10,566.45	17,389.21	28,255.66					
	"	1	B	Cahtersville	Miranda	rc	15.61	9-23-19	80,715.19	70.21	8,361.64	50,577.93	59,009.78		16,341.56	352.65	16,694.11			4,411.30	4,411.30	
	"	1	C	Miranda	Dyerville	rc	13.77	9-16-18	91,991.88		39,163.53	26,598.71	65,762.24		17,113.69	9,115.93	26,229.62					
						b	.16	11-1-17														
	"	1	D	Dyerville	Jordan Creek	rc	11.19	8-24-15	73,638.30		26,034.47	15,939.94	41,974.41		22,662.07	14,221.58	37,083.65			560.24	560.24	
	"	1	E	Jordan Creek	Rio Dell	rc	2.14	9-11-16	109,975.74	7.48	25,315.32	30,141.76	55,464.56		21,901.60	12,388.43	34,290.03		1,858.79	6,453.36	10,762.15	
						b	.43	1-23-17														
						c	4.74	4- 5-22														
	"	1	F	Rio Dell	Fortuna	c	7.87	4- 5-22	75,840.85		7,121.01	2,831.98	9,952.99		14,819.69	1,068.17	15,887.86					
	"	1	G	Fortuna	Eureka	e	4.32	1-23-17	84,408.33	14,296.92	1,578.38	17,821.44	33,693.74	37,323.41	955.59	12,585.69	50,864.69					
						e	7.97	12- 1-21														
						b	.13	7-31-20														
	"	1	H	Eureka	Arcata	rc	6.19	6- 1-20	77.08		11.14	65.94	77.08									
	"	1	I	Arcata	Trinidad	rc	15.6	"	225.90		225.90		225.90									
	"	1	J	Trinidad	Orick	rc	7.8	6- 1-20	12,461.66	900.20	2,886.83		3,161.03		12,300.63		12,300.63					
111	Imperial	12	A	Westerly Boundary	Coyote Wells	c	9.02	6- 7-15	13,761.38	4,772.85	1,625.50	3,564.11	9,962.47			469.58	469.58	1,113.46	926.32	1,699.55	3,739.33	
	"	12	B	Coyote Wells	Ocotillo	c	11.735	2-11-16	17,094.62	7,685.29	2,149.16	3,092.85	12,926.30					2,691.92	762.11	1,532.29	4,986.42	
	"	12	C	Ocotillo	El Centro	c	10.003	2-20-17	51,952.43	8,980.11	3,401.02	10,297.74	22,638.87			27,692.79	27,692.79	4.77		1,616.00	1,620.77	
	"	26	B	Trifolium Canal	Kane Springs	c	6.989	7- -16	34,324.31	3,396.82	598.36	1,332.14	5,327.32	77,154.07	27.49	1,665.26	78,846.82	16,334.17			16,334.17	
	"	26	C	Kane Springs	Tule Ranch	c	11.077	6-15-20	4,706.01	1,103.79	1,302.51	1,871.77	4,278.01									
	"	26	D	Tule Ranch	Gravel Wash	c	6.591	6- 1-21	2,628.32	1,112.55	109.35	1,406.42	2,628.32									
	"	26	E	Gravel Wash	Northerly Boundary	e	8.333	6- 1-21	2,565.55	1,621.85	133.64	1,409.86	2,565.55									
	"	26	F	El Centro	Imperial	c	1.99	"	230.01	67.74		162.27	230.01									
	"	27	A	E. High Line Canal	County Jail	w	0.928	5- 1-20	1,113.35	11.14	1,093.29	8.92	1,113.35									
	"	27	B	County Well	Yuma	p	5.362	6- -17	122,053.50	334.36	30,942.99	2,951.86	37,229.21	66,354.99	18,469.30		84,824.29					
						mm	1.186	6- -17														
						b	0.032	"														
VI	Inyo	23	A	Independence	Division Creek	s	10.309	6- -20	1,851.89		1,850.86	1.03	1,851.89									
	"	23	B	Division Creek	Fish Springs School	c	8.012	4- -20	2,364.81	337.48	1,025.71	938.94	2,298.13		90.68		92.68					
						s	2.478	4- -20														
	"	23	B	End Standard Parallel So.	Bishop	c	11.66	"	1.80						1.80		1.80					
	"	23	E	Bishop	Round Valley Road	ss	8.37	"	57.46		57.46		57.46									
	"	23	F	Round Valley Road	Northerly Boundary	rc	5.84	4-10-20	6,067.28	129.04	5,729.89	208.15	6,067.28									
VI	Kern	4	A	Southerly Boundary	Grapevine Creek	c	10.739	5- 1-21	60,475.80	979.52	8,478.64	38,156.53	47,614.69	7.72	1,693.81	9,316.73	11,018.26		25.81	1,617.04	1,642.85	
	"	4	B	Grapevine Creek	Sec.5 & 6 T 32.S.R	c	17.291	5-12-16	412,674.79	65,066.46	4,540.58	60,872.13	130,479.17	121,639.65	137,434.65	70,895.58	279,360.28	2,231.65	3.69		2,235.34	
	"	4	C	Sec.5 & 6 T 32.S.R	Bakersfield	oc	12.385	8- 7-18	83,717.22	31,021.07	6,993.98	14,696.29	52,691.34		1,156.95	11.28	1,168.15	15,421.59	1,111.72	314.42	16,697.73	
						c	0.571	5- 1-21														
	"	4	D	Bakersfield	Lerdo	oc	10.177	12-23-14	20,349.56	4,658.53	2,273.89	4,365.10	11,297.52	1,128.22	874.50	6,778.56	8,771.32			738.62	738.62	
						te	1.611	8-16-18														
	"	4	E	Lerdo	Fenaco	oc	9.008	4-30-15	7,378.55	3,164.56	1,540.57	2,594.63	7,299.46	29.09			29.09					
	"	4	F	Fenaco	Northerly Boundary	oc	12.456	3- 2-15	47,848.50	9,218.67	5,105.83	6,594.97	20,919.47		488.67	2,405.79	2,894.46	18,149.50	4,954.02	931.05	24,034.57	
VI	Kings	10	A	Hanford	Easterly Boundary	oc	9.027	4-16-16	36,079.03	9,986.62	3,988.04	5,742.30	23,713.96	400.94	10,835.28		11,236.22	2,098.85			2,098.85	
	"	10	B	Easterly Boundary	1 Mi. N. of Lemoore	c	10.401	1-1 -21	509.09	248.18	8.76	252.85	509.09									
1	Lake	16	A	Westerly Boundary	Lakeport	rc	9.36	10- 1-20	29,960.80		1,660.14	13,936.44	15,596.58		13,364.22		13,364.22					

MOTOR VEHICLE FUND EXPENDITURES.

										General Maintenance				Improvement				Reconstruction			
Dist.	County	Rte	Sec	From	To	Type	Miles under Maint.	Date Completed	Total	Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total
VII	Lassen	28	A	Westerly Boundary	Bieber	e	15.8	"	10,034.30		7,338.65	2,695.65	10,034.30								
	"	29	B	Cooperville	Susanville	e	15.068	"	30,468.07		2,705.21	600.34	3,305.54			27,162.53	27,162.53				
	"	29	C	Susanville	Johnstonville	e	4.577	"	1,514.34		1,456.47	57.77	1,514.24								
VII	Los Angeles	2	A	County Highway Rte 3	Rancho El Encino	te	7.899	9-29-20	86,904.71	5,599.88	6,506.79	5,114.44	17,580.93			24,764.05	24,764.05	45,059.73			45,059.73
						c	2.669	9- 1-21													
	"	2	B	Rancho El Encino	Calabasas	c	8.377	"	353,347.28	17,799.15	16,732.03	10,225.19	34,756.37	96.94		4,534.85	4,629.79	309,961.12	47.64	353.79	309,961.12
						sc	1.089	10-20-24													
	"	2	C	Calabasas	Westerly Boundary	oc	9.984	1- -25	134,248.15	5,483.69	71,974.75	11,994.32	42,452.81	545.66	286.85	6,892.95	7,725.46	83,742.06	889.63	71.98	84,683.67
						c	1.295	4- 1-25													
	"	2	D	Los Angeles City Limit	Westerly Boundary	os	14.126	"	137,304.55	1,356.01	41,557.65	12,340.51	55,256.97	4,110.33		36,640.85	45,753.18	5,941.42		30,304.68	36,696.40
	"	4	A	Saugus	Castaic School	c	7.613	4-23-26	18,969.88	1,845.79	5,214.90	5,573.69	13,165.78	4,634.90	190.99	1,451.01	5,339.60				
						sc	1.00	6- -26													
	"	4	B	Castaic School	S 17,T6N,R17W,S.B.B&M	c	10.097	2-10-19	100,099.80	20,527.46	14,079.40	27,305.36	47,932.36	52,932.70		7,944.44	55,877.14	47.46	240.64		288.10
						sc	2.745	6- -26													
	"	4	C	Forest Reserve Corner	Saddle W. of Liebre Mt.	c	14.519	11 -18	146,431.22	3,779.65	22,156.94	40,079.00	66,015.59	38,665.27	26,672.36	4,035.56	69,373.19	154.93	967.41		1,122.34
	"	4	D	Saddle W. of Liebre Mt.	Northerly Boundary	c	7.185	11-23-25	76,570.00	1,644.18	11,952.14	21,300.13	34,896.45	331.36	98.17	1,021.76	1,451.29	35,041.16	1,720.18	997.54	38,453.68
						oc	10.429	11-23-25													
	"	4	E	Los Angeles	Saugus	os	9.44	"	13,784.79	7,930.08	5,151.31		13,081.39			102.97	102.97				
	"	9	A	San Fernando	La Canada	c	14.918	10- -18	12,647.00	1,201.31	2,240.70	7,291.49	10,733.50	147.29		879.45	1,026.74	923.09	22.19	68.38	980.66
	"	9	C	County Highway	Claremont	oc	181	10- -15	2802.34	17.45	60	375.02	792.24								
	"	9	D	Claremont	Easterly Boundary	oc	.435	10- -15	918.86	1.04	85.76	875.92	962.62			13.13	13.13				
	"	9	E	Pasadena	Arcadia	os	5.33	"	9,615.43	3,097.89	4,466.43	1,057.11	9,619.43								
	"	9	G	Monrovia	Azusa	os	4.146	"	29,981.26	999.10	3,284.81	10,558.10	15,492.04					39.57		14,449.60	14,489.17
	"	9	H	Azusa	Glendora	os	1.674		478.18	1.80	251.71	216.66	478.18								
	"	9	I	Glendora	Lordsburg	os	5.412		4,636.19	1,294.20	1,684.20	1,657.87	4,636.27								
	"	9	J	Lordsburg	End of County Highway	os	2.724		2,286.77	396.11	1,281.20	819.46	2,096.77								
	"	19	A	Foothill Boulevard	Pomona	os	2.659		99.74		60.47	39.27	99.74								
	"	23	A	Saugus	Santa Clara River	oc	4.848		5,349.80	971.05	1,528.70	2,811.19	5,309.74		40.09		40.09				
	"	23	B	Santa Clara River	William's Ranch	c	1.906	2-26-20	1,184.91	61.25	479.68	619.20	1,160.13		24.74		24.74				
	"	23	C	William's Ranch	Seeley's Ranch	oc	8.419	"	3,814.30	380.04	2,391.21	1,103.10	3,874.34								
	"	23	D	Seeley's Ranch	2 Mi. N. of Acton	o	10.598	8- -26	5,847.97	380.40	1,564.05	3,947.52	5,847.97								
	"	23	E	2 Mi N. of Acton	Palmdale	c	11.853	5- -23	4864.20	103.44	169.73	503.05	976.22								
VI	Madera	4	A	Southerly Boundary	Madera	oc	10.037	12- -23	18,668.78	2,649.50	5,911.75	8,229.63	16,790.88	1,114.12	501.61	1,096.81	2,712.54				
	"	4	B	Madera	Colfax	om	9.994	10-29-23	14,465.84	2,922.41	7,385.82	4,516.89	14,825.12	1,907.62	1,549.28	163.82	3,620.72				
	"	4	C	Colfax	Northerly Boundary	oc	7.171	11-24-24	19,263.74	5,057.25	7,297.94	4,193.81	16,548.90	900.58	348.01	522.44	1,631.03	53.75			53.75
VI	Merlin	1	A	Northerly Boundary	San Rafael	c	15.97	12-15-19	38,800.07	9,684.03	7,194.70	11,926.49	28,805.22	1,007.62	1,549.28	4,367.35	6,924.25	3,255.51			3,255.51
		1	B	San Rafael	Sausalito	c	6.95	9-26-19	41,151.22	12,175.68	12,915.42	10,163.78	35,254.88	64.09	3,245.84	974.72	4,284.65	1,970.64	646.54	4.84	2,622.02
	"	5	A	Ignacio	Petaluma Creek	sc	2.61	5-24-29	13,093.20	10.94	4,253.85	18,824.92	23,089.71			37.84	37.84				
VI	Mariposa	18	A	Westerly Boundary	Cathay-White Rock Road	o	10.661	1- -27	14,802.79	40.84	4,823.53	7,837.00	12,701.37			101.42	101.42				
	"	18	B	Cathay-White Rock Road	Agua Fria Creek	s	7.829	3-24-28	9,726.65	15.06	3,146.82	4,543.05	7,724.93								
	"	18	C	Agua Fria Creek	Mariposa	s	6.825	7- 6-28	5,510.59	5.02	3,003.66	2,501.92	5,510.59								
	"	18	H	El Portal	Yosemite National Park	s	1.276	6- -29	2,419.94		1,426.74	954.05	2,380.79		39.38		39.38				
III	"	40	A	Truckmans Cabins East	Truckmans Cabins West	s	2.2		14.02		14.02		14.02								
I	Mendocino	1	A	Southerly Boundary	Hopland	p	12.94	6-21-23	58,653.26	24.12	25,729.53	18,197.93	44,158.63		6,710.46	7,784.19	14,494.59				

MOTOR VEHICLE FUND EXPENDITURES.

Dist.	County	Rte	Sec	From	To	Type	Miles under Maint.	Date Completed	Total	General Maintenance				Improvement				Reconstruction			
										Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total
1	Mendocino	1	B	Hopland	Ukiah	c	7.52	11- 8-15	47,222.63	496.70	25,105.61	11,790.74	37,393.05		6,894.72	2,604.98	9,499.70		529.68		529.68
						oc	4.06	11- 8-15													
	"	1	C	Ukiah	Forsythe Creek	oa	7.73	6-23-14	53,742.27	4,805.37	37,864.60	8,732.60	51,402.57	24.95	1,460.06		1,485.03	430.12	424.55		854.67
	"	1	D	Forsythe Creek	Ridgewood	c	7.85	4- -15	31,782.26	143.71	9,713.34	15,485.22	24,342.27		2,630.47	4,219.52	6,849.99				
	"	1	E	Ridgewood	Willits	c	6.83	1-21-14	68,085.60		18,840.99	22,297.02	41,138.01		20,433.92	6,530.67	26,964.59				
	"	1	F	Willits	Arcata	c	8.32	12-10-18	42,439.75		6,615.94	15,305.29	21,921.23		20,491.14	27.38	20,518.52				
	"	1	G	Arcata	Long Valley	c	10.19	4- -20	38,687.68		3,566.30	17,074.07	20,640.37		8,027.31		8,027.31				
	"	1	H	Long Valley	Rattlesnake Summit	c	13.77	4- -20	18,921.95		3,996.87	12,726.61	16,723.48		2,198.47		2,198.47				
	"	1	I	Rattlesnake Summit	Leggett Valley	"	17.33	"	21,824.15		3,779.53	14,924.66	18,704.19		3,119.96		3,119.96				
	"	1	J	Leggett Valley	Bridges Creek	"	8.56	"	11,115.63		1,079.03	8,764.68	9,843.71		1,271.92		1,271.92				
	"	1	K	Bridges Creek	Northerly Boundary	"	11.22	"	20,923.52		2,668.52	19,723.77	22,412.29		8,511.13		8,511.13				
	"	16	A	Hopland	Easterly Boundary	g	9.74	7- -20	24,361.07		3,448.63	11,669.64	15,118.27		9,232.13		9,232.13		10.67		10.67
VI	Merced	4	A	Southerly Boundary	Merced	oc	14.364	8-10-15	29,405.61	15,034.60	4,335.15	4,156.77	23,526.52		28.64	1,843.53	1,872.17	1,751.69	56.13		1,807.82
	"	4	C	Merced	Arena	oc	9.867	11-24-14	78,526.01	17,177.28	4,574.44	9,210.55	30,962.27	17,846.65	279.28	6,668.81	24,814.44	22,745.05	4.25		22,749.30
						c	1.050	10- -21													
	"	4	D	Arena	Northerly Boundary	oc	9.980	3-25-14	136,618.37	17,042.66	2,652.58	4,789.63	24,714.87	43,467.36	57,870.74	4,683.19	111,423.31	480.19			480.19
	"	18	A	Merced	Easterly Boundary	c	14.910	6- -21	2,162.57	674.95	43.67	604.14	1,322.76			439.81	439.81				
II	Modoc	28	A	Adin Summit	Canby	c	10.930	"	5,929.04		2,341.01		2,341.01			3,588.03	3,588.03				
	"	28	B	Canby	Alturas	c	17.111	"	3,412.97		2,580.63		2,580.63			832.34	832.34				
	"	28	C	Alturas	Nevada State Line	e	8.00	"	786.28		786.28		786.28								
VI	Modoc	13	A	Seneca Pass	Blackburn Jct.	e	15.00		1,493.83		485.57	1,008.26	1,493.83								
	"	23	A	Southerly Boundary	Sherman Hill	oe	5.781	12-23-17	9,746.55		1,065.15	1,590.44	2,655.59	16.52	7,074.44		7,090.96				
	"	23	B	Sherman Hill	Whiskey Canyon	oe	4.176	1- -17	3,916.71		1,165.27	2,351.44	3,516.71								
	"	23	C	Whiskey Canyon	McCoy Creek	e	8.018	"	2,661.61	86.58	2,113.60	461.43	2,661.61								
	"	23	D	McCoy Creek	Cane Ducbio	e	8.61	"	615.46		247.14	368.32	615.46								
	"	23	E	Cane Ducbio	Deadman Creek	e	9.26	12- -18	2.34		2.34		2.34								
	"	23	F	Deadman Creek	Devil's Punch Bowl	e	5.834	"	2,350.20		923.87	1,426.33	2,350.20								
	"	23	G	Devil's Punch Bowl	Tioga Pass Jct	e	11.00	" -21	1,777.62	13.60	1,553.87	210.15	1,777.62								
	"	23	J	Bridgeport	Sonora Jct. Rte 13	e	18.50	"	10,661.34	1.58	4,135.68	5,523.88	10,661.34								
	"	23	K	Sonora Jct. Rte 13	Antelope Valley	e	17.0	"	7,720.42		3,523.78	4,181.46	7,705.24			28.34	28.34				
	"	40	A	Tioga Pass	10.3 mi. East	e	10.3	"	23,312.68	304.58	4,208.21	17,617.10	18,129.89	1,678.11	3,561.66	3.02	5,182.79				
	"	40	B	10.3 mi E Tioga Pass	Junction Rte 23	s	3.7	"	8.51			8.51	8.51								
V	Monterey	2	A	N. Easterly Boundary	Salinas	oa	1.246	"	24,131.82	6,315.03	4,315.57	9,077.69	20,308.29	51.01	2,474.67	1,300.85	3,825.53				
						oc	3.10	11- 9-15													
						c	6.104	4-29-16													
	"	2	B	Salinas	Chualar	oc	10.385	2-23-16	25,812.66	2,379.07	4,353.04	5,566.79	12,374.90		223.84	13,263.92	13,487.76				
	"	2	C	Chualar	Camphora	c	10.364	7-19-18	7,879.32	4,345.91	561.76	2,971.63	7,879.30								
	"	2	D	Camphora	Greenfield	c	7.042	12-19-16	18,328.77	2,784.59	1,451.05	10,351.19	14,586.83	2,132.86	351.11	1,257.97	3,741.94				
	"	2	E	Greenfield	King City	c	10.498	6- 7-16	11,300.42	4,154.93	2,105.57	5,039.92	11,300.42								
	"	2	F	King City	San Lucas	c	8.061	12-10-18	8,365.04	1,543.96	1,579.31	2,643.42	5,166.69		2,715.38	483.07	3,198.35				
						g	1.023	10- -20													
	"	2	G	San Lucas	Sea Arch	e	11.648	2-26-20	9,250.82	1,774.99	300.99	7,170.21	9,246.19			6.63	6.63				
	"	2	H	Sea Arch	3 mi. N Bradley	e	11.257	9-20-16	16,210.12	2,789.54	276.95	13,143.63	16,210.12								
	"	2	I	3 mi N. Bradley	Southerly Boundary	e	10.431	6-13-19	7,651.91	1,648.72	800.91	4,467.60	6,917.23	93.04	19.48	22.16	134.68				

MOTOR VEHICLE FUND EXPENDITURES.

Dist.	County	Rte.	Sec.	From	To	Type	Miles under Maint.	Date Completed	Total	General Maintenance				Improvement				Reconstruction			
										Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total
IV	Kern	8	A	Easterly Boundary	Kern	oc	4.23	11-10-15	30,853.91	10,177.76	4,730.15	27,679.03									
	"					c	2.56	11- 1-19													
	"	8	B	Kern	Easterly Boundary	c	8.63	8-26-19	25,692.02	3,056.17	4,681.59	6,804.26	25,692.02								
III	Nevada	17	A	Southerly Boundary	Rattlesnake Creek	a	9.115	12- 1-18	13,316.48	708.44	4,431.03	8,177.01	13,316.48								
	"	17	B	Rattlesnake Creek	Nevada City	a	7.965	"	8,391.57	897.31	3,149.65	4,344.61	8,391.57								
	"					c	[illegible]	12- -19													
II	"	25	A	Nevada City	Northerly Boundary	a	[illegible]	"	4,689.05		4,478.80	210.25	4,689.05		74.61	38.79	113.40				
III	"	37	A	Southerly Boundary	3 m. S. of Cisco	a	4.1	"	3,004.92	203.06	1,387.02	1,414.84	3,004.92								
	"	37	B	3 Mile S.m.E. Cisco	Summit Valley	a	8.1	"	5,865.28	45.95	2,884.71	2,934.62	5,865.28								
	"	37	C	Summit	N. Side Donner Lake	a	4.1	"	4,735.14		2,253.00	2,482.14	4,735.14								
	"	37	D	W. Side Donner Lake	Truckee	a	5.1	"	4,361.71		1,387.61	2,611.74	4,361.71								
	"	37	E	Truckee	Sierra County Line	a	10.1	"	4,469.09		2,737.41	1,931.68	4,669.09								
	"	38	A	Southerly Boundary	Route 4, Truckee	a	6.8	"	472.12		70.35	399.77	472.12								
VII	Orange	2	A	Southerly Boundary	Colwell	oc	15.11	11- 9-15	70,979.25	3,867.22	14,203.83	52,908.20	70,979.25	9,108.47	1,779.46	6,934.65	14,242.58	13.25	14.56	2,754.97	2,781.79
	"	2	B	Colwell	Irvine	oc	5.682	11- 9-15	23,238.92	490.50	4,554.26	18,194.16	23,238.92			4,673.74	4,673.74		56.76	5,629.76	5,686.52
						to	7.644	" -20													
	"	2	C	Irvine	Santa Ana	oc	7.336	8- -15	45,719.63	2,749.44	11,777.98	17,426.28	32,453.70	489.64	60.43	18,704.34	19,254.41		14.55		14.55
	"	2	D	Santa Ana	Anaheim	tc	4.897	11-13-14	24,144.89	8.97	3,396.45	4,577.89	7,983.41	476.64	209.12	15,462.39	16,148.35	13.13			13.13
	"	2	E	Anaheim	Fullerton	tc	1.508	1- 2-14	6,847.97		1,364.76	1,696.41	3,045.57	77.86	49.71	3,786.13	3,913.70				
	"	2	F	Fullerton	Northerly Boundary	oc	4.754	3-20-15	152,075.43	317.45	6,199.23	6,845.69	13,362.37	16.00		2,649.38	2,665.40	148,646.66			148,646.66
III	Placer	3	A	Southerly Boundary	Lincoln	oc	10.17	6-23-15	17,984.35	4,543.30	6,208.89	7,289.07	17,021.26						957.00		957.00
	"	3	B	Lincoln	Northerly Boundary	c	9.419	12-13-16	24,645.72	2,586.14	1,089.86	7,051.73	7,733.67			15,748.71	15,748.71	.58		182.76	183.34
	"	17	A	Newcastle	Auburn	c	8.571	6- 6-13	7,417.90	1,246.00	919.42	5,007.48	7,412.90								
	"	17	B	Penryn	Auburn	c	3.475	7- 6-17	8,641.03	1,896.55	585.84	7,008.64	9,541.03								
	"	17	C	Auburn	Northerly Boundary	a	6.687	"	3,530.57	95.00	2,638.21	795.56	3,530.57								
	"	37	A	Auburn	Applegate	a	7.90	"	24,264.31	419.22	2,915.08	19,708.39	23,042.69		2.31	149.31	151.62				
	"	37	B	Applegate	Colfax	a	9.131	"	12,067.52	9.76	5,343.22	6,534.54	12,087.52								
	"	37	C	Colfax	Gold Run	a	7.48	"	15,823.04	12.99	6,955.14	8,646.38	15,614.46		5.33	3.23	8.56				
	"	37	D	Gold Run	R R Crossing E of Towle	a	2.6	"	11,516.03	11.55	5,510.03	5,994.01	11,515.59		1.44		1.44				
	"	37	E	R R Crossing E of Towle	Emigrant Gap	a	6.8	"	12,300.98	8.16	6,986.49	5,307.31	12,300.98								
	"	37	F	Emigrant Gap	Northerly Boundary	a	3.5	"	5,002.55	4.22	3,044.13	1,954.21	5,002.55								
	"	37	G	1 mi. W. of Cisco	3 mi. E. of Cisco	a	3.5	"	4,451.71	4.02	1,915.37	2,532.12	4,451.71								
	"	37	H	N. Boundary Summit Valley	N. Boundary of Summit	a	3.6	"	3,022.09	3.41	977.99	2,040.69	3,022.09								
	"	38	A	S. Boundary (McKinney)	Tahoe City	a	8.8	"	7,830.70	8.10	2,813.75	5,012.55	7,830.40								
	"	38	B	Tahoe City	Truckee River Bridge	a	5.3	"	6,975.05		2,967.15	3,199.80	6,966.95			8.09	8.09				
	"	38	C	Truckee River Bridge	Northerly Boundary	a	8.2	"	5,884.84		2,228.39	3,656.45	5,884.84								
	"	39	A	Tahoe City	Crystal Bay	a	11.59	"	30,900.07	42.97	1,849.98	1,415.68	3,308.63	187.10	12,506.32	17,905.63	30,599.24				
VII	Riverside	19	A	Westerly Boundary	Riverside	oc	9.336	12-12-14	17,334.15	764.39	9,869.17	7,700.65	17,334.15								
						oa	.999	"													
	"	26	A	Northerly Boundary	Beaumont	c	6.809	10- -20	8,432.57	580.87	3,544.05	4,314.60	8,439.52			5.96	5.96	270.36	22.51	96.02	388.89
	"	26	B	Beaumont	Banning	oc	2.04	"	76.96	4.01		16.95	20.96								
	"	26	E	Edom	Indio	c	0.767	8- -19	893.98	366.38		178.34	544.72			4.50	4.50			543.76	543.76
	"	26	F	Indio	N.E.Cor.S.6 T7S,R8E,S3B	c	8.552	5- -19	10,834.77	1,345.02	435.92	861.56	2,642.50			8,890.54	8,890.54			7,297.63	7,297.63
	"	26	G	N.E.Cor.Sec.6 T7S,R8E	Southerly Boundary	c	14.334	7- -21	7,447.80	906.79	907.89	816.01	2,632.69						10.91		10.91

MOTOR VEHICLE FUND EXPENDITURES.

Div.	County	Rte.	Sec	From	To	Type	Miles Under Maint.	Date Completed	Total	General Maintenance				Improvement				Reconstruction			
										Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total
III	Sacramento	3	A	Auburn Road	Northerly Boundary	oc	1.859	2-26-14	4,905.27	199.10	1,042.85	1,344.77	2,586.72					208.69	1,309.96		1,518.65
	"	3	B	Sacramento City Limits	Sylvan School	oc	3.46	"	145,125.88	13,955.88	15,749.43	24,461.66	53,667.21	35,946.40	5,161.80	990.06	42,098.28	40,186.32	8,606.62	567.39	49,360.33
						cm	8.32	"													
						pt	.531														
	"	4	A	Southerly Boundary	McConnell Station	oc	7.302	"	53,580.47	3,337.34	9,587.06	8,446.36	21,370.76	2,945.59	1,498.96	27,768.16	32,212.71				
	"	4	B	McConnell Station	Sacramento	oc	13.995	"	78,798.33	21,223.42	40,917.76	15,755.91	77,897.09	276.24	995.55	29.45	901.24				
	"	11	A	Easterly Boundary	Folsom	oc	5.630	11- 9-15	3,527.58	98.05	1,444.67	2,057.77	3,579.69								
	"	11	B	Folsom	Sacramento	ua	17.302	"	80,659.07	21,995.44	20,615.35	10,964.12	53,574.91			.36	.36	21,964.24	3,550.89	1,758.57	27,083.70
						c	.271	5-20-18													
	"	34	A	Clay	Easterly Boundary	s	8.473	"	32.58		32.18	.40	32.58								
	"	53	A	Westerly Boundary	Isleton	c	6.1	:	5,760.91	54.91	1,050.46	4,655.54	5,760.91								
	"	53	B	Isleton	Easterly Boundary	oa	9.6	:	13,727.07		4,551.38	9,175.69	13,727.07								
V	San Benito	2	A	Northerly Boundary	S.Westerly Boundary	c	4.452	4- 1-16	45,883.27	10,174.30	5,999.64	12,731.28	28,905.22	1,419.32	1,975.32	12,074.61	15,469.25		1,308.80		1,308.80
						oc	6.001	6- -16													
	"	22	A	San Juan Bautista	Hollister	cm	7.09	"	63,997.97	6,861.64	7,009.54	4,025.95	17,897.13	14,159.03	21,698.03	10,243.78	46,100.84				
	"	67	A	Rte 2 near San Juan	Pajaro River	s	3.089	"	368.35			129.05	129.05			239.30	239.30				
VII	San Bernardino	9	A	Upland	Citrus Avenue	oc	10.355	3-23-15	16,936.38	699.22	6,718.16	9,479.78	16,897.16	8.93	60.29		69.22				
	"	9	B	Citrus Avenue	Rialto	oc	4.020	8-11-14	5,177.64	251.90	3,757.66	1,168.08	5,177.64								
	"	9	C	Rialto	San Bernardino	oc	1.677	8-11-14	6,975.33	725.34	1,814.37	2,869.95	4,679.66	334.19	472.71	1,538.77	2,345.67				
	"	9	D	Westerly Boundary	Upland	oc	1.686	11-24-14	3,951.94	827.04	903.07	1,903.97	3,634.08			327.86	327.86				
						c	0.539	5- -18													
	"	19	A	Westerly Boundary	Ontario	tc	2.127	6-23-14	23,396.03	1,166.10	2,955.69	2,444.66	6,566.45	322.20	14,474.58	2,032.60	16,829.38				
	"	19	B	Ontario	Southerly Boundary	oc	4.482	6-23-14	14,556.22	410.30	9,710.96	3,500.96	13,622.22						922.04	11.96	934.00
	"	26	A	San Bernardino	Redlands	c	7.23	"	39.91	27.37	12.54		39.91								
	"	26	B	Redlands	Southerly Boundary	c	.288	10- 5-20	826.90	98.36	181.99	546.55	826.90								
	"	31	A	San Bernardino	Devore	cm	0.901	"	2,395.05	92.60	348.04	1,888.84	2,329.48								
						c	7.771	"													
	"	31	B	Devore	Summit	cm	15.167	"	18,541.10	137.94	4,391.93	13,500.70	18,030.57					172.26	338.27	510.53	
	"	43		Waterman Canyon	Big Bear Lake	s	49.2	"	64,717.48	222.38	36,577.64	27,917.06	64,717.48								
VII	San Diego	2	A	N.City Limits San Diego	"C" St. Encinitas	oc	8.41	9-22-13	41,227.89	2,350.09	5,466.79	12,693.81	20,510.69	1,589.52	30.09	18,992.82	20,602.43	.73	108.04		108.77
	"	2	B	"C" St. Encinitas	S.City Limits Oceanside	oc	10.730	7-21-14	43,289.14	4,165.86	4,953.69	14,006.76	23,146.33	6,043.08	84.25	7,587.04	13,714.34	56.51		6,169.96	6,226.47
						c	1.410	8- -19													
	"	2	C	N. City Limits Oceanside	1 Mi.N.Las Flores Sta.	oc	9.03	8-11-14	106,478.88	2,364.09	4,234.43	19,003.50	25,602.02	5,611.59			5,611.59	5,346.01		69,889.26	75,235.27
	"	2	D	1 Mi.N.Las Flores Sta.	Northerly Boundary	oc	11.136	7-20-15	19,811.46	2,144.36	4,233.34	11,311.02	17,688.72	1,464.88		717.48	2,182.00	.74			.74
	"	12	A	San Diego	E. Boundary La Mesa	oc	1.965	11-24-14	18,941.06	5,646.25	2,780.38	10,514.46	18,941.06								
						c	4.150	8-26-18													
	"	12	B	La Mesa	E. Boundary El Cajon	oc	1.557	2- -15	6,941.86	1,694.94	1,421.06	3,825.86	6,941.86								
						c	.411	8- -18													
	"	12	C	El Cajon	Alpine	c	13.904	9- -21	18,810.62	1,559.79	2,532.67	14,218.69	18,311.21			35.55	35.55			463.86	463.86
	"	12	D	Alpine	Pine Valley	c	4.619	9- -21	29,706.56	390.06	5,983.69	23,667.06	27,260.81							2,445.75	2,445.75
						s	12.208	8-19-18													
	"	12	E	Pine Valley	Cosbere Ranch	s	6.628	4- -21	3,503.73	47.68	2,481.36	974.69	3,503.73								
	"	12	F	Cosbere Ranch	Tecate Divide	s	13.575	3- -21	6,146.24	230.00	389.67	5,566.57	6,146.24								
	"	12	G	Tecate Divide	Easterly Boundary	s	15.201	2- -21	5,447.10	1,286.49	710.71	3,449.90	5,447.10								

MOTOR VEHICLE FUND EXPENDITURES.

Dist.	County	Rte	Sec	From	To	Type	Miles under Maint.	Date Completed	General Maintenance				Improvement				Reconstruction			
									Total	Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total
VII	San Diego Imperial	12	M	County Boundary	Ten Ll...rinare Grade	c	.981	3- -21	34.38			34.48	34.48								
III	San Joaquin	4	A	Southerly Boundary	Manteca	cm	4.511	"	31,899.49	6,386.51	4,636.15	[illegible]437.41	29,460.07	900.59		1,816.05	2,416.62		22.80		22.80
						c	2.071	6- -21													
						b	0.2	"													
	"	4	B	Manteca	Stockton	cm	[illegible]8.495	"	54,565.66	48,436.53	11,187.37	4,121.42	63,745.12	38.82		1.98	37.80	98.52	255.39	498.93	782.74
						o	.60	4-17-20													
	"	4	C	Stockton	Houston School	cm	11.811	"	52,476.44	16,187.90	10,895.92	8,340.95	35,999.17			1.84	4,555.08	4,555.92	390.79	220.36	11,209.[illegible]	11,820.35
	"	4	D	Houston School	Northerly Boundary	c	2.315	12- -21	6,532.[illegible]	1,565.[illegible]	907.57	2,040.17	4,513.74	7.63	1[illegible].13	1,760.22	1,900.38	119.04			119.04
						c	1.402	6- 5-20													
						on	.530	"													
	"	5	A	Westerly Boundary	Banta	oc	8.077	"	69,811.77	8[illegible].299.[illegible]	7,404.32	7,[illegible]1.46	35,935.38	11,908.21	20,827.18	1,698.94	33,854.33		22.06		22.06
						tm	.682	11- -21													
	"	5	B	Banta	French [illegible]	on	9.364	"	70,197.95	17,709.76	7,[illegible]4.71	21,411.35	46,340.47	1.95	.58	4,182.37	4,184.[illegible]		197.15	19,415.48	19,612.63
						c	2.499	6- -[illegible]													
	"	53	A	Westerly Boundary	Thornton	on	4.9	"	7,143.62	410.79	276.45	6,387.83	7,077.07							66.55	66.55
	"	53	B	Thornton	Lodi	on	13.4	"	1,112.17		[illegible].38	1,033.99	1,112.37								
	"	66	A	Manteca	Modesto School	on	4.	"	1,700.93	1,572.68		128.25	1,700.93								
V	San Luis Obispo	2	A	Northerly Boundary	Paso Robles	oc	5.038	7- -15	9,931.10	1,986.73	1,026.53	6,912.44	9,925.70			5.40	5.40				
						c	3.609	8-24-15													
	"	2	B	Paso Robles	Atascadero Creek	c	10.045	8-24-16	12,142.89	2,754.71	1,387.46	7,995.32	12,137.49			5.40	5.40				
	"	2	C	Atascadero Creek	Santa Margarita	oc	8.395	8- 9-15	12,672.36	2,629.95	2,360.81	7,681.60	12,671.36								
	"	2	D	Santa Margarita	San Luis Obispo	oc	6.392	4- -15	66,625.45	4,775.78	10,855.95	18,342.82	33,974.05	2,092.76	1,167.69	29,398.55	32,659.00		292.40		292.40
						oe	3.629	8- -15													
	"	2	E	San Luis Obispo	Arroyo Grande	oc	17.812	6-22-15	38,947.51	7,741.08	6,786.73	16,254.54	30,782.35	1,873.04	784.89	6,448.23	9,566.16				
						on	.642	6-22-15													
	"	2	F	Arroyo Grande	Southerly Boundry	oc	3.764	8-13-19	29,802.93	3,[illegible]1.32	1,526.30	5,277.16	10,714.78	984.70	9,798.20	8,305.65	19,088.15				
						c	8.703	8-13-19													
	"	33	A	Paso Robles	Estrella River	c	11.565	"	259.34	7.62	188.56	33.16	229.34								
	"	33	C	1 Mi.S.Shandon Turn Sta.	Westerly Boundary	s	6.934	12- -19	604.76	97.49	101.30	368.07	567.36	34.05		6.85	40.90				
IV	San Mateo	2	A	Northerly Boundary	San Mateo	to	10.68	4-22-14	120,361.41	7,562.36	15,749.57	28,737.11	48,349.05		450.67	6,440.60	6,891.27	482.16	64,638.92		65,121.08
	"	2	B	San Mateo	Southerly Boundary	tm	5.20	3-20-14	75,271.30	7,792.48	6,826.67	14,996.78	29,609.43	193.98	31.56	23,941.47	24,166.03	16,132.23	1,220.90	112.71	17,465.84
						e	4.26	10-20-21													
V	Santa Barbara	2	A	Northerly Boundary	1 Mi.South of Divide	te	5.807	8-24-15	43,951.14	1,684.14	1,998.32	7,186.44	10,868.90	1,421.67	9,664.33	31,601.42	42,687.42	226.[illegible]		6,773.90	7,000.[illegible]
						e	3.563	8- -20													
						c	1.256	6- 15													
	"	2	B	1 Mi. South of Divide	Los Alamos	oc	11.972	6- -16	19,893.39	2,863.34	2,686.70	9,395.23	14,945.27	901.99	8.58	4,040.55	4,948.12				
	"	2	C	Los Alamos	Zaca	e	8.753	9-28-18	6,506.67	1,569.34	593.89	4,009.02	6,472.25	8.69		23.73	34.42				
	"	2	D	Zaca	Alisal	e	12.074	"	46,122.11	12,516.73	4,528.71	11,377.86	28,013.30	8,344.07	1,426.91	7,039.47	16,810.45		298.36		298.36
	"	2	E	Alisal	Alcatraz School	e	4.998	5- -16	36,300.83	11,972.[illegible]	3,979.60	17,756.70	33,608.45	1,365.46	773.51	13.41	2,692.38				
						e	2.925	8- -16													
	"	2	F	Alcatraz School	El Capitan Creek	c	10.392	3-19-19	37,997.86	9,533.02	842.65	14,993.28	25,369.15	7,136.87	161.22	5,[illegible]0.32	12,618.41				
	"	2	G	El Capitan Creek	Glenn Anne Canon Road	c	9.431	10- -15	5[illegible].174.[illegible]	6,603.30	973.42	14,687.71	23,670.43	7,970.14	1,710.59	3[illegible].873.67	3[illegible].554.40				

MOTOR VEHICLE FUND EXPENDITURES.

Dist.	County	Rte.	Sec.	From	To	Type	Miles under relief	Date Completed	General Maintenance				Improvement				Reconstruction			
									Total	Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total
V	Santa Barbara	2	H	Carpenteria	Southerly Boundary	ac	2.954	*	11,077.65		5,527.54	1,014.01	4,498.23	11,034.78			42.87	42.87				
						ac	0.364	5-27-14														
	"	2	I	Glen Anne Canyon Road	Stony Creek	oc	.840	10- -15	3,146.74	1,925.29	524.89	684.56	3,135.74									
	"	2	J	Santa Barbara	Carpenteria	oc	.691	8- 7-15	20,331.02	14,067.71	1,405.29	3,857.19	19,330.19	589.73		1,241.10	1,830.83					
						c	1.019	8- -20														
						ac	1.913	*														
						cm	2.625	*														
	"	2	K	Stony Creek	Santa Barbara	ac	5.719	*	144,334.76	19,495.87	2,615.43	6,781.75	28,893.04	94,506.96	1,069.66	9,949.92	104,546.54	10,895.18				10,895.18
						c	1.939	*														
IV	Santa Clara	2	A	Northerly Boundary	San Jose	tc	6.52	10- 6-14	113,310.56	5,991.40	19,184.43	13,432.43	38,608.26	6,160.03	45,869.81	22,472.48	74,702.32					
						tc	7.15	3-25-14														
						tc	1.93	12- 7-15														
						c	0.93	11-16-21														
	"	2	B	San Jose	Morgan Hill	tc	17.70	11-17-14	238,110.69	14,364.31	33,126.47	10,577.62	58,068.35	49,382.32	101,966.90	20,381.45	172,330.67	3,633.91	1,077.76			4,711.67
	"	2	C	Morgan Hill	Southerly Boundary	tc	7.86	1- 5-15	121,805.27	13,796.22	13,388.00	9,865.45	37,079.67	58,029.38	13,182.30	486.41	73,698.09	10,017.03	1,060.48			11,077.51
						c	1.78	7- 7-15														
						oc	4.34	7- 7-15														
	"	5	A	Northerly Boundary	San Jose	oc	7.21	10- 5-15	53,997.99	5,858.23	22,814.71	6,364.60	35,037.54	7.08	1,565.37	13,182.69	14,755.14		2,297.15	1,008.16		3,305.31
	"	5	B	San Jose	Southerly Boundary	tc	1.69	7-28-16	59,604.24	5,009.93	14,983.56	26,709.37	46,560.86	116.52	9,110.18	13,794.68	23,021.38					
						o	15.38	7-28-16														
IV	Santa Cruz	5	A	Easterly Boundary	Santa Cruz	c	15.97	7-30-15	93,569.77	3,494.56	22,735.52	36,329.84	62,559.92	1,797.13	19,490.69	9,842.03	31,129.85					
	"	42	A	Saratoga Gap	Redwood Park	c	15.67	*	68,377.19	29.01	47,525.41	16,195.34	63,849.76		2,443.02		2,443.02		65.41			65.41
	"	44	A	Boulder Creek	California Redwood Park	s	8.2	*	9,177.36	9.97	3,231.98	1,788.63	5,030.58		16.59	4,070.69	4,086.68					
II	Shasta	3	A	Cottonwood Creek	Redding	o	15.784	*	404.90	5.81	216.17	171.20	393.18		11.72		11.72					
	"	3	B	Redding	Baird	g	16.876	10- 5-15	76,030.41	77.62	33,056.94	19,653.81	52,188.37		23,436.45	415.58	23,842.04					
	"	3	C	Baird	La Moine	g	23.971	10- 5-15	119,967.54	4.38	38,924.38	35,392.51	74,321.27		46,032.36	2,614.01	48,646.37					
	"	3	D	La Moine	Northerly Boundary	g	21.734	10- 5-15	286,660.60	.55	36,281.84	58,071.47	94,353.86		143,485.02	46,821.72	190,306.74					
	"	20	A	Tower House	Schilling	g	6.26	12- -20	10,008.90		6,044.04	3,805.12	9,849.16	34.64	87.69	37.41	159.74					
	"	20	B	Schilling	Redding	g	9.739	12- -20	12,060.31		5,719.15	6,097.19	11,816.65	34.65	87.58	121.33	243.56					
	"	28	H	Igo	Montgomery Creek	g	14.498	*	25,620.12		895.58	1,414.04	2,309.72		46.08	23,264.32	23,310.40					
	"	28	C	Montgomery Creek	Ramey	g	19.073	*	21.14		21.14		21.14									
II	Sierra	25	A	Westerly Boundary	Downieville	s	17.067	12- -21	49,368.19		2,045.15	7,216.03	9,663.18			39,698.99	39,698.99					
III	"	37	A	Nevada County Line	State Line	s	12.5	*	11,680.44		6,212.39	3,468.05	11,680.44									
II	Siskiyou	3	A	Southerly Boundary	Weed	s	7.621	10-21-15	48,734.28		5,582.23	9,112.90	14,695.13		24,436.65	122.50	24,559.15					
						o	10.553	*														
	"	3	B	Reed	Yreka	g	16.379	10- 6-14	16,379.40		13,464.79	2,858.86	16,323.65		55.75		55.75					
						cm	17.540	*														
	"	3	C	Yreka	Oregon Line	g	24.954	12-21-15	96,785.28		36,929.17	20,465.70	57,394.87	131.65	37,507.15	1,881.60	39,390.41					
III	Solano	7	A	Benicia	2.5 mi.S.of Cordelia	o	9.05	3-25-16	6,067.60	1,535.84	430.29	4,101.47	6,067.60									
	"	7	B	2.5 mi.S.of Cordelia	Fairfield	oc	9.001	10- 5-15	34,429.87	2,729.80	11,431.63	7,997.74	22,149.17		1,978.12		1,978.12	302.88				302.88
						s	.447	*														
	"	7	C	Fairfield	Vacaville	oc	8.855	7- 7-15	27,769.50	14,279.32	4,030.34	6,989.39	25,299.05	58.90			58.90	2,411.55				2,411.55
	"	7	D	Vacaville	1 mi. N.E.of Elmira	c	6.337	1-11-16	16,647.48	6,220.51	385.45	5,891.70	12,497.66					2,149.82				2,149.82
	"	7	E	1 mi.N.E.of Elmira	Northerly Boundary	c	8.301	6-26-16	235,833.79	12,158.41	3,801.36	2,823.16	18,782.87	98,599.53	17,425.32	1,023.97	117,050.82					

MOTOR VEHICLE FUND EXPENDITURES.

Dist	County	Rte	Sec	From	To	Type	Miles Under Maint	Date Completed	General Maintenance				Improvement				Reconstruction			
									Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total
II	Solano	8	A	Westerly Boundary	Rte 9 at Cordelia	c	3.456	1- 9-19	10,559.54	7,105.60	41.87	7,488.27	10,635.74			23.80	23.80			
	"	53	A	Fairfield	Denverton	"	8.68	"	1.50		1.50		1.50							
	"	53	B	Denverton	Rte Vista	"	11.944	"	1.50		1.50		1.50							
	"	53	C	Rte Vista	Easterly Boundary	p	.30	"	1,252.24			1,252.24	1,252.24							
IV	Sonoma	1	A	Northerly Boundary	Healdsburg	c	4.32	7-20-15	44,238.36	136.86	16,979.23	5,212.63	22,328.72	282.74	11,381.08	10,245.62	21,909.44			
						p	5.89	"												
						c	10.11	"												
	"	1	B	Healdsburg	Santa Rosa	ac	14.32	11-10-14	60,549.08	30,629.94	12,806.07	11,956.61	55,392.62		957.64	4,198.82	5,156.46			
	"	1	C	Santa Rosa	Southerly Boundary	c	12.42	11-14-19	67,934.49	25,147.24	7,459.83	29,956.50	58,563.57	369.31	902.42	7,166.43	8,438.16	932.76		932.76
						o	6.46	12-21-15												
	"	8	A	S.R.County Line	Sonoma Creek	ac	5.43		44,719.73	260.90	10,871.15	20,706.59	32,538.64		2,717.00	2,064.09	4,781.09			
						p	4.87													
	"	8	B	Sonoma Creek	Easterly Boundary	p	4.41	"	11,871.33	122.26	5,910.28	2,289.18	8,321.72	719.01	1,051.90	2,184.70	3,549.61			
II	Stanislaus	4	A	Southerly Boundary	Ceres	tc	12.556	8- -13	230,664.84	8,304.46	5,829.68	8,773.13	23,907.27	121,337.17	136,301.49	17,116.91	274,757.57			
	"	4	B	Ceres	Northerly Boundary	ac	7.823	6-23-14	69,077.31	5,853.55	7,440.69	8,735.35	22,029.59	16,140.21	22,219.35	8,690.16	47,047.72			
						tc	1.498	11- -21												
	"	13	A	Salida	Oakdale	c	14.858	6-10-16	14,135.63	3,327.77	983.40	4,362.29	8,673.46			6,662.17	6,662.17			
	"	13	B	Oakdale	Easterly Boundary	c	12.792	8- -21	9,312.08	668.85	107.66	1,455.67	2,232.08							
	Sutter	3	A	Yuba City	Northerly Boundary	c	11.709	1-11-16	11,298.30	2,554.06	359.17	7,696.98	10,608.21			690.09	690.09			
	"	15	B	Wadsworth Canal	Yuba City	c	5.968	"	121.31	121.31			121.31							
II	Tehama	3	A	Southerly Boundary	Los Molinos	c	11.768	10- -21	2,349.81	885.75	843.02	521.04	2,249.81							
	"	3	B	Tehama Junction	Red Bluff	c	10.509	10-10-17	7,348.39	714.43	2,523.98	4,010.01	7,248.39							
	"	3	C	Red Bluff	Northerly Boundary	c	13.658	10- -21	30,638.77	894.72	11,612.86	4,038.59	16,543.15		14,089.62		14,089.62			
						s	.411	"												
	"	3	D	Los Molinos	Red Bluff	c	14.216	"	1,115.07	409.56	134.53	570.96	1,115.07							
	"	7	A	Southerly Boundary	Tehama Junction	ac	3.234	12- -15	17,644.54	2,844.93	4,966.48	8,963.14	16,776.57	40.76	116.97	710.24	867.97			
II	Trinity	20	C	Westerly Boundary	Hurst Ranch	s	12.934	"	39,418.90		2,823.76	17,661.10	20,184.30			234.00	234.00			
	"	20	G	Hurst Ranch	Whites Bar Cr.	s	15.628	"	184.34		184.34		184.34							
	"	20	H	White Bar Cr	Helena	s	11.40	11- -20	11,189.08		2,899.98	5,429.18	8,329.16		1,593.52	1,063.40	2,656.92			
	"	35	A	Hunts	Peanut	s	21.20		28,067.73		8,310.66	19,626.15	27,939.01			82.64	82.64		46.08	46.08
VI	Tulare	4	A	Southerly Boundary	Quail	c	15.258	3- 6-18	11,755.49	5,194.94	1,992.12	4,568.43	11,755.49							
	"	4	B	Quail	Tulare City Limits	c	12.778	2-26-19	7,446.55	1,551.57	964.06	4,176.64	6,692.27	255.80		538.48	794.28			
	"	4	C	Tulare	Jct West of Visalia	c	9.261	12-14-18	5,339.79	996.26	749.89	3,593.24	5,339.39							
	"	4	D	Jct West of Visalia	Goshen	ac	3.195	7-28-16	12,177.56	2,492.63	2,170.21	4,290.41	8,953.25		2,952.75	271.56	3,224.31			
						tc	2.955	7-28-16												
	"	4	E	Goshen	Lingsburg	c	13.98	2-11-16	18,511.53	5,299.76	1,296.42	8,071.24	14,667.42	469.40	3,360.72		3,830.12		13.99	13.99
	"	10	A	Westerly Boundary	2 mi. South of Goshen	c	3.976	4-12-16	2,262.37	929.14	453.30	879.93	2,262.37							
	"	10	H	Tulare Junction	Visalia	tc	0.273	3- 6-18	143.90	57.30	38.25	48.35	143.90							
II	Tuolumne	13	A	Westerly Boundary	1 mi. E.of Keystone	s	10.842	6-12-15	9,753.99	1,128.33	7,149.16	4,470.05	9,744.54		9.45		9.45			
	"	13	B	1 mi. E.of Keystone	Sonora	s	11.052	3-11-16	51,753.46	1,332.50	12,917.16	28,904.16	43,153.82	2,384.79	706.32	5,568.31	8,599.64			
	"	13	C	Sonora	Pooley's Ranch	s	8.5	"	6,700.83	87.96	4,406.76	1,342.00	5,836.06		864.77		864.77			
	"	13	D	Pooley's Ranch	Long Barn	s	11.0	"	8,147.53		4,685.02	3,462.51	8,147.53							
	"	13	E	Long Barn	Strawberry	s	11.4	"	3,890.14	9.72	1,847.86	2,032.56	3,890.14							

MOTOR VEHICLE FUND EXPENDITURES.

Dist	County	Rte	Sec	From	To	Type	Miles under Const	Date Completed	Total	General Maintenance				Improvement				Reconstruction			
										Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total	Pavement Base	Pavement Surface	Miscellaneous	Total
III	Tuolumne	13	F	Strawberry	Mi-Wuk	a	14.3	*	4,069.06	93.08	3,038.73	1,937.25	5,069.06								
	"	13	G	Mi-Wuk	Bakers	a	13.3	*	1,468.33		1,917.33	1,551.00	3,468.33								
	"	13	H	Bakers	Easterly Boundary	a	9.4	*	1,910.89		1,062.44	848.45	1,910.89								
	"	18	-	Rte 40 near Sequoia	Yosemite Nat'l Park	a	5.61	*	1,850.35		1,711.78	138.72	1,850.35								
	"	10	A	Tuolumne River	Groveland	a	10.6	*	28 743.59	1,666.60	5,300.15	21 660.60	28,665.34			666.62	666.62		52.21	52.21	
	"	40	B	Tuolumne River	Groveland	a	10.3	*	16,314.57	447.13	5,697.38	9 779.46	16 314.57								
	"	41	C	Groveland	Southerly Boundary	a	9.4	*	9 487.33	234.05	4,135.93	5,543.47	9 453.55						77.78	77.78	
	"	40	D	Southerly Boundary	Summit 1 m.n.Merkle Ranch	a	6.7	*	11,749.61		2,394.45	9 355.15	11 749.61								
	"	40	E	Summit 1 m.n.Merkle Ranch	Jct. Rte 18	a	8.0		12,197 71	286.78	7 302.66	4 618.27	12,197 71								
	"	40	F	Jct Rte 18	Yosemite Nat'l Park	a	6 1	'	7 777.29		4 520.79	3 706.90	7 727.69								
III	Ventura	2	A	Easterly Boundary	Newbury Park	c	1.818	6- -30	9 277.38	476.67	4,824.30	3,975.51	9 277.38								
	"					oc	5 581	6-23-14													
	"	2	B	Newbury Park	Springville	oc	9.849	1- -15	55,698.43	3 042.77	16,675.13	8,809.90	28,026.00	299.55	124.74	5,417.69	5,842.18	11,841.84	509.65	15,456.56	27,808.25
						c	3.371	7- -15													
	"	2	C	Springville	Ventura	c	8.903	8- -17	21,389 19	930.85	2,288.98	3,957.32	7,176 65	13.31	2,896.29	11 61	2,921 21		94.84	11,026.49	11,261.33
						bc	0.569	8- -17													
	"	2	D	Ventura	Padre Juan Canyon	oc	6.169	6- -15	8,083.97	523.72	2,325.16	4,853.94	7 702.82			279.18	279.18		101.97	101.97	
	"	2	E	Padre Juan Canyon	Sea Cliff	oc	1.952	6- -15	5 341.67	315.67	1,029.22	3,292.34	4,637.23			744.44	744.44				
	"	2	F	Sea Cliff	Rancho El Rincon	oc	4.363	6- -15	23,761 37	141.85	2,054.11	21,542.45	23,738.41			80	80		22.96	22.96	
	"	2	G	Rancho El Rincon	Easterly Boundary	oc	0.685	6- -15	3,498.36	193.60	744.08	2,554.68	3,492 36								
III	Yolo	6	A	2 mi N. of Davis	Yolo Trestle	oc	5.95	2-11-16	17,097.96	1,612.04	4,349.46	11 726.36	17,097.96								
						c	1.547	9- -18													
						st	0.36	12- -17													
	"	6	B	Yolo By-Pass	West Sacramento Levee	pt	3.089	3- -16	6,516.46	403.54	2,430.26	3,682.66	6,516.46								
	"	6	C	West Sacramento Levee	Sacramento River	oc	2.562	5- -16	11,644.48	582.66	1,807.61	9 054.27	11,644.48								
						c	1.134	6- -16													
						st	.809	5- -16													
	"	7	A	Southerly Boundary	Woodland	oc	11.641	9-17-15	21,270.66	2,856.38	5,108.78	11,717.00	19,682.16	987.45	173.15		1,160.60	427.46	.44		427.90
						sc	.189	10- -21													
	"	7	B	Woodland	Zamora	c	10.657	5- -21	2,863.98	188.68	463.13	2,212.17	2,863.98								
	"	7	C	Zamora	Northerly Boundary	c	10.951	3- 4-20	4,037.56	476.98	611.90	2,948.68	4,037.56								
III	Yuba	3	A	Southerly Boundary	Morrison's Crossing	c	9.396	10- -15	4,117.81	983.39	537.23	2,597 19	4,117.81								
	"	3	B	Morrison's Crossing	Marysville	oa	9.100	8-24-13	40,075.34	2,922.68	9,185.37	13,097.22	25,205.27	5,141.14	8,851.41	2,601.66	16,594.21	169.83	98.78	7.25	275.86
						bc	0.348	10- -13													
II	"	25	A	Freeman's Crossing	Easterly Boundary	c	1.090	10- -20	9,817.94		3,574.50	5,186.65	8,725.15		21.95	1,070.84	1,092.79				
II	Butte	30	A	near Merrimac					171.13							171.13	171 13				
	"	30	B	" "					1,056.98							1,056.98	1,056 98				
					Grand Total		3,534.566		10,982,426.94	1,255,583.55	2,009,951.68	2,819,264.69	6,084,750.12	2,185,817.41	1,770,626.90	1,015,935.86	5,972 773 97	905,288.00	109,616.46	240,992.39	1,255,896.85

WIDENING AND THICKENING WORK COMPLETED OR UNDER CONSTRUCTION, JUNE 30, 1922.

Contract No.	Dist.	County	Rte.	Sec.	From	To	Length Miles	Contract Date	Date Completed	Type of Work	Total Est. Cost	Cost per Mile	Cost per Mile Shoulders	Cost per Mile Surface
Concrete Shoulders and Asphaltic Concrete Surface														
D-634	III	Placer	5	A	Sacramento County Line	Lincoln	8.00	3-8-22	Incomplete	18' x 7" P.C.Conc. Sh. 15' x 2½" A.C. Sur.	128,000.00	16,000.00	10,000.00	18,000.00
347 & MRO	IV	San Joaquin	2	A	Tracy	58.16-21.61	36.55	4-19-21	Incomplete	18' x 8" P.C.Conc. Sh. 15' x 2½" A.C. Sur.	584,864.00	15,999.62	10,007.06	17,776.35
746 & D414	III	Solano	7	C	Vacaville	Fairfield	6.86	11-17-21	Incomplete	18' x 8½" P.C. Conc. Sh. 18' x 2½" A.C. Sur.	109,804.00	16,005.10	9,267.13	9,734.97
328 & MRO	V	"	7	D	1.2 mi. S. of Davisville	0.46 mi. N. of Benicia	6.46	12-31-21	Incomplete	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	91,468.36	14,157.33	7,697.38	10,000.00
D 490	III	Stanislaus	4	A	Southerly Boundary	Ceres	12.06	1-16-21	4-12-22	18' x 8" P.C. Conc. Sh. 15' x 2½" Tar-A.C. Sur.	238,021.69	17,908.33	7,266.49	10,433.84
329 & MRO	V	"	7	D	Tuolumne River	Tuolumne River	1.99	1-5-21	4-12-22	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	33,410.86	16,789.37	7,303.98	9,485.39
330	IV	Alameda	5	A	Livermore Boundary	Crocker Hill	4.99	2-24-21	Incomplete	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	110,450.00	21,063.06	10,984.76	10,078.28
D-530	IV	Marin	1	B	San Anselmo	San Anselmo	0.66	9-22-21	11-18-21	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	20,141.27	34,746.32	17,183.03	17,563.29
331 & MRO	IV	"	1	B	"	"	10.66	4-3-21	4-17-22	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	185,947.78	17,487.78	7,888.49	9,599.29
345 & D420	IV	"	2	C	Corte Madera	Corte Madera	0.46	11-17-21	Incomplete	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	11,015.00	23,945.65	13,913.04	10,032.61
346 & MRO	IV	"	2	C	Larkspur	Larkspur	0.46	11-17-21	Incomplete	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	11,015.00	23,945.65	13,913.04	10,032.61
348 & MRO	IV	"	2	C	Larkspur Creek	Southerly Boundary	4.54	11-17-21	Incomplete	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	74,320.00	16,403.97	7,401.83	11,391.36
349 & D420	IV	Sonoma	1	C	Petaluma Creek	0.1 mi. So. of Petaluma	4.29	3-8-22	"	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	95,006.81	21,750.09	11,771.57	9,989.02
350 & D580	III	San Mateo	3	A	Redwood City	0.65 mi. So. of Belmont	6.65	10-4-21	10-20-21	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	113,051.46	16,996.00	8,015.65	10,014.06
341	V	Santa Barbara	2	E,F,G	Goleta	Canada de los Llagas,	9.41	11-29-21	Incomplete	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	147,771.29	15,994.36	13,760.36	14,134.00
					Los Cristianos Creek	Santa Cruz								
344	VI	Fresno	4	A	Selma	Kingsburg	3.71	12-6-21	8-6-22	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	77,004.33	20,917.60	9,550.66	11,161.78
D-448	VI	Kern	6	C	Sec.19-30-27 M.D.B.	Bakersfield	10.00	3-6-22	Incomplete	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	210,507.03	21,051.26	10,196.79	9,854.57
D-456	VI	Tulare	6	B	Through Tipton		.80	3-6-22	"	18' P.C. Conc. Sh. 15' x 2½" A.C. Sur.	13,200.00	16,500.00	10,200.00	16,500.00
514 & MRO	VI	Merced	4	A	Arena	Southerly Boundary	4.04	5-10-21	8-4-	18' x 8½" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	89,340.69	22,109.73	10,749.73	12,541.49
D-458	VI	"	6	C-D	Twin Atwater & Livingston		1.0	3-8-22	6-22	18'-9" x 7" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	26,500.00	26,500.00	10,000.00	16,500.00
D407 -D462														
& 348	VI	"	4	A-C	Southerly Boundary	Arena	6.33	11- 2-21	Incomplete	18' x 8"-8½" P.C. Conc. Sh. 15' & 18'-5" A.C. Sur.	161,158.72	25,479.73	14,194.61	11,285.12
282, D-265	VI	Tulare	10	B	Visalia	Cox Grove School	3.03	10- 1-19	7- 2-21	24' x 6" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	80,008.98	26,403.63	6,473.65	9,353.86
D-413														
& M.W.O.	VI	Kern	4	B	Grapevine Creek	Sec.8 & 6 T32S, R28E.	16.14	1-10-21	6-12	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	360,047.06	19,707.36	9,499.60	10,207.76
325, 326	VI	Tulare	6	B	Pelissier	Northerly Boundary	1.97	3-29-21	6-22	18' x 8" P.C. Conc. Sh. 15' x 2½" A.C. Sur.	40,665.90	21,007.88	9,088.14	12,619.86
852	VI	"	8	B	Sultana	Irvine	3.69	9- 3-19	4-10-20	18' x 8" P.C. Conc. Sh. 15' x 2½" Tar.	89,840.36	14,126.61	9,182.63	7,971.98
						Total	144.30			Estimated Total Cost and Estimated Average Cost	2,971,803.26	20,592.84	10,113.84	10,478.70
Concrete Shoulders and Second Stry														
D-389	III	Colusa	10	A	Williams	Colusa	0.70	3-17-21	9- 2-21	18' x 8" Conc.Sh. 16' x 4" Conc. Base 2nd story	11,730.67	30,476.54		
SBO MRO	IV	Santa Clara	2	C	Gilroy	Carmardero Creek	1.72	9-28-21	4- 6-22	2'-6"-8" P.C.Conc.Sh. 15' x 4" Conc. Base 2nd story	29,948.11	31,868.10		
2412,&														
MRO 1650	VI	Kern	4	C	Sta. 307 + 89	Sta. 418 + 00	2.09	3-16-21	Incomplete	18' x 8" Conc. Sh. 18' x 4" Conc. Base 2nd story	63,037.66	25,376.82		
& D-343	VI	"	4	C	Bakersfield	4th St.	48	3-16-21	"	18' " " " " " " " " "	12,740.84	26,543.42		
MRO-1097														
& 1146	VI	"	4	F	Northerly Boundary	Dearborn	.81	8-26-19	11- 1-19	20' x 8" Conc. Base 2nd story	16,926.07	18,427.25		
D442, MRO	VI	Merced	4	C	Southerly Boundary	Arena	2.14	3-17-21	Incomplete	24' x 8" Cond. Sh. 15' x 4" Conc. Base 2nd story	68,944.35	30,818.11		
D333, D413										18' x 8" " " 15' x 4" "				
& MRO	VI	Kern	4	B	Sta. 760 + 51	Sta. 820 + 11	1.06	4-22-20	6-22	Conc. Sh. - 0.11 Mi. Conc.Base 2nd story-0.34 Mi. P.C.Conc.	24,970.10	23,701.06		
MRO 1651 &										Base, 2nd story				
MRO 1282	VI	Merced	4	A-C	Southerly Boundary	Arena	.28	3-24-20	7-20	18' x 4" Conc. Base 2nd story	4,667.01	16,668.61		
1368-1790	VII	Los Angeles	2	A-B	Country Highway #3	Calabasas	9.86	3-17-21	1- 6-22	18' x 8" Conc. Sh. 18' x 4" Conc. Base 2nd story	286,099.16	29,038.49		
1791	VII	Orange	2	A	Irvine	Tustin	5.01	4-4-22	Incomplete	18' x 8" Conc. Sh. 18' x 4" Conc. Base 2nd story	128,654.73	25,656.37		
251	VII	Los Angeles	8	A	Lankershim Boulevard	South Sherman Way	1.53	9-14-19	2- 4-20	20' x 4" R.C.B. 2nd Story	39,624.63	25,179.06		
1792	VII	"	8	E	Russell Ranch	Former Easterly Boundary	1.29	3-10-20	6-20	18' x 4"-6" Edge - R.C.B. 2nd Story	42,644.95	33,058.03		
MRO 1636	VII	"	8	D	Northerly Boundary	Liebre Mountain	3.81	2-24-21	6-22	18' x 8" Conc. Sh. 18' x 4" R.C.B. 2nd story	84,870.66	22,231.82		
1793	VII	Ventura	1	A-B	Easterly Boundary	Conejo Grade	3.02	6-4-19	11-15-19	18' x 8" Conc. Sh. 15' x 4" Alter. Base 2nd Sty	84,799.46	28,079.62		
248- 480	VII	Orange	8	F	Fullerton	Northerly Boundary	2.78	9-26-21	4-12-22	18' x 8" Conc. Sh. 18' x 4" Conc. Base 2nd story	71,211.34	25,727.10		
						Total	34.45			Estimated Total Cost and Estimated Average Cost	920,937.87	27,046.63		
Topsoil and Asphaltic Concrete Surface														
374	III	Colusa	7&15-B&A		In the town of Williams		.36	6-28-22	Incomplete	24' x 2½" A.C. Sur.	11,093.66	31,696.71		31,696.71
736 &														
MRO-1183	IV	Santa Clara	1	A	Stevens Creek	San Tomas Aquino Creek	6.80	3-15-19	-19	20' x 1½" Top. Sur.	47,826.01	7,368.74		7,368.74
350-4	IV	"	2	B	Newhall Avenue	San Jose	1.69	7-25-17	11-10-17	20' x 1½" Top. Sur.	7,000.80	4,616.94		4,616.94
334	VI	Kern	4	B	Sta. 870 + 80	Sta. 880 + 11	.96	9-14-21	8- 22	20' x 2"-4" A.C. Sur.	8,043.10	9,428.83		9,428.83
342	VI	Fresno	4	A	Fresno	2.3 Mi. Northwesterly	2.07	11-24-21	3-15-22	20' x 2"-3" A.C. Sur.	29,930.71	17,290.09		17,290.09
212-MRO	VI	"	4	D	Malaga	Fresno	1.08	11-19-17	4-24-18	20' x 1½" Top. Sur.	24,157.69	9,761.04		9,761.04
D12 - 241	VII	Orange	8	D-E	Santa Ana	Fullerton	6.43	7- 3-18	12-18	18' x 1½" Top. Sur.	24,042.16	3,747.76		3,747.76
349	VII	Los Angeles	6	A	3.4 Mi. N.E. from Castaic	11 Mi. S. of Lebec Mt	7.04	12- 6-21	Incomplete	20' x 2" A.C. Sur.	107,644.44	14,728.22		14,728.22
D-329	VII	"	8	D	Leuzinger School House	Sec.17 T.2 S. R.17 W.	2.74	4-20-22	6-22-22	20' x 2½" Willite Sur. - Top. Sur.	28,496.40	10,478.79		10,478.79
251	VII	"	8	A	Lankershim Boulevard	South Sherman Way	2.92	8-12-19	1- 4-20	21' x 1½" Top. Sur.	35,470.00	9,092.53		9,092.53
D-329	VII	"	8	A	Encino	Castaic School House	1.00	4- 2-20	6-22-20	18' x 1½" Willite Mix.	16,240.75	16,183.75		16,183.75
MR 227	VII	San Bernardino	19	A	Westerly Boundary	Ontario	4.13	9-29-16	11-27-15	16' x 1½" Top. Sur. & 2" A.C. Sur. - 16' x 4" Top. Sur. & Top. Sur. 20' wide over old P.C. Conc. R. Bond	14,799.49	6,943.42		
						Total	37.65			Estimated Total Cost and Estimated Average Cost	314,444.74	9,680.01		9,885.01

WIDENING AND THICKENING WORK COMPLETED OR UNDER CONSTRUCTION, JUNE 30, 1922.

Contract No.	Dist.	County	Rte.	Sec.	From	To	Length Miles	Contract Date	Date Completed	Type of Work	Total Bit. Cost	Cost per Mile	Cost per Mile Shoulders	Cost per Mile Surface
						Concrete Shoulders (Only)								
1-C-6	III	Stanislaus	12	A	Bald Eagle Ranch	Oakdale	9.58	11- 6-19	3- 1-21	25' x 6" P.C. Conc. Sh.	71,854.94	7,500.51	7,500.51	
MAR 76	VI	Fresno	4	A	Fowler	Selma	1.76	1-20-18	10-1918	25' x 6" P.C. Conc. Sh.	10,343.36	5,876.91	5,876.91	
2-427	VI	Madera	4	A	Southerly Boundary	Madera	.63	3- 6-21	6-22	25' x 8" P.C. Conc. Sh.	10,000.00	15,048.19	15,048.19	
21-	VII	Orange	2	B	Sullivan	Irvine	5.68	9- 3-19	2-26-20	25' x 8" P.C. Conc. Sh.	46,365.68	8,162.97	8,162.97	
					Total		17.65			Estimated Total Cost	138,563.96	7,762.69	7,762.69	
										and Estimated Average Cost				
						Miscellaneous								
2433-4-B	III	Glenn	7	A	Southerly Boundary	Willows	7.83	9-30-21	Incomplete	Bit. Macadam	245,042.59	30,544.83		
2-376	III	Yuba	3	B	1 Mi. S of Marysville	Marysville	1.0	4-20-21	"	24' x 8" P.C. Conc. Sh. & 18' x 8" Oil Macadam	19,900.00	19,900.00	11,066.40	8,833.60
MVG 163	VI	Fresno	4	A	Fowler	Selma	1.78	7- 6-18	- 1b	20' x 6" Bit. Macadam Sh.	4,766.71	1,759.81	1,759.82	
190-1921	VI	"	4	F	Fresno	Vernon	.15	11-29-21	6-22	24'-6" Metric width Bituminous Surface, base & Asph. Sur.-SPRR Xing	1,449.74	9,049.55		
2-331	VI	Madera	4	C	Through Livingston		.15	4-13-20	6- 22	24' x 4" Conc. base - (Additional width)	1,117.00	7,446.66		
					Total		13.58			Estimated Total Cost	272,315.04			

SUMMARY

Length Miles		Average Est. Cost per Mile	Average Est. Cost per Mile Shoulders	Average Est. Cost per Mile Surface
144.30	Concrete Shoulders and Asphaltic Concrete Surface	2,971,603.28	20,592.54	20,592.54	10,113.84	10,478.70
34.05	Concrete Shoulders and Second Story	910,937.87	27,046.63			
37.65	Topeka and Asphaltic Concrete Surface	364,640.74	9,686.01			9,686.01
17.65	Concrete Shoulders (Only)	138,563.96	7,762.69	7,762.69		
11.58	Miscellaneous	272,315.04				
	Total	4,667,960.86				

COMPLETED CONTRACTS, JUNE 30, 1922.

SHOWING STATISTICAL INFORMATION AS TO CONTRACTS ARRANGED BY COUNTIES AND ROUTES, WITH LENGTHS, TERMINI AND OTHER STATISTICS.

L.O. No.	Div.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Res. Engineer	Type of Work	Total Estimate Work	Total Estimate Materials	Total Estimate Total	Exec. Off'rs Account	Total
115	IV	Alameda		A	Greenville	Livermore	4.97	5-11-14	Bennett Const. Co.	J. D. Green	15 ft. Concrete Base	47,449	44,699	92,148	3,231	95,379
136	IV	"		A	Tassajo Boundary	Altamont	4.06	10-8-14	Palmer & Wilhelm	W. Wear	15 ft. Concrete Base	74,715	24,142	98,857	4,043	102,900
136	IV	"		A	Altamont	Greenville	4.58	7-11-21	Bates, Borland & Ayer	W. C. Hoyt	15 ft. Concrete Base	65,342	20,668	86,010	4,993	91,003
136-136	IV	"		A	Greenville	Tassajo Boundary	10.84	8- 4-15	See Letter	A. C. Sass	Oiled Surfacing	4,545	3,719	8,264	32	8,296
124	IV	"		A	Altamont	Greenville	.21	5-12-20	See Letter		Cancelled June 1920	112		112		112
294	IV	"		A	At Altamont		.06	1- 4-22	See Letter	H. W. Schreiber	Fence, Inc. Acer.	4,192	1,492	5,684	115	5,799
163	IV	"		A	Livermore	Scotts Vale	4.82	7-25-15	Wm. Haught Const. Co.	H. C. Bays	18 ft. Concrete Base	57,420	21,130	63,550	4,440	68,990
270	IV	"		A	Scotts Vale	Dublin	4.34	4-22-17	Bates, Borland & Ayer	H. C. Bays	18 ft. Concrete Base	59,726	24,745	84,471	4,359	88,830
270	IV	"		A	At San Ramon Creek		.11	5-24-16	See Letter	H. C. Bays	Bridge Approach	1,341	1,341	2,682	31	2,713
60	IV	"		A	Haymers	Valle Vista School	3.12	4-24-14	Tisdale Bros.	A. D. Haworth	18 ft. Concrete Base	31,794	18,668	40,662	2,813	43,275
317	IV	"		C	Greenacres Corner	Southern Boundary	8.40	7-19-16	O. G. Ritchie	R. Stockley	18 ft. Concrete Base	104,986	66,676	171,662	7,980	179,342
60-152	IV	"		C	Valle Vista School	Niles	4.76	4-24-14	See Letter	H. C. Bays	18 ft. Concrete Base	57,584	21,675	64,259	4,248	68,507
60	IV	"		C	Niles	Alden	6.09	9-14-17	See Letter	O. G. Georges	Oiled Surfacing	3,333	3,333	6,666	43	6,709
	IV	"		C	At High Wooder Crossing		.03	5-14-17	See Letter	O. G. Georges	Gravel Shoulders	1,133	1,133	2,266	23	2,289
	IV	"		C	Sta. 805	Sta. 870	.06	10-30-21	See Letter	J. E. Kreiter	Paving Exception	1,365	1,332	2,697	303	3,000
83	IV	"	5	D	Haymers	Oakland	5.06	4-22-21	Manson Creamery Co.	Leon L. Clarke	24 ft. Tarmac Surfacing	54,309	4,120	58,431	3,248	61,679
249	IV	Amador	24	A	Westerly Boundary	Ione	5.66	5-16-21	W. J. Schmidt	W. B. Smith	24 ft. Grading	47,935	4,222	52,157	3,041	56,218
249-258	IV	Butte	3	A	Southerly Boundary	Biggs	9.68	10-17-13	Municipal Imp. Co.	L. L. Piper	15 ft. Concrete Base	71,434	41,102	114,317	7,807	122,124
	IV	"	3	A	Station 1995+50	Station 2064+50	.05	7-18-19	See Letter	W. B. Dennis	15 ft. Concrete Base	364	185	549	19	568
317	IV	"	3	A	Nelson	Biggs	10.42	7- 3-16	See Letter	W. B. Miller	15 ft. Concrete Base	457,283	146,882	304,165	12,433	316,598
154	IV	"		A	Nelson	Chico	12.77	2-9-15	Whitlock & Morrill	W. T. Weston	15 ft. Concrete Base	73,869	63,268	136,957	6,462	143,419
221	IV	"		A	4th St. Channelstown	Little Chico Creek	.40	12-18-15	See Letter	J. E. Merrell	15 ft. Concrete Base	4,763	1,895	3,636	514	4,172
20-148	IV	"		A	Southern Chico Creek Bridge	Northern Boundary	.10	3-23-19	See Letter		15 ft. Concrete Base	406	310	716		716
70	IV	"		A	Lindo Channel	Northern Boundary	10.70	6- 8-15	C. L. Barr	J. E. Merrell	15'6"Concrete Base	71,479	57,941	138,526	7,856	136,378
	IV	"		A	Chico	Sta. 670	1.40	9- 8-15	See Letter	A. D. Haworth	Gravel Shoulders	3,918	3,976	7,894		7,894
348	IV	"		A	Oroville	Thirteen Road	4.38	7- 9-18	W. Blumenkrantz	C. W. Butts	15 ft. Concrete Base	106,673	44,984	142,657	7,602	150,259
432	IV	"		A	Across Feather River near Oroville		.72	3-25-21	Healy-Tibbetts Construction	Leon L. Clarke	Steel Bridge	164,777	12,213	173,984	6,114	180,130
	IV	"		A	At Feather River Bridge			5-25-21	See Letter	W. B. Butts	Steel	1,964		1,964	53	2,017
282	IV	"		A	At Feather River Bridge			5-25-21	See Letter		Tests	1,790		1,790		1,790
460	III	"	49	A	Westerly Boundary	2-1/2 Miles West Chico	5.74	6-22-21	Ruhstaller & Sons	A. C. Hewitt	Grading&15'6" Concrete Base	76,250	28,034	95,272	6,117	101,389
201	III	Calaveras	24	A	Westerly Boundary	Valley Springs	10.00	7- 3-16	Frank C. Winters	W. C. Ivers	Grading	65,072	6,067	71,139	6,193	77,332
201	III	"	24	B	Valley Springs	Jct. Stanislaus	10.00	8-11-21	See Letter	W. C. Ivers	Grading	58,214	20,042	78,256	4,737	82,993
93	III	Colusa	7	A	Hershey	Berlin	10.39	6-24-21	J. L. Schaad	W. H. Miller	15 ft. Concrete Base	64,629	54,866	113,495	6,953	120,448
93	III	"	7	A	Arbuckle	Hershey	.31	8-10-21	Perry & Hosmer Const. Co.	W. H. Robinson	22'5 ft. Tarmac Surf.	5,487		5,487	216	5,703
93	III	"	7	A	Hershey	Arbuckle	6.92		See Letter	W. H. Miller	Oiled Surfacing	2,302	4,245	2,997	166	2,765
93	III	"	7	A	Arbuckle	Sta. 0+00 "C"	3.73	6-25-21	See Letter	W. H. Miller	Oiled Surfacing	2,214	2,532	5,746		5,746
142	III	"	7	B	Berlin	Colusa Junction	11.67	8-10-21	J. L. Schaad	W. H. Miller	15 ft. Concrete Base	74,686	55,835	130,521	7,925	140,447
142	III	"	7	B	S.P.Crossing Colusa & Lake R.R.		.01	3-15-19	See Letter		15 ft. Concrete Base					
142	III	"	7	B	Berlin	Colusa Junction	7.33	8-10-21	See Letter	W. H. Miller	Oiled Surfacing	5,694	7,132	12,826	95	12,921
172	III	"	7	C	Colusa Junction	Northern Boundary	10.67	6-22-15	L. P. Kendall	W. H. Hatchet	15 ft. Concrete Base	46,915	46,432	97,347	4,110	101,457
172	III	"	7	C	Sta. 220+00 (Est.)		.03	3-26-19	See Letter	W. H. Wetmore	15 ft. Concrete Base	439	182	623	161	962
172	III	"	7	C	Colusa Junction	County Line	16.71	7-25-21	See Letter	W. H. Miller	15 ft. Concrete Base	71,870	16,565	88,435	7,031	95,466
141	III	"	15	A	Williams	Colusa	9.44	3-29-19	See Letter	W. H. Hatchet	15 ft. Concrete Base	79,307	46,696	126,081	5,040	131,121
141	III	"	15	A	Williams	Colusa	0.62	3-29-19	See Letter	W. H. Miller	15 ft. Concrete Base	5,756	3,183	8,939	300	9,239
141	III	"	15	A	Sta. 141	Sta. 174	.65	8-17-21	See Letter	W. H. Smith	18' Conc. Base & Tarmac Surf.	3,747	11,182	15,913	424	21,343
134	IV	Contra Costa	14	A	San Pablo Creek	Richmond	4.59	8-11-21	C. H. Patterson	C. I. Lee	Oiled Surfacing	4,230	3,913	8,143	76	8,219
134-114	IV	"	14	A	Richmond	Pinole	5.37	4-30-15	Bates, Borland & Ayer	W. B. Jennison	15'6 in Concrete Base	52,143	17,331	68,474	4,356	73,832
134-240	IV	"	14	A	Southerly Boundary	Pinole	1.54	9-10-21	Stanford Brown & Co.	Wm. B. Jennison	15 ft. Concrete Conc. Base	15,686	4,815	20,501	1,413	21,914
315	IV	"	14	A	300 ft.West Alameda Co.Line			7-15-15	See Letter	W. B. Jennison	Culverts	1,146	514	1,654	147	1,801
134-156	IV	"	14	A	Richmond	Pinole	5.37	7-15-15	See Letter	Wm. Seaver	Oiled Surfacing	2,929	1,552	4,434	111	4,545
180	IV	"	14	A	Sta. 350+33	Sta. 361+59	.09	7-28-20	Cancelled	4-8-20		323		323	272	595
158	IV	"	14	A	At San Pablo&Wild Cat Creeks			12-6-15	See Letter	W. B. Jennison	Wing Walls and Bridges	260	61	321	213	534
180	IV	"	14	B	Martinez	El Cerrito	6.49	9-22-14	Bates, Borland & Ayer	W. B. Jennison, Jr.	Grading	54,715	5,284	59,999	7,981	67,980
180	IV	"	14	B	El Cerrito (Ferme)	Berkley	3.65	7-7-15	Bates, Borland & Ayer	W. B. Jennison	Grading	41,294	6,727	47,021	3,706	50,727
134-180	IV	"	14	B	Berkley	Oakland	5.64	10-30-14	Whitlock & Morrill	W. B. Jennison, Jr.	15 ft. Concrete Base	94,442	28,583	77,025	5,110	82,135
130	IV	"	14	C	Berkley	Hart	4.49	8-28-17	See Letter	W. W. Hall	15 ft. Concrete Base	93,042	24,839	112,881	4,833	117,712
130	IV	"	14	C	At Volma		.19	6-29-17	See Letter		Conc.Abutments	3,460		3,460	1,885	5,345
134-180-133	IV	"	14	B	Mercline	Hart	.82	9-13-19	See Letter		Grading		17,211	17,211	1,618	18,829
301-446	I	Del Norte	1	A	Wilson Creek	Castle Crags	16.01	7-28-21	Clyde W. Wilcox	C. W. Hart	20'6" Concrete Base	281,915	241,554	541,469	44,186	585,655
397	I	"	1	B	Cushion Creek	Crescent City	4.08	12-15-19	Fuller & McMinn	W. H. Hamert	Grading, Conc.	49,931	9,010	57,741	2,800	60,541
259-308	I	El Dorado	11	A	White Rock	Shingle Springs	10.38	11-26-19	See Letter	C. W. Todd	12 ft. Concrete Base	310,867	47,287	350,474	6,929	357,403
67	I	"	11	B	Shingle Springs	El Dorado	6.75	6-7-21	See Letter	C. W. Todd	12 ft. Oiled Macadam	87,036	10,962	97,998	4,529	102,527
67	I	"	11	B	El Dorado	Placerville	3.87	4-22-21	See Letter	C. W. Hamert	12 ft.Conc.Base-Oiled Surf.	147,196	28,038	180,834	4,928	185,762
51	VI	"	4	A	Pyramid Lake Road	Camino	17.39	10-20-21	See Letter		Grading & Conc. Surf.	3,950		3,950	580	4,530
51	VI	Fresno	4	A	Fowler	Kingsburg	8.21	11-21-21	A. Teichert & Sons	R. W. Chesbrough	15 ft.Conc.Base-Oiled Surf.	44,716	31,316	72,034	4,625	76,659
52	VI	"	4	A	Fowler	Kingsburg	3.71		California Const. Co.	C. W. Bair	Conc.Slabs&Asph.Surf.	41,440	34,451	75,891	1,544	77,435
52	VI	"	4	A	Fowler	Fresno	7.27		A. Teichert & Sons	R. W. Chesbrough	15 ft.Conc.Base-Oiled Surf.	43,175	41,259	84,434	2,172	86,606
52	VI	"	4	A	Fresno	Fowler	2.09	11- -21	Mesch-Newsom & Co.	C. L. Poulos	Concrete Surfacing	22,148		22,148	1,412	23,560
96	VI	"	4	A	Fresno-Kings Co. Line, 38'46"E to Sta.		1.74		See Letter		Bituminous Pavement	230		230		230
96	VI	"	4	A-C	Van Ness Blvd. & Belmont Ave. Intersections			9-7-19	See Letter		Conc.Base-Barrecrete Surf.	1,180		1,180		1,180

COMPLETED CONTRACTS, JUNE 30, 1922.

Con.No.	L.O. No.	Div.	County	Rte.	Sec.	From	To	Length Contract (Miles)	Contract Date	Contractor	Res. Engineer	Type of work	Final Estimate Work	Materials	Total	Exp. during Const.	Total
8	9	VI	Fresno	4	C	Fresno	Herndon	9.56	5-27-22	Tormicel St.Pav.Co.	D.F. Chamberlin	15 ft.Conc.Base-Oil Surf.	46,097	20,536	66,633	3,100	69,733
246	303	VI	"	10	U	Fresno	Oil Well Northeasterly	6.04	6-19-22	Peterson Const.Co.	Jno. Bair	Oil Surfacing	29,159	13,984	43,143	980	44,123
246	303	VI	"	10	U	Coalinga	Oil King School	8.06	6-19-22	Peterson Co. Donovan	S.T. Corfield	Oil Conc.Base	136,478	112,531	249,004	3,759	252,763
D-337	360	VI	"	10	R	Oil King	Oil King School	10.00	5-24-21	Dosch C. Mitchell	R.L. Stump	Asphaltic Concrete Surf.	215	115	330	8,662	373,812
10	10	VI	"	10	P	Oil King School	Huron Road	12.00	5- 3-21	Dosch C. Mitchell	R.L. Stump	12 ft. Conc.Base	228,662	140,848	369,510		
D-779	436	VI	"	10	F	At Sta. 27+40 & 84+26		.10	8-25-21	Day Labor		Bridge Approaches	354	64	418	1,058	1,476
113	131	III	Glenn	7	A	Southerly Boundary	Willows	8.39	11-8-21	C.W. Cross	H.R. Hatchel	15 ft. Conc.Base	46,281	35,175	76,456	5,871	81,327
113	131	III	"	7	A	County Line	Willows	6.96	5-23-22	Day Labor	J.A. Mc Davitt	Oil Surfacing	2,676	798	3,474	103	3,577
D-424	1-1-177	III	"	7	A&B	Adjoining town of Willows		.68	1-18-22	Day Labor	C.S.F. Larkhoff	18 ft. Conc.	7,342	7,675	15,017	808	15,825
113	177	III	"	7	B	Willows	Grapit	9.43	7-7-15	Taylor & Berliner	H. Carter	15 ft. Conc.Base	38,554	43,290	81,844	4,744	86,588
172	242	III	"	7	B	At Walker Creek		1.04	7-10-16	M. Jacinto & A.L. De Rosa	H.R. Hachet	15 ft.Conc.Base & Bridge	8,552	5,315	13,867	956	14,823
203	268	III	"	7	B	Walnut Creek Bridge Approx.		.04	2-25-19	Day Labor	A.L. Mc Davitt	15 & 21 ft.Conc.Base	905	197	302	158	1,060
D-347	04-247	III	"	7	B	Willows	Grapit	10.44	5-23-19	R.M. Miller	R.M. Miller	Oil Surfacing	14,810	9,044	23,854	1,076	24,930
7	67	III	"	7	C	Grapit	Northerly Boundary	8.96	6- 9-14	C.W. Moore	W.L. Heaton	15 ft. Conc.Base	49,374	17,789	58,163	2,763	60,918
D-70	97	III	"	7	C	Grapit	Northerly Boundary	6.34		Day Labor	J.W. Barnard	Oil Surfacing	3,087	1,456	4,543	343	4,886
303	87	III	"	7	C	Across Hambright Creek		.02	6-14-21	Jenkins & Elton		Bridge	8,733	1,820	9,943	851	10,794
7	97	III	"	7	C	At Stacey Creek			11- 2-21	Jenkins & Elton	C.S.F. Larkhoff	Rock Protection	6,382		6,382	692	7,074
D-415	67	III	"	7	C	At Hambright Creek bridge			11-17-21	Day Labor	L.O. Wallace	Conc.Base & Guard Rail	330	287	617		617
44	56	I	Humboldt	1	A	Carberville	Sec.1,7 S.,R.3.E.	5.48	10-13-13	Fairbairn & Baechtel	A.D. Kennedy	Gravel	49,076	3,391	52,466	2,463	54,929
60	78	I	"	1	A	Southerly Boundary	Sec. 1, T.1 S., R.3E.	4.58	4-22-14	Berry, Mackie & Co.	A.D. Kennedy	Conc. Bridge	60,619	4,106	64,725	1,984	66,709
D-345		I	"	1	A	Appro. to South Fork Bridge			8-15-19	Day Labor		Grading	1,703	99	1,762	34	1,796
D-423	54-78	I	"	1	A	Southerly Boundary	Carberville		5-9-22	Day Labor		Gravel Surface	2,698	4,047	6,745		6,745
211	302	I	"	1	B	Carberville	Miranda	15.61	11-19-17	Fahrer & Mc Brode	S.W. Cameron	Grading	249,458	23,871	273,330	14,133	287,472
211	302	I	"	1	B	Across Bear Gulch		.04	7-20-21	Frank H. Green	H. Eardith	Conc. Bridge	39,977	9,458	49,435	3,404	41,839
D-250	302	I	"	1	B	Sta. 370+00	Sta. 850+00	4.95	9- 3-19	Day Labor		Graveling	2,800	18,463	21,263		21,263
D-269	302	I	"	1	B	At Sta. 94 & Bean Creek			10-15-19	Day Labor		Bridges	13,126	4,663	17,807	134	17,941
93	118	I	"	1	C	Myerville	Myerville	13.73	5-11-14	Fairbairn & Baechtel	S.W. Cameron	Grading	153,041	9,463	162,504	7,684	167,508
71	91	I	"	1	D	Myerville	Shingle	7.20	9- 9-18	Frank Smith & G.W. Conners	F.E. Mackney	Grading	97,247	5,422	102,669	5,822	108,291
104	110	I	"	1	D	Shingle	Jenkins Creek	5.76	10-15-19	Mc Donald & J.J. Clancy	J.H. Frost	Grading	37,371	1,954	39,325	2,823	41,148
D-153	91	I	"	1	D	Sta. 1+00	Sta. 13+00	.25	9-13-17	Day Labor	Fred Lerwill	Grading	4,430	193	4,623		4,623
136	209	I	"	1	E	Big Bell	Bell	6.86	5- 9-18	Nater, Boland & Aver	J.W. Frost	Steel Bridge	52,240	4,017	56,257	3,556	71,653
166	230	I	"	1	E	Bell Bluer bridge near Scotia		.19	4-25-16	Mercer, Fraser Co.	J.P. Johnson	Steel Bridge	107,302	13,685	120,407	1,214	121,621
281	1-1-299	I	SHP	1	F	South Fortuna Bridge	Fortuna	12.13	5-24-21	Mercer, Fraser Co.	J.H. Stanford	18 & 18 ft. Conc.Base	167,968	101,340	269,308	1,801	271,109
265	297	I	"	1	F	Rio Dell	Fortuna	6.51	9-18-17	A. Robinson & R.H. Smith	Fyrne Lerwdith	Grading	42,862	3,713	46,575	3,256	49,853
297	297	I	"	1	F	2 Mi. north of Rio Dell	1/4 Mi. south of Alton	.80	10-31-13	Day Labor	C.L. Long	Grading	12,394	232	12,626	884	13,490
D-216		I	"	1	F	Vanduzen Creek Bridge Est.		.15	3-21-19	Day Labor		Timber Bridge	1,161		1,161		1,161
153	135	I	"	1	G	Loleta	Beatrice	4.30	10- 6-14	Ellis Ware & Jacobs	R.H. Nixon	Grading	31,774	2,533	34,307	2,160	36,467
169	135	I	"	1	G	Loleta	Beatrice	4.19	7-15-15	Ellis Ware & Jacobs	T.W. Dunmore	15 ft. Conc.Base	32,976	3,486	36,462	2,342	38,804
D-279	346	I	"	1	G	Eureka Slough Bridge		.13	2-28-19	Mercer, Fraser Co.	J.C. Lewis	Timber Bridge	64,262	16,992	81,254	2,695	83,948
		I	"	1	G	Eureka	Eureka	7.94	10-15-19	Day Labor	J.J. Stockard	15 ft. Conc.Base	169,538	78,660	248,198	12,800	260,998
238	343	I	"	1	H	Eureka	Arcata	6.17	3-13-18	Mercer, Fraser Co.	Gradng		66,668	11,025	77,687	8,295	105,982
D-308	343	I	"	1	H	Eureka	Arcata	6.20	3-22-22	Day Labor	J.J. Stockard	Gravel Surface	19,152	24,310	43,462	1,291	44,753
D-343	434	I	"	1	H	S. 19, T 7 N., R. 1 E.	Strawberry Creek	.50	5-29-20	Day Labor	J.J. Stockard	Grading	11,091	1,801	12,892	1,202	14,094
407	407	I	"	1	I	Near Red River		.15	8-23-20	Day Labor	J.J. Stockard	12' Tile drain	508	20	528		528
249	386	I	"	1	J	Freshwater Lagoon	Orick	2.80	7-28-19	A. Hildebrant & J.F. Reddy	C.H. Parry	Grading	41,418	2,990	44,408	4,548	48,954
197	117	VII	Imperial	12	A	Western Creek	Coyote Wells	6.02	10- 6-14	J.W. Calbet	C.H. Woodrice	15 ft. Conc.Base	82,590	23,363	105,953	6,665	112,618
197	117	VII	"	12	A	Western Creek Bridge		.06	11-23-15	Holland Const. Co.	C.H. Harvell	Concrete Bridge	20,382	8,118	28,500	2,252	30,752
D-190	117	VII	"	12	A	San Diego & Arizona R.R.Crossing				Day Labor	C.H. Woodrice	Abuts. for Under Crossing	2,636	2,979	5,614	35	5,649
196	214	VII	"	12	A	Western Canyon	Coyote Wells			Day Labor	C.H. Hopkins	Constructing Detours	1,997	105	2,102	38	2,140
D-196		VII	"	12	A	Western Canyon Grade		5.11	1-14-20	Day Labor	C.O. Kelmer	Widening	16,657	2,814	19,471	308	19,779
116	142	VII	"	12	B	Coyote Wells	Dixie Land	11.74	12- 8-14	Rice & Dutcher	A.M. Allen	15 ft. Conc.Base	76,639	34,997	111,636	5,481	117,017
161	214	VII	"	12	B	Mc Cain	El Centro	11.87	12-15-15	Fred Hoffman	A.M. Allen	15 ft. Conc.Base	72,056	35,775	107,831	4,112	111,943
178		VII	"	12	C	New River Bridge		.06	8- 5-17	Mercerau Brg. Const. Co.	L.W. Hanson	Concrete Bridge	12,279	7,276	19,550	1,610	21,160
D-165		VII	"	12	C	Foreign at Brawley Canal		.01	1-21-16	Day Labor		18 ft. Conc.Base					
D-165		VII	"	12	C	Sta. 0+00		.25	1-21-16	Day Labor	L.W. Hanson	Grading	2,663		2,663	79	2,742
22		VII	"	12	C	Appro. to New River Bridge		.25	3-22-19	Day Labor		15 ft. Concrete Base	2,334	1,547	3,881	32	3,913
D-254	309	VII	"	9	A&B	Sta. 307+22 Sec. A	Sta. 369 Sec. B	10.23	10-20-21	Day Labor	F. Jaye George	22 ft. Conc. Base	1,283	5,460	6,743	98	6,841
D-254	407	VII	"	9	B	Knox Corrigan	Tule Wash	11.23	1- 7-16	Day Labor	C.H. Harvell	8 & 15 ft. Conc.Base	139,977	48,218	188,195	4,734	192,929
262	413-414	VII	"	9	D&E	Northerly Boundary	Tule Wash	14.86	5- 4-20	Day Labor	H.C. Hester	Conc.Base	109,972	142,828	252,800	3,303	256,103
397		VII	"	9	A	High Line Canal	1 Mile east	1.00	10-15-19	Day Labor		15 ft. Millite Pavement	33,529	6,981	40,510	911	41,421
266	408	VI	Inyo	23	A	Indian Allotment	Division Creek	7.47	8- 4-20	Chas. D. Seterns	C.W. Rosenberg	Grading	35,972	2,566	37,538	2,157	39,415
D-266	408	VI	"	23	A	Independence	Division Creek	2.73	11-13-19	Day Labor		Grading	15,473	2,008	16,481	794	17,275
314	383	VI	"	23	A	Division Creek	Fish Springs School	10.35		Day Labor	C.C. Boyer	Grading & 8 ft. Conc.Base	82,377	22,598	104,975	5,218	110,193
106	125	VI	"	23	A	Round Valley	Northerly Boundary	3.84	1-23-19	Day Labor		Grading	43,327	4,262	47,589	2,516	50,105
		VI	Kern	6	A	Southerly Boundary	2.3 Mi. Sw. of Rose Sta.	10.30	10- 6-14	A.D. Coleman Const. Co.	C.C. Boyer	Grading	86,434	5,177	92,561	4,256	101,839
75	196	VI	"	4	A	Southerly Boundary	2.3 Mi.So. of Rose Sta.	8.56	9-24-15	Day Labor	F. H. McGill	Oiling Graded Road	3,617		3,617	289	3,906
D-249	196	VI	"	4	A	Southerly Boundary	2.3 Mi.So. of Rose Sta.	10.54	8-30-19	Day Labor	C. W. Rosenberg	20 ft. Conc. Base	373,938	101,616	477,451	6,334	481,785
96	196	VI	"	4	B	Grapevine Creek	Sec. 5 & 6, T. 32 S., R. 28 E.	17.29	8-26-14	Lyon & Atkinson	C. W. McGill	Oil Surfacing	250,825	52,795	283,530	3,734	287,264
D-96	196	VI	"	4	B	Grapevine Creek	Sec. 1 & 6, T. 32 S., R.28 E.	11.39	1-7-16	Day Labor		Oil Surfacing	514	1,504	2,018		2,018
D-333	196	VI	"	4	B	Sta. 790+17	Sta. 812+37	.94	5-22-20	Day Labor	L. J. Vincent	20 ft.Conc.Base 2nd Story	12,715	12,211	24,926	44	24,970

COMPLETED CONTRACTS, JUNE 30, 1922.

Con.No.	L.O. No.	Div.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Res. Engineer	Type of Work	Final Estimate			Serv. During Contr.	Total
													Work	Materials	Total		
D-413	106	VI	Kern	4	B	Grapevine Creek	Sta. 409+36	6.35	11-17-21	Day Labor	C. C. Le Lacey	3-C Of Fl. Conc. Shrubbers	38,985	26,603	65,588	938	66,116
D-57	77	VI	"	4	B	1.4 Mls. S. of Arvin	Bakersfield	1.96	5-7-14	John D. Marsh	J. C. North	15 ft. Concrete Base	94,338	47,193	141,531	6,298	148,259
D-57	77	VI	"	4	B	Bakersfield	Haberfield	13.00		Day Labor	C. C. Farnes	Oiled Surfacing	4,779	3,888	8,668	296	8,999
D-57	77	VI	"	4	B	Haberfield	Lerdo	10.15	2-26-14	Geo. C. Season & Sons	C. V. James	15 & 24 ft. Conc. Base	96,661	41,759	76,820	4,576	81,395
D-57	77	VI	"	4	B	Lerdo	Shafter	1.4	1-15-15	Day Labor	R. B. McGill	Reinforced Concrete Slope	3,090	1,968	5,058	418	5,476
D-57	77	VI	"	4	B	Shafter	Wasco	5.0	1-15-15	Day Labor	R. B. McGill	Reinforced Concrete Slope	3,090	1,968	5,058	418	5,476
D-57	77	VI	"	4	B	Wasco	Sta. 409+36	6.35	11-17-21	Day Labor	C. C. Le Lacey	3-C Of Fl. Conc. Shrubbers	38,985	26,603	65,588	938	66,116
D-413	106	VI	Kern	4	B	Grapevine Creek	Sta. 409+36	6.35	11-17-21	Day Labor	C. C. Le Lacey	3-C Of Fl. Conc. Shrubbers	38,985	26,603	65,588	938	66,116
D-432	69	VI	"	4	D	Haberfield	Lerdo	10.14		Day Labor	R. B. McGill	Oil Surfacing	4,309	2,437	6,746	260	6,906
D-343	435	VI	"	4	D	Haberfield	Meadow Lane	.37	8-17-20	Day Labor	C. V. James	15 ft. Concrete Base	3,455	1,969	5,424	94	5,518
D-51	70	VI	"	4	D	Lerdo	Shafter	5.0	8-26-14	Geo. C. Season & Sons	C. V. James	15 ft. Concrete Base	70,453	37,063	107,516	4,059	111,575
D-41	70	VI	"	4	D	Lerdo	Famosa	2.09		Day Labor	R. C. Farnes	Oil Surfacing	3,952	2,750	6,702	277	6,979
D-52	53	VI	"	4	D	Shafter-Boundary	Bakersfield	12.43	4-20-14	Chas. T. Atkinson	A. P. Darlinghouse	15 ft. Concrete Base	51,350	50,799	102,149	3,702	105,851
D-38	82	VI	"	7	F	Northerly boundary	Bakersfield	12.44		Day Labor	R. C. Farnes	Oil Surfacing	4,400	2,667	7,066	313	7,378
D-300	445	VI	"	7	AA3	Southerly boundary	Northerly boundary	10.52	7-17-21	Geo. C. Season & Sons	C. V. James	15 ft. Concrete Base	209,328	71,917	417,245	8,000	425,245
D-300	445	VI	Kings	7	A	Tulare County boundary	Hanford	6.96	6-22-16	Geo. C. Season & Sons	C. M. Brown	15 ft. Concrete Base	97,668	37,503	95,033	3,515	98,548
D-126	171	VI	"	10	A	"	Sta. 347+50	.70	12-23-19	Concrete Products Co.	"	Concrete Culvert	378	201	579	"	579
D-74	437	VI	"	10	B	Easterly boundary	1 Mi. S. of Lemoore	12.34	11-7-20	Slater & Cardinal	R. T. Swaps	15 ft. Concrete Base	410,526	435	411,961	8,857	419,818
D-417	437	VI	"	10	B	Easterly boundary	1 Mi. S. of Lemoore		12- 7-21	Day Labor		Reconstruction Fence	54		54		54
D-417	437	VI	Lake	10	A	Lemoore	Lemoore	9.36	9- 5-19	Dirkswager & Pet-ross Inc.	C. A. Potter	Grading	131,325	8,449	139,774	9,849	149,623
D-405	448-512-513	VI	Larson	29	AJ	"	"					Test Boring	118		118		118
226	333	VI	Larson	29	B	Chester	Westwood	14.90	10-20-21	J. F. Moffatt	J. W. Bissell	Test Boring	101,421	12,385	113,806	20,926	134,732
						Coppervale	Honeyville		7- 2-18			Grading					
134	471	VI	"	29	H	Westerly City Boundary	Pine St., Susanville	.19	10-14-20	Ransome Scalff. Const. Co	R. P. Lyons	Grading	3,096	133	3,229	315	3,544
134	471	VI	"	29	H	Near Honeyville	"	1.00	7-29-17	Day Labor	"	Grading	529	247	776	"	776
D-303	333	VI	"	29	H	Susanville	Honeyville	15.00	4-2-20	Day Labor	P. C. Kacanly	Gravel Surface	133,110	10,656	153,618	127	153,745
D-303	333	VI	"	29	H	Coppervale	"	.90	7-14-21	C. W. Gildersleeve	R. P. Lyons	Concrete Bridge	1,373	2,122	3,495	595	10,090
17	17	VI	Los Angeles	2	A	Across Santa Ana River	Rancho El Encino	6.50	10-25-17	Geo. Green Bros. Co.	C. H. Foster	15 ft. Conc. Base-Oil Surf.	36,538	14,058	83,179	3,694	84,873
261	17	VI	"	2	A	Lankershim Boulevard	South Cheviot Way	5.32	9-12-19	Grunat & Justin, Inc.	H. C. Veeder	30 Conc. Base-15 Topp. Surf.	50,025	10,040	60,065	1,726	62,393
21	39	VI	"	2	B	Rancho El Encino	Calabasas	10.27	3- 4-13	John D. Marsh	C. F. Swallwaper	15" Conc. Base-Oil Surface	69,508	28,862	98,360	7,727	106,087
319	39	VI	"	2	B	Rancho El Encino	Sharp Ave.	5.65	8-31-22	C. W. Bedford	C. W. Ainley	Shims, Adjust. Bases Guttery					
21	39	VI	"	2	B	At Sta. 307+20	"		9-29-21	Day Labor	C. W. Ainley	Installing 24" C.M.P.	127		127		127
21	38	VI	"	2	C	Calabasas	Easterly boundary	11.38	12-23-13	Gillette, Montgomery & Tracy	C. H. Foster	15 ft. Concrete Base	108,988	28,826	137,813	8,602	146,422
267	38	VI	"	2	C	Russell Ranch	Former Easterly Boundary	1.29	9-26-18	Geo. H. Curtis	C. W. Ainley	18 ft. Concrete Base	30,535	10,614	41,249	1,276	42,525
21	38	VI	"	2	C	Calabasas	Easterly Boundary	11.38		Day Labor	R. B. Fenix	Oil Surfacing	11,147	2,047	13,194	638	13,832
21	38	VI	"	2	C	Calabasas Maintenance Sta.	"		10-23-19	Day Labor	C. W. Webber	Fireplace & Fence	2,401	579	2,980	"	2,980
21	38	VI	"	2	D	Across Rio Hondo		1.09	8-15-16	Geo. H. Jones	H. C. Foster	Steel & Concrete Bridge					
134	106	VI	"	4	A	Castaic	Castaic	4.21	7-11-15	R.E. Kennedy & F. Williams	H. C. Foster	15 ft. Concrete Base	20,962	10,537	31,499	3,228	34,727
181	272	VI	"	4	A	Castaic	Castaic School	4.08	5-22-17	Brashear, Burns Co.	L. W. Cumming	15 ft. Concrete Base	26,740	13,740	40,480	3,432	43,912
181	268	VI	"	4	A	Santa Clara River				Day Labor	C. J. Kerr	Rock Protection	2,153		2,153	524	2,677
D-159	272	VI	"	4	A	Newhall Property			6-19-18	Day Labor		Fencing Right of Way	491		491		491
D-159	272	VI	"	4	AA3	Sta. 330+00 Sec. E1	Sta. 300 (Sec. 8)	3.74	4-3-20	Day Labor	W. F. Bixby	Bridge & Pipeline Surface	36,780	17,662	54,442	1,342	44,971
101	129	VII	"	4	B	Castaic School	Sec. 17, 7.6 W., R. 17 W.	10.84	9-22-14	Mahoney Bros.	E. J. Steele	Grading	129,237	6,970	134,107	12,735	146,922
202	129	VII	"	4	B	Castaic School	Ray Ranch	3.79	8-26-17	Brashear, Burns Co.	J. G. Beckford	20 Ft. Concrete Base	57,472	13,695	71,122	4,611	75,732
181	129-151	VII	"	4	BC	Ray Ranch	Sec. 17, 7.6 W., R. 17 W.	12.94	9-11-19	Day Labor	C. W. Ainley	Filling Graded Road	21,998	6,000	27,998	1,000	28,998
181	129-151	VII	"	4	BC	Completing Ridge Route		14.92	9-11-19	Day Labor	H. C. Foster	20 Ft. Concrete Base	195,714	162,686	358,400	5,600	364,000
D-147	98-129	VII	"	4	C	Castaic Junction	Northerly Boundary		7-15-20	Day Labor	C. S. Grace	Gravel Surface Terrace	34,000		34,000	1,000	35,000
120	151	VII	"	4	C	Sec. 17, 7.6 N., R. 17 W.	Liebre Mountain	14.52	12-22-14	Los Moor Const. Co.	H. S. Gripper	Grading	301,938	14,466	316,404	13,872	330,276
120	151	VII	"	4	C	Sec. 17, 7.6 N., R. 17 E.	Liebre Mountain	14.52	8-24-15	Day Labor	H. S. Gripper	Filling Graded Road		See P-30			
D-146		VII	"	4	C	Moving pile line to Ridge Route			9-6-17	Day Labor	C. S. Grace	For Water Supply	2,527	1,227	3,754		3,754
D-146		VII	"	4	C	Moving Shop to Ridge Route			11-21-17	Day Labor	C. S. Grace	For Water Supply	5,312		5,312		5,312
D-178	98-151	VII	"	4	CAD	Sta. 253+00 Sec. C	Sta. 139+00 Sec. D	6.76	1-10-18	Day Labor	C. S. Ainley	20 Ft. Concrete Base	139,183	56,729	195,912	2,526	198,437
178	98	VII	"	4	D	Liebre Mountain	Northerly Boundary	12.52	6-9-14	Los Moor Const. Co.	C. G. Eckert	15 Ft. Concrete Base	147,596	36,622	183,218	1,043	184,261
D-90	98	VII	"	4	D	Liebre Mountain	Northerly Boundary	8.34		Day Labor	L. W. Cumming	Oil Surfacing	4,403	1,062	5,465	558	6,023
D-168	98	VII	"	4	D	Liebre Mountain	Northerly Boundary	4.20	10-11-17	Day Labor	C. G. Eckert	Oil Surfacing	2,366		2,366	252	2,618
184	98	VII	"	4	D	Castaic Junction	La Liebre	4.90	7-23-17	Day Labor	R. J. Sheafe	20 Ft. Concrete Base	37,000	13,389	51,389	4,312	55,701
213	301	VII	"	9	A	San Fernando	Rancho Tujunga	10.02	11-19-17	A.L. Weyer & G.E. Oswald	C. F. Swallwaper	15 Ft. Concrete Base	109,854	50,237	125,796	3,855	129,651
213	301	VII	"	9	A	Across N. Branch of Big Tujunga	"	.16	9-10-21	F. W. Leibetter	L. D. Packard	Reinforced Concrete Bridge	14,017	971	14,988	4,588	19,576
285	439	VII	"	9	A	Across S. Branch of Big Tujunga	River	.03	9-10-21	Mercereau Bros. Const. Co.	L. D. Packard	Concrete Bridge	24,995	5,316	30,311	1,060	31,379
D-234	301	VII	"	9	A	At Dunsmuir Station	"	.30	3-25-19	Day Labor	"	Guard Rail	1,055	86	741		741
256	184	VII	"	9	A	At Pacoima Canyon Bridge	"	.02	6-25-19	Day Labor	"	Bridge Approaches	8,450	400	8,850	1,850	10,700
178	165-166	VII	"	9	CAD	County Highway Div. 3A	Easterly Boundary	.60	4-8-18	Day Labor	C. H. Wendrien	18 Ft. Concrete Base-Oil Surf.	7,153	2,843	10,000	850	10,850
D-190	225	VII	"	9	I	Near Dinkeys				Day Labor		Bank Protection	400		400		400
327	391	VII	"	23	B	Santa Clara River Bridge		.04	1-23-19	J.F. Shuster & R.A. Peterson	H. C. Veeder	Concrete Bridge	8,530	3,147	11,667	808	12,475
327	391	VII	"	23	B	Santa Clara River	Williams Ranch	1.86	8-30-19	Pressdeprest Const. Co.	C. F. Montgomery	20 Ft. Concrete Base	30,994	13,662	40,646	1,656	42,302
D-159	391	VII	"	23	B	Santa Clara River Bridge				Day Labor		Concrete Pilings	443	1,178	1,621		1,621
D-159	391	VII	"	23	B	Santa Clara River Breakers.			2-14-20	Day Labor		Grading	104		104		104
D-150	281	VII	"	23	D	Seeley Ranch	Near Acton	10.60	7-18-17	Day Labor	C. N. Ainley	20 Ft. Concrete Base	125,009	81,941	206,950	5,514	212,464
796	290	VII	"	23	K	2 Mi. N. of Acton	Palmdale	8.64	9-26-19	Fred Hoffman	H. C. Foster	20 Ft. Concrete Base	209,940	75,515	285,455	10,267	295,722
D-796	290	VII	"	23	K	Near Acton	Near Vincent	2.00	5-16-18	Day Labor		Grading	17,054	1,854	18,908	852	19,760
796	453	VII	"	23	K	Lancaster	Northerly Boundary	6.00	3-31-21	Southwest Paving Co.	C. F. Montgomery	15 Ft. Concrete Base	174,982	108,820	283,790	10,959	294,749
D-479	479	VII	"	60	B	Easterly Mt. Wallace Ranch	Santa Ynez	7.40	6-13-22	Day Labor		Right of Way Condemnation	8,000		8,000		8,000
	16	VI	Madera	4	B	Southerly Boundary	Madera	9.99	6-27-12	Berwick St. Paving Co.	D. W. Chamberlain	15 ft. Conc. Base-Oil Surf.	49,368	24,398	73,566	4,234	77,800

Costs shown under D-63 include costs incurred under D-64.

COMPLETED CONTRACTS, JUNE 30, 1922.

Contract No	I.O. No	Dist.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Resp. Engineer	Type of Work	Federal Estimate: Work	Federal Estimate: Materials	Federal Estimate: Total	Emergency Relief Allot.	Total
D-137	10	VI	Madera	4	A	Southerly Boundary	Madera	1.00	3-8 -22	Day Labor	J. C. Obertseuffer	Concrete Shoulders	4,597	3,866	8,463	340	8,803
138	11	VI	"	4	C	Madera	Chowchilla	10.08	3-29-22	Thompson Company Co.		18 ft. Oil Macadam	68,683	741	69,424	4,965	74,389
139	12	VI	"	4	D	Northerly Boundary	Gallinas Creek	5.00	3-29-22	Hermance Bros. & Co.	C. E. Wells	18 ft. Concrete Base	33,739	15,697	49,436	4,863	54,299
140	13	VI	Marin	1	A	Northerly Boundary	Gallinas Creek	4.78	3-29-22	Geo. A. Moraghan	C. Chatterton, Jr.	Grading	39,311	11,342	50,653	3,802	54,455
201	186-299	IV	"	1	B	Northerly Boundary	San Rafael	15.97	10-19-21	Leland J. Tenney	R. J. Brown	15 ft. Concrete Base	242,258	102,329	344,587	24,390	368,977
D-55	190	IV	"	1	A	Northerly Boundary	Gallinas Creek	1.71	12-2 -21	Day Labor	C. C. Cottrell	Gravel Surfacing	2,730	733	3,463	43	3,506
D-256	198	IV	"	1	A	Sta. 247+25	Sta. 298+85	.93	3-1-22	Day Labor	F. C. Lerner	Sweeping Oiling	3,530	37	3,567	197	3,764
V-580	299	IV	"	1	A	At Northerly City Limits	San Rafael		8-25-21	Day Labor	J. M. Mueller	Reconditioning Base	365	193	558	39	597
63	95	IV	"	1	B	Larkspur	Sausalito	4.00	5-15-22	Clyde Anderson	Clyde Anderson	18 ft. Concrete Base	60,401	18,176	78,577	5,147	83,724
173	95	IV	"	1	B	Larkspur	Sausalito	5.76	9-10-16	Marin Rock Co.	L. E. Atcheson	18 ft. Concrete Base	29,978	27,697	57,675	5,149	62,824
D-36	161	IV	"	1	B	Ross	Larkspur	.89	4-6 -16	Day Labor	C. C. Cottrell	18 ft. Concrete Base	12,472	5,162	17,634	686	18,320
V-92	162	IV	"	1	B	At Corte Madera Creek		.09	4-6 -16	Day Labor	F. C. Lerner	Grading	17	17	34	2	36
V-253	95	IV	"	1	B	Larkspur	Sausalito	.99	5-8 -19	Day Labor	F. C. Lerner	18 ft. Concrete Base	12,259	10,283	22,542	1,075	23,617
V-254		IV	"	1	B	San Rafael Avenue		.09	5-8 -19	Day Labor	F. C. Lerner	Concrete Shoulders	1,334	1,334	2,668	843	3,511
214	234	IV	"	1	A	Novato Creek & Huron Slough		.16	12-14-17	Hutchinson-Hanrahan Co.	R. E. Lawrence	Concrete Bridges	33,294	7,327	40,621	1,180	41,801
234	234	IV	"	8	A	Ignacio	Black Point	2.75	4-8 -16	A. C. Flynn	A. C. Flynn	Grading	10,808	4,008	14,816	1,458	16,274
D-110	254	IV	"	8	A	Sta. 0+00	Sta. 138+00	2.12	8-11-16	Day Labor	A. C. Greer	Grading	15,663	75	15,738	1,536	17,274
161	198-241	IV	Marin-Sonoma	8	A	Petaluma Creek Bridge		.27	9-14-16	Healy-Tibbitts Con. Co.	C. B. Foley	Concrete Bridge	93,912	7,083	100,995	6,966	107,961
D-262		IV	"	8	A	Petaluma Creek Bridge			11-16-19	Day Labor		Auxiliary Power	560	1	561		561
D-287	198-241	IV	"	8	A	Petaluma Creek Bridge			11-4-19	Day Labor	H. W. Screlber	Concrete Repair & Int	7,998		7,998	36	8,034
157	206	VI	Mariposa	18	A	Westerly Boundary	Cathey Thite Rock Pond	10.05	11-9 -15	C. B. Foley	B. S. Sather	Grading	65,904	5,966	71,870	6,555	78,425
D-111	206 (Exc.)	VI	"	18	A	Owens Creek Bridge, Sta.47+9		.02	10-11-16	Day Labor	B. S. Sather	Concrete Bridge	4,211	1,189	5,400	443	5,843
D-143	356	VI	"	18	A	Westerly Boundary	Sta. 531	10.05	4-5 -17	Day Labor		Oil Surface	1,437	1,482	2,919	79	2,998
V-108	345	VI	"	18	B	Cathey White Rock Road	Agua Fria Creek	7.83	7-18-16	Day Labor	B. S. Sather	Grading	134,821	6,983	141,804	5,080	146,871
176	319	VI	"	18	C	Agua Fria Creek	Chowchilla	5.70	10-17-17	Day Labor	B. S. Sather	Grading	83,316	4,758	87,074	4,886	91,960
D-244		VI	"	18	C	Agua Fria Creek Bridge		.03	8-8 -19	Day Labor		Concrete Bridge	6,560	2,731	9,291	75	9,366
301	458	VI	"	18	D	Merriman	Sierra National Forest	7.84	5-25-21	Callaway & Hayes	J. R. Terkhorne	Grading	111,656	11,946	123,602	10,233	133,837
D-294	415	VI	"	18	N	Sierra National Forest	Sierra National Park	1.98	1-6 -20	Day Labor	Carl Nelson	Grading	26,800	1,989	28,791	133	28,926
2	2	I	Mendocino	1	B	Hopland	Ukiah	10.91	5-23-13	General Construction Corp.	J. A. Lathrop	Grading	92,300	3,013	95,313	2,075	97,388
87	109	I	"	1	B	Hopland	Ukiah	11.40	8-11-14	Ward Bros.	J. D. Archer	15 ft. Concrete Base	78,690	15,553	94,243	8,164	102,387
D-113	109-250	I	"	1	B	4 Mi. South of Ukiah	Ukiah	4.06		Day Labor	J. D. Archer	Oil Surfacing	1,929	1,700	3,629	36	3,729
28	28	I	"	1	B	Ukiah	Forsythe Creek	7.73	3-26-13	H. Lawrence & C. White	J. D. Archer	Bridge Repairs	74,319	4,539	78,858	5,612	84,470
57	55	I	"	1	B	Forsythe Creek	Ridgewood	4.55	4-22-14	Ward Bros.	Hans Kersnik	Grading	55,912	3,992	59,904	5,027	64,931
D-	57	I	"	1	B	Ridgewood	Longvalley	4.61		Day Labor	L. O. Kennedy	Grading	52,377	4,125	56,502	5,027	61,529
20	27	I	"	1	B	Ridgewood	Willits	6.84	2-6 -13	Fairbairn & Boschiel	L. O. Kennedy	Grading	38,366	872	39,138	3,413	42,551
D-277	27	I	"	1	B	Willits			10-23-19	Day Labor		Temporary Covers			10		10
213	289	I	"	1	B	Willits	Arnold	8.21	11-17-17	Day Labor	F. M. Howard	Grading	121,215	7,163	128,378	5,564	134,382
253	299	I	"	1	B	Outlet Creek			11-3 -21	Day Labor	F. M. Howard	Concrete Culvert, Bridge	7,283	3,445	10,728	303	11,031
304	305	I	"	1	C	Across Outlet Creek		.03	6-14-22	Hart St. Corporation	J. A. Kitts	Concrete Bridge	5,998	5,336	11,334	681	12,015
305	305	I	"	1	C	Across Long Valley Creeks		.03	6-14-22	Hart St. Corporation	Reese L. Caldwell	2 Concrete Bridges	9,799	8,944	18,743	1,054	19,797
306	305	I	"	1	C	Across Long Valley Creek		.01	6-22-22	C. H. Gilderleeve	H. R. Cartel	2 Concrete Bridges	5,163	2,654	7,817	235	8,052
247	307	I	"	16	A	Hopland	Easterly Boundary	9.74	6-29-21	T. J. Hulbert	F. C. Kitts	Grading	146,378	21,474	167,852	10,409	180,260
69	18	VI	Merced	4	A	Merced	Southerly Boundary	14.27	8-27-14	Healy-Tibbitts Con. Co.	C. B. Foley	Concrete Base	59,554	61,662	121,216	7,145	128,361
D-12	18	VI	"	4	A	Merced	Southerly Boundary	14.35		Day Labor	B. J. Forbes	Oil Surfacing	5,398	3,143	9,041	393	9,434
D-176		VI	"	4	A	Sta. 261+13		.01	11-30-17	Day Labor		15 ft. Concrete Base	162	180	342		342
D-160		VI	"	4	A	Sta. 463+15	Sta. 463+47	.01	1-24-19	Day Labor		15 ft. Concrete Base	202	117	319		319
D-221		VI	"	4	A	Sta. 317+05.5	Sta. 320+92	.74	1-24-19	Day Labor		15 ft. Concrete Base	1,174	1,174	2,348		2,348
D-407	18-18	VI	"	4	AAC	Southerly Boundary	Merced	2.86	11-2 -21	Day Labor	H. J. Bair	Concrete Shoulders	9,253	13,320	22,727	c 362	23,089
D-442	18-18	VI	"	4	AAC	Sta. 148.318+50+15Sta275+57 Sec.	Sta. 156+84+42to Sta. 1030+60	6.52	3-28-22	Day Labor	H. J. Bair	Conc. Base, Oil Surf.	11,902	8,974	20,876	c 1,000	21,876
11	12	VI	"	4	C	Arena	Merced	10.86		Healy-Tibbitts Con. Co.	C. B. Foley	18 ft. Concrete Base, Oil Surf	61,592	34,435	96,027	6,922	102,942
D-179		VI	"	4	C	Sta. 684+33		.01	12-11-17	Day Labor			370	65	435		435
D-297	12	VI	"	4	C	Atwater			11-1 -19	Day Labor		15 ft. Concrete Base, Trans. Concrete Shelters	1,551		1,551	341	1,892
D-438	12-6	VI	"	4	CLD	Through Atwater & Livingston		1.00	3-8 -22	Day Labor	H. J. Bair	Concrete Shoulders	3,081	3,358	6,439	317	6,756
6	6	VI	"	4	D	Northerly Boundary	Arena	9.74	8-27-14	Healy-Tibbitts Con. Co.	C. B. Harper	18 ft. Trans. Base, Oil Surf	53,187	28,168	81,355	4,844	86,199
324	6	VI	"	4	D	Delhi	Northerly Boundary	4.26	7-28-21	J. J. Costello Jr.	F. G. Johnson	Asphaltic Conc. Surf.					
D-145	6	VI	"	4	D	Sta.0+59 & Sta.7+40		.02	7-5 -17	Day Labor		15 ft. Concrete Base	426	262	688		688
D-180		VI	"	4	D	Sta.115+15.3to 116+00 ,Sta.247+00		.03	2-1 -18	Day Labor		Riprap	2,629	1,016	3,645	45	3,690
D-246		VI	"	4	D	Sta.476+00 & Sta. 497+00		.15	6-3 -19	Day Labor		Culverts	1,039	591	1,629		1,629
D-331		VI	"	4	D	At Livingston			6-5 -20	Day Labor		Concrete Shoulders	1,177		1,177		1,177
340	349	VI	"	18	A	Merced	Easterly Boundary	14.89	4-25-19	J. C. Lee	K. K. Sare	15 ft. Concrete Base	170,186	159,529	329,715	15,933	345,648
V-79	203	VI	Mono	23	A	Southerly Boundary	Sherman Hill	5.00	10-4 -15	Day Labor	C. C. Boyer	Grading	41,098	3,173	44,271	3,319	47,590
D-101		VI	"	23	B	Sherman Hill	Whiskey Canyon	.83	4-4 -16	Day Labor	C. C. Boyer	Grading	16,651	13	16,664	345	17,010
D-189		VI	"	23	B	Road Crews Bridges		.03	4-15 -18	Day Labor	C. C. Boyer	Concrete Bridges	7,315	1,837	9,152	1,009	8,161
D-193		VI	"	23	B	Hart Creek Canyon		.03	4-30-18	Day Labor	C. C. Boyer	Retaining Curves, Etc.	25,538	1,560	26,776	2,572	29,481
D-199		VI	"	23	B	Hilton & Antelope Creeks		.04	5-14-19	Day Labor	C. C. Boyer	Bridges	6,268	880	7,148	304	7,452
A-248		VI	"	23	C	Whiskey Canyon	McGee Creek	7.81	3-6 -19	Day Labor	B. S. Sather	Grading	96,856	4,103	100,961	5,082	106,043
A-249		VI	"	23	B	Convict & Hot Creeks			5-15-19	Day Labor	C. C. Boyer	Bridges	10,302	639	10,942	798	11,740
D-197	236	VI	"	23	B	Sta. 0+00	Sta. 10+00	.19	7-14-19	Day Labor		Grading	1,713		1,713	23	1,736
D-193		VI	"	23	G	Dead Man Creek	Devils Punch Bowl	1.80	4-24-16	Day Labor	C. C. Boyer	Grading	23,127	1,224	24,351	1,743	26,094
D-194	352	VI	"	23	G	Devils Punch Bowl	Tioga Road	11.70	6-19-16	Day Labor	C. C. Boyer	Grading	87,697	5,491	93,188	4,816	98,004

COMPLETED CONTRACTS, JUNE 30, 1922.

County	L.O. No.	Dist.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Resident Engineer	Type of Work	Final Estimate Work	Materials	Total	Encr. Salvage Cost	Total
61	50	V	Monterey		A	Laguna	Monterey Boundary	4.34	10-29-15	R. A. Burns	R. C. Linton	Grading	31,314	2,307	33,621	3,555	39,176
131	95	V	"		A	Salinas	Soledad	4.91	4-7-21	Myers Portable Oil Heat	R. C. Linton	15 ft. Concrete Base	31,253	16,037	47,290	1,870	49,160
131	95	V	"		A	Soledad	Monterey Boundary	6.44	9-7-21	Ben Hur	R. C. Linton	15 ft. Concrete Base	41,522	9,683	51,205	1,900	53,105
1-151	154	V	"		C	Gonzales	Soledad	9.10	9-25-17	Ray Lobor	R. C. Moore	Oil Surfacing	7,045	2,553	9,598		9,598
151	154	V	"		C	Chualar	Gonzales	10.59	9-25-17	Ray Lobor	R. C. Moore	15 ft. Concrete Base	44,036	18,926	62,962	2,964	65,926
1-160	145	V	"		A	Salinas	Natividad	10.28	9-25-17	Ray Labor	R. C. Moore	Oil Surfacing	7,054	2,170	9,224	111	9,335
160	145	V	"		A	Natividad	Soledad	10.35	9-25-17	Albert A. McNeale	R. C. Moore	15 ft. Concrete Base	53,268	20,850	74,118	4,375	78,493
160	154	V	"		D	Soledad	Greenfield	11.14	8-10-21	Hardman Peck Con. Co.	O. C. Wratten	15 ft. Concrete Base	67,536	39,537	107,073	9,550	116,623
1-152	(See 1-151-B)	V	"		Z	DEPU	Exceptions	1.34	8-25-21	Ray Labor	J. J. Jones	15 ft. Concrete Base	10,842	11,901	22,743	283	23,026
133	95	V	"		E	2 Miles N.	King City Overhead	7.35	8-8-21	Hardman Peck Con. Co.	S. Stern	15 ft. Concrete Base	53,905	19,963	73,868	3,256	77,124
1-141	95	V	"		E	King City	Creek #25	1.32	3-19-19	Ray Labor		Grading	1,445		1,445		1,477
126	(See 1-129)	V	"		E-D	San Lucas	Creek #25	11.16	1-3-21	Chas. S. Thomas & Sons	R. E. Hazlerigg	15 ft. Concrete Base	103,280	39,664	142,944	4,836	147,780
1-129	95	V	"		D	Greenfield	Salinas River	10.47	10-18-17	Wm. J. Tibbetts Con. Co.	F. H. Hopkins	15 ft. Concrete Base	58,286	41,470	99,756	4,500	104,256
356	392	V	"		F	King City	South Side Salinas River	1.02	8-24-21	J. A. Costello Jr.	J. Eckert	Asp. Conc. Base & Surf	25,090		25,090	686	25,776
1-132	342	V	"			Gonzales	Gravel Bridge	.52	6-18-21	Ray Labor		Test Borings	279		279		279
1-132	342	V	"			Gravel Bridge	Gonzales	.52	6-18-21	Ray Labor		Grading Approaches	4,060	5	4,065	63	4,128
1-100	317	V	"			Gonzales	San Lucas	11.04	6-24-21	Ray Labor	R. C. Hale	15 ft. Concrete Base	117,043	67,655	184,698	6,411	191,109
1-100	317	V	"			San Lucas	Soledad		6-19-21	Ray Labor		Stockpiling Materials	3,623		3,623	282	3,905
1-100	317	V	"			2 Mi. N. of Soledad	Soledad	10.08	6-30-21	Frank L. Smith	W. C. Little, Jr.	15 ft. Concrete Base	97,311	29,567	126,878	6,370	133,248
1-236	166	V	"		N	3 Mi. S. of Soledad	San Ardo (Except one	1.27	4-10-17	Ray Labor	J. Beck	15 ft. Concrete Base	29,501	9,173	38,674	2,055	34,729
230	166	V	"		H	Southern Boundary	Mouth of Arroyo	10.24	7-13-16	L. L. Connors	J. Beck	15 ft. Concrete Base	131,230	77,653	209,883	5,804	215,392
1-230	166-376	V	19	Napa	A	Monterey Boundary	Soledad	6.32	5-26-15	Ray Labor	J. M. Jefferson	15 ft. Concrete Base & Surf.	56,446	18,250	74,696	2,477	77,173
1-205	184	V	"		G	Stone's Gap	Soledad	2.57	7-27-21	Ray Labor	R. F. Hoshaw	15 ft. Concrete Base	19,605	10,214	29,819	2,250	32,069
205	184	V	"		G	Napa	Monterey Boundary	6.03	7-27-21	Ray Labor	Ray Labor	15 ft. Concrete Base	99,864	69,470	169,335	7,797	176,132
1-283	318	VII	Nevada	17	A	Southern Boundary	Cottonwood Creek	9.17	10-13-17	Ray Labor		Stockpiling Materials	1,399	241	1,599	44	1,514
309	Misc-160	III	"	17	A-B	Southern Boundary	Nevada City	14.82	11-19-17	A. L. Fairbanks	W. T. Heston	Grading	174,407	27,705	202,254	12,966	215,220
								9.00				15 ft. Concrete Base					
1-302	407	III	"	20	A	Nevada City	Grass Valley		7-25-21	Ray Labor	R. M. Brown	Grading	12,841	7,774	20,615	1,766	22,381
1-342	Misc-407	III	Nevada-Tuba	20	A	Across Middle Yuba River Bridge			7-13-21	Ray Labor	R. M. Brown	Concrete Bridge	22,053	7,256	29,311	1,301	30,612
139	144	VII	Orange		A	San Juan Capistrano	Calivan	5.57	12-22-14	W. D. Compere, Inc.	J. G. Beckford	15 ft. Concrete Base	36,529	12,962	51,834	2,613	54,144
139	143	VII	"		A	Santa Ana River Bridge	Orange	1.00	4-6-15	Steelwater Burns Co.	J. G. Beckford	Grading	37,496	6,455	43,951	1,726	45,677
1-139	143	VII	"		A	Santa Ana	Orange	3.54	11-24-14	Ray Labor	J. G. Beckford	15 ft. Concrete Base	24,444	13,764	38,208	1,619	39,827
139	144	VII	"		A	Southern Boundary	Santa Ana River	2.19	1-8-15	Ray Labor	J. G. Beckford	15 ft. Concrete Base	15,423	10,194	25,617	1,259	26,876
1-43	(144-143)	VII	"		B	Calivan	Southern Boundary	15.08	6-2-15	Ray Labor		Detours	2,466		2,466	220	2,686
1-66	155	VII	"		A	S. 32, T. 8 S., R. 7 W.	Tarro	3.07	8-24-15	Ray Labor	J. G. Beckford	15 ft. Concrete Base	12,309	9,198	22,577	466	22,493
1-66	143-155-163	VII	"		A	Southerly Boundary	San Juan Creek	6.02		Ray Labor	C. E. Bishop	Oil Surfacing	8,364	3,291	11,655	113	11,768
1-167	116	VII	"		B	Calivan	Irvine	1.40	9-24-17	Ray Labor	C. P. Swallenmeyer	15 ft. Concrete Base	1,405	1,053	2,459	113	2,572
	116	VII	"		B	Calivan	Irvine	6.57	9-24-17	Ray Labor		15 ft. Concrete Base	69,789	38,745	108,534	5,750	114,284
252	116	VII	"		B	Calivan	Irvine	9.37	9-3-19	Geo. H. Curtis	L. W. Sanson	Topk. Surf. & Conc. Shlders.	66,439	19,606	106,045	2,197	108,242
77	116	VII	"		B	Calivan	Irvine	9.37		Ray Labor	J. R. Kreiler	Oil Surfacing	2,112	8,426	4,538	663	5,201
168	116	VII	"		B	Aliso Creek Bridge	Irvine	.01	10-14-17	Ray Labor		Concrete Pile Trestle	190	48,265	48,455		48,455
99	103	VII	"		B	Irvine	Santa Ana	7.40	9-10-14	White & Haskell	John C. Ware	15 & 18 ft. Concrete Base	77,866	16,995	94,941	3,652	98,493
1-59	103	VII	"		B	Irvine	Santa Ana	7.40		Ray Labor	J. R. Kreiler	Oil Surfacing	5,814	2,709	8,523	833	9,356
1-12	40	VII	"		D	Santa Ana	Anaheim	4.94	8-13-14	Ray Labor	Geo. H. Brown	Tarvia Surfacing	4,561	10,230	14,815	364	17,186
1-226	40	VII	"		D	Santa Ana	Fair Grounds	1.06	8-13-14	Ray Labor	Wm. F. Burns	15 ft. Concrete Base	703	647	1,350	24	1,374
40	48-49-50	VII	"		DFP	Anaheim	Northerly Boundary	11.18	10-26-13	Downey Asphalt Co.	Geo. H. Brown	18 ft. Concrete Base	64,936	32,540	94,565	3,731	100,296
1-26	47	VII	"		D	Anaheim	Fullerton	1.75	10-26-14	Ray Labor	J. C. Barth	Topmix Surface	2,289	4,174	6,463	309	6,842
	47	VII	"		D	Fullerton	Northerly Boundary	4.75	9-26-17	Ray Peterson	C. W. Ainley	(Conc. Shlder. & Rep. Surf.) Conc. Base & Mix Surf.					
1-23	50	VII	"		E	Fullerton	Northerly Boundary	4.75		Ray Labor	Geo. H. Brown	Oil Surfacing	3,319	2,316	5,637	663	6,300
13	35	VII	Placer		B	Southerly Boundary	Lincoln	7.90	9-25-12	Horse Cleek & De Momo	J. L. Piper	15 ft. Conc. Base-Oil Surf.	60,795	25,306	86,101	8,160	102,366
1-64	325	VII	"		B	Auburn Ravine Road	Auburn	.12	4-16-15	Ray Labor	C. E. Bates	Subway & Conc. Base Approx.	1,400	1,400	2,800	1,400	4,200
164	325	VII	"		B	Lincoln	Northerly Boundary	8.57	11-9-15	C. S. & A. M. Gerrill	J. L. Piper	15 ft. Concrete Base	48,444	33,963	82,407	5,527	88,434
1-144		VII	"		B	Yankee Jim's Bridge (1 & 2)				Ray Labor	C. E. Bates	Grading	300		300	33	333
1-200	203	VII	"		B	Ahart, Young & Tadmore Creek Bridges		1.44	3-26-19	Ray Labor	C. F. Beutie	1" & 2½ ft. Concrete Base	5,647	1,783	7,430	873	8,303
1-156	220	VII	"		B	Meherrin	Penryn	7.75	7-15-16	H. W. Hobbs Const. Co.	H. W. Hobbs	15 ft. Concrete Base	36,146	20,758	56,904	4,776	61,680
1-220	220	VII	"		B	Penryn	Newcastle	1.42	3-3-19	Ray Labor	J. C. Worth	15 ft. Concrete Base	14,698	10,153	24,851	2,179	27,030
1-247	228	VII	"		A	Newcastle	Sta. 324+00	1.35	8-3-19	Ray Labor	J. C. Barth	15 ft. Concrete Base	10,261	9,802	19,713	1,843	21,557
164	216	VII	"		B	Penryn	Auburn	6.49	1-11-16	A. C. McLean Const. Co.	S. J. Treadaway	15 ft. Concrete Base	39,307	28,366	67,673	4,901	72,574
5-403		VII	Placer	29	A-I												
		VII	Lassen	29	A-I	See D-4-C II-Las-29-A & III-Pla-29-A											
53	53	VII	Riverside	19	A	Eastern Boundary	Riverside	9.32	10-29-13	W. P. Company, Inc.	C. M. Woodrow	18 ft. Concrete Base	49,543	22,091	71,612	4,886	76,498
D-31	53	VII	"	19	A	Westerly Boundary	Riverside	9.32	3-16-15	Ray Labor	C. M. Woodrow	Oil Surfacing	3,719	1,627	5,346	877	6,223
262	398-399	VII	Riverside	26	A-I												
		VII	San Bernardino	26	A-I	County Number #32	Beaumont	6.94	11-6-19	R. M. Lissom	W. T. Scott	Grading	65,982	6,832	72,734	6,233	78,979
D-227		VII	Riverside	26	B	City of Indio		2.61	4-2-19	Ray Labor	C. W. Bitts	15 ft. Concrete Base	9,089	5,265	14,354	525	14,879
D-270	344	VII	Riverside	26	F	W. 1/2 Sec. 5, T. 7 S., R. 9 E.		2.61	11-25-18	Ray Labor	C. W. Bitts	15 ft. Concrete Base	36,824	22,660	59,484	829	59,923
267	412	VII	Riverside	26	G	N.E. Cor. Sec. 7, T. 5 S., R. 8 E.	Southerly Boundary	14.33	2-4-20	Ray Labor	T. T. Scott	15 ft. Concrete Base	297,529	109,373	406,932	9,470	416,410

COMPLETED CONTRACTS, JUNE 30, 1922.

Con.No.	L.O. No.	Div.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Res. Engineer	Type of Work	Final Estimate Work	Final Estimate Materials	Final Estimate Total	Engr. During Const.	Total
12	14	III	Sacramento	3	A	Auburn Road	Northerly Boundary	1.85	9-25-12	Burns, Clark & Da Rosa	W. P. Ireland	15 ft. Conc.Base-Oil Surf.	10,891	4,823	15,714	2,730	18,444
D-412	14	III	"	3	A	Near Sylvan School			11-17-21	Day Labor		Removing Tree	226		226		226
D-432		III	"	3	B	At North Sacramento Trestle			3-8-22	Day Labor	H. L. Sturgeon	Boring & Test Pits	262		262		262
112	128	III	"	11	A	Folsom	Easterly Boundary	6.83	11-10-14	A.R. & C.H. Corrill	J. L. Piper	12 ft. Concrete Base	41,306	23,184	64,490	4,322	68,812
D-71	128	III	"	11	A	Folsom	Easterly Boundary	6.83		Day Labor	N. H. Miller	Oil Surfacing	3,828	2,413	6,241	93	6,334
D-222	189	III	"	11	B	Through Folsom		.27		Day Labor	J. A. McDavitt	15 ft. Concrete Base	2,447		2,447		2,447
287	450	III	"	84	A	Clay	Easterly Boundary	8.43	5-10-21	Bluroakrans & Vernon	F. R. Baker	Grading	61,349	7,589	68,938	5,437	74,375
D-109		III	"			State Fair Grounds, Sacramento		.14		Day Labor		Demonstration Road	536	24	560	75	635
D-293		III	"			Sacramento			12-15-19	Day Labor		Maint. Bldg. & Shop Site	22		22		22
333		III	"			At Sacramento Headquarters			10-19-21	M.J. Hopper & Son	E. J. Seadler	Maintenance Shop Bldg.	56,791	6,068	62,859	1,662	64,521
D-425		III	"			At Sacramento Headquarters			1-18-22	Day Labor	E. J. Seadler	(Test. Lab. Foundation (& Test Piles	13,840	4,843	18,683	78	18,761
D-458		III	"			At Sacramento Headquarters			5-17-22	Day Labor		Maintenance Shop	3,118	3,818	6,936		6,936
42	51	V	San Benito	2	A	Westerly Boundary	San Juan Bautista	4.22	10-29-13	E. O. Burge	J. C. Alstrom	Grading	44,545	2,753	47,298	3,263	50,561
D-8	51	V		2	A	San Juan Bautista	Northerly Boundary	4.05	9-1914	Day Labor	K. Beck	15 ft.Conc.Base-Oil Surf.	46,014	21,688	67,702	4,014	71,716
D-48	51-225	V	"	2	A	Westerly Boundary	San Juan Bautista	5.21	12-7-15	Day Labor	H. S. Tolan	15 ft. Concrete Base	66,434	16,790	83,224	1,751	84,975
D-89	225	V	"	2	A	Through San Juan Bautista		.80	12-7-15	Day Labor	H. S. Tolan	15 ft.Conc.Base-Oil Surf.	6,183	3,618	9,801	138	9,939
D-161	51-225	V	"	2	A	Sta. 248+59	Sta. 566+41	5.87	9-26-17	Day Labor	A. S. Moore	Oil Surfacing	1,979	1,068	3,047	56	3,103
46	59	VII	San Bernardino	9	A	Upland	Citrus Avenue	10.36	11-21-13	Hudson-Johnson Con. Co.	C. H. Wondries	18 ft.Conc.Base-Oil Surf	55,372	34,758	90,130	6,148	96,278
D-347	45	VII	"	9	B	Through Rialto		1.50	9-20-20	Day Labor	R. V. Darling	Repairing Pavement	748		748		748
38	45-46	VII	"	9	B-C	Citrus Avenue	San Bernardino	5.83	8-11-13	C. J. Flower	C. H. Wondries	18 ft.Conc.Base-Oil Surf.	34,312	17,189	51,501	4,907	56,408
D-159		VII	"	9	C	At Lytle Creek		.07	9-19-17	Day Labor	W. F. Bixby	Bridge Extension	2,160	1,019	3,179	250	3,429
53	74	VII	"	9	D	Westerly Boundary	Upland	1.68	2-26-14	Louie Ferrell	C. H. Wondries	18 ft. Concrete Base	16,321	6,334	22,655	2,365	25,020
D-46	74	VII	"	9	D	Westerly Boundary	Upland	1.69		Day Labor	C. H. Wondries	Oil Surfacing	242	741	983	23	1,006
D-186	342	VII	"	9	D	Through Upland		.54		Day Labor	O. W. Monroe	18 ft. Concrete Base	2,348	3,057	5,415	36	5,451
37	43-44	VII	"	19	A-B	Westerly Boundary	Southerly Boundary	6.61	7-23-13	Bent & Pennybaker	L. R. Lathrop	18 ft. Conc.Base-Oil Surf.	39,492	18,856	58,348	4,293	62,641
D-24		VII	"	19	B	Ontario	Southerly Boundary	.13		Day Labor	L. R. Lathrop	18 ft.Conc.Base-Oil Surf.	957	736	1,693	15	1,708
262	398-399	VII	(San Bernardino (Riverside	26 26	B) A)	See Contract 262 Riv-26-A & S.Bd.-26-B											
7	7	VII	San Diego	2	A	San Diego	Encinitas	8.42	8-27-12	K.L.Curtis & Co.	A. W. Allen	15 ft.Conc.Base-Oil Surf.	55,501	14,137	69,638	3,929	73,567
D-298	416	VII	"	2	A	At Escondido Creek Bridge		.04	1-22-20	Day Labor	E.J.Bessington	15 ft. Concrete Base	1,107	666	1,773	73	1,846
30	26	VII	"	2	B	Encinitas	Oceanside	10.63	5-21-13	J.M.Montgomery	A. W. Allen	15 ft. Concrete Base	60,308	23,940	84,248	4,017	88,265
221	340	VII	"	2	B	Through City of Oceanside		1.91	3-13-18	E.S.Groshong	Wm. F. Bixby	15 & 20 ft. Concrete Base	15,661	8,252	23,913	1,165	25,078
D-352		VII	"	2	B	At San Marcos Creek			3-2-22	Day Labor		Paving Approaches	3,388	1,585	4,973	37	5,010
D-386		VII	"	2	B	La Costa & Agua Hedionda Creeks			11-22-21	Day Labor		Inspection Chgs.on Brs.	1,328		1,328		1,328
D-11	26-47	VII	"	2	B-C	Encinitas	Los Flores	18.48		Day Labor	C. N. Ainley	Oil Surfacing	21,208	11,032	32,240	1,862	34,102
39	47	VII	"	2	C	Oceanside	Los Flores	8.03	9-24-13	C.L.Hyde Const. Co.	A. W. Allen	15 ft. Concrete Base	48,598	20,471	69,069	2,974	72,043
D-187		VII	"	2	C	At Los Flores Creek Bridge				Day Labor	O. W. Monroe	Grading	463		463		463
D-237		VII	"	2	C	At San Margarita River Bridge		.08	6-11-19	Day Labor	O. W. Monroe	Grading	2,378		2,378	7	2,385
D-393		VII	"	2	C	Oceanside	Los Flores		11-22-21	Day Labor		Inspection Chgs. on Brs.	869		869		869
D-402	47-76	VII	"	2	C-D	Oceanside	Northerly Boundary		10-20-21	Day Labor		Rebuilding R/W Fence	5,294		5,294	138	5,432
58	76	VII	"	2	D	Los Flores	Westerly Boundary	11.14	4-22-14	W. A. Perry	C. N. Ainley	15 ft. Concrete Base	77,553	29,607	107,160	8,032	115,192
D-58	76	VII	"	2	D	Los Flores	Westerly Boundary	11.14		Day Labor	C. N. Ainley	Oil Surfacing	9,706	5,502	15,208	150	15,358
D-80	76	VII	"	2	D	At Sta. 0+00 & Sta. 9+97		.05	10-25-15	Day Labor	J. G. Beckjord	15 ft. Concrete Base	7,230	449	7,679	293	7,972
59	77	VII	"	12	A	East San Diego	La Mesa	1.96	4-22-14	C. L. Hyde Const. Co.	E. S. Gripper	15 ft. Concrete Base	12,815	6,649	19,464	1,581	21,045
217	331	VII	"	12	A	Through East San Diego and La Mesa		4.15	1-24-18	David H. Ryan	C. G. Kolster	15 ft. Concrete Base	44,482	11,759	56,241	2,012	58,253
D-28	77-108	VII	"	12	A-B	East San Diego	El Cajon	3.52	1-22-15	Day Labor	L. M. Cummings	Oil Surfacing	3,640	1,366	5,006	561	5,567
94	108	VII	"	12	B	La Mesa	El Cajon	1.55	8-26-14	C. L. Hyde Const. Co.	E. S. Gripper	15 ft. Concrete Base	12,764	4,116	16,880	952	17,832
223	345	VII	"	12	B	Through El Cajon		3.41	4-10-18	W.E.Hall & R.L.Baskerville	C. G. Kolster	15 & 20 ft. Concrete Base	21,945	9,525	31,470	1,219	32,689
D-93	224	VII	"	12	C	El Cajon	Flinn Springs	7.23	12-6-17	Day Labor	J. G. Beckjord	15 ft. Concrete Base	33,081	44,565	77,646	1,920	79,566
D-120	422	VII	"	12	C	Sta. 530	Sta. 698	3.18	3-9-17	Day Labor	J. G. Beckjord	Grading	22,341	4,201	26,542	212	26,754
D-181	422	VII	"	12	C	Sta. 424+34.48	Sta. 765+58	3.48	1-16-18	Day Labor	W. D. Eaton	Grading	19,461	1,106	20,567	904	21,471
269	422-423-330	VII	"	12	C-D	Flinn Springs	Ogden Ranch	11.27	5-7-20	Riley & Peterson	A. N. George	15 ft. Concrete Base	213,206	95,472	308,678	11,452	320,130
204	296	VII	"	12	D	Guatay Creek	Pine Valley	4.55	9-11-17	W. M. Ledbetter	C. P. Montgomery	Grading	24,100	2,933	27,033	2,313	29,346
219	330	VII	"	12	D	3 Mi. E. of Willows	Sweetwater River	3.74	3-13-18	Maurice Ryon	C. P. Montgomery	Grading	70,342	4,015	74,357	2,738	77,095
D-106	330	VII	"	12	D	Viejas Creek	Guatay Creek	2.36	7-26-16	Day Labor	J. G. Beckjord	Grading	23,252	2,759	26,011	828	26,839
D-166	330	VII	"	12	D	At Viejas Creek Bridge and near	Sta. 177+00		10-6-17	Day Labor	W. D. Eaton	Grading	770	4	774	8	782
D-180	330-423	VII	"	12	D	1 Mi. West of Alpine	Viejas Creek	2.65	1-16-18	Day Labor	W. D. Eaton	Grading	8,161	2,640	10,801	387	11,188
D-193		VII	"	12	D	At Sweet Water River Bridge			5-23-18	Day Labor	O. W. Monroe	Grading	951		951	9	960
253	400	VII	"	12	E	Pine Valley	Cosbere Ranch	6.61	12-15-19	M. D. Goodbody	C. P. Montgomery	Grading	59,464	6,014	65,478	9,027	74,505
D-206	400	VII	"	12	E	Sta. 178	Sta. 192+55-Cottonwood Creek	.28	8-22-18	Day Labor	W. D. Eaton	Grading	8,645	124	8,769	233	9,002
264	401	VII	"	12	F	Cosbere Ranch	Tecate Divide	13.80	12-15-19	Wright & Doran	A. N. George	Grading	179,446	11,980	191,426	11,082	202,508
D-361	401	VII	"	12	F	At Banton Ranch			4-6-21	Day Labor		Cattle Pass	2,063	395	2,458	20	2,478
296	368	VII	"	12	G	Over S.D.& A.Ry. near Jumba		.03	5-10-21	W. M. Ledbetter	O. W. Monroe	Overhead Crossing	5,950	1,662	7,612	648	8,160
D-231	368	VII	"	12	G	Tecate Divide	Easterly Boundary	15.21	4-10-19	Day Labor	C. G. Kolster	15 ft. Concrete Base	417,613	155,285	572,898	11,457	584,355
D-238	366	III	San Joaquin	4	A	At Calla & Manteca		2.69	8-20-19	Day Labor	F. C. Hewitt	15 ft. Concrete Base	35,621	28,936	64,557	2,015	66,572
D-279	405-366	III	"	4	A	Stanislaus River Bridge		.25	10-23-19	Day Labor		Topeka Surfacing	833	1,865	2,698	136	2,834
D-239	367	III	"	4	B	Manteca	Stockton	.60	7-18-19	Day Labor	F. C. Hewitt	15 ft. Concrete Base	5,968	5,277	11,245	171	11,416
256	395	III	"	4	D	Houston School	Northerly Boundary	4.72	9-26-19	N.A.Dontanville	B. T. Willard	8 & 15 ft. Concrete Base	55,607	38,094	93,701	3,825	97,526
D-394	395	III	"	4	D	At Johant Slough		.05	9-22-21	Day Labor	J. F. Knapp	Pav.Br.Apprs.& Guard Rail	2,133	597	2,730		2,730
347	208	III	"	5	A	Tracy	3/4 Mi. East	.68	12-21-21	J. A. Costello, Jr.	C. S. Merrick	15 ft. Asph. Surface					

COMPLETED CONTRACTS, JUNE 30, 1922.

Com.No.	L.C. Mile	Dist.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Res. Engineer	Type of Work	Final Estimate Work	Materials	Total	Aver. Unitary Cost.	Total
D-240	369	III	San Joaquin	5	B	Banta	French Camp	2.50	7-14-19	Day Labor	F. T. Hewitt	15 ft. Concrete Base	34,565	22,774	57,339	1,882	59,241
D-262	309	III	"	5	B	Paradise Cut ...idge		.36	7-25-19	Day Labor		Grading	513		513		566
C-361	309	III	"	5	B	At Banchide Bridge			8-25-20	Day Labor		Left Bridge	51		51		51
D-1	56	V	San Luis Obispo	2	A	Paso Robles	Northerly Boundary	10.63	7-17-19	R.A.Pontenville	C. F. Price	15 ft.Conc.Base-Oil Surf.	72,024	50,102	122,126	5,554	130,683
D-136	56	V	"	2	A	At Creston 17-27-43 E 2.15		.00	6-17-19	Day Labor	C. F. Price	15 ft. Concrete Base	2,041	906	2,947	114	3,156
154	121	V	"	2	B	Atascadero Creek	Paso Robles	10.05	8-10-15	J. D. Marsh	C. D. Cowden	15 ft. Concrete Base	70,661	44,869	117,530	5,902	122,830
D-139	125-155	V	"	2	B	Escrelitos		.63	7-25-19	Day Labor	C. F. Price	15 ft. Concrete Base	2,502	2,409	4,911	3,894	8,805
56	57	V	"	2	B	Santa Margarita	Atascadero Creek	8.32	7-26-14	W. A. Pontenville	W. S. Hurt	15 ft.Conc.Base-Oil Surf.	64,121	45,285	109,406	3,771	113,177
D-139	57-123	V	"	2	B	At Stat.Under 13-142 & 173		.17	6-17-19	Day Labor		15 ft. Concrete Base	2,018	964	2,982	114	3,096
110	138	V	"	2	B	San Luis Obispo Creek	Cuesta	3.60	10-7-14	Thos.D. Hunt	W. S. Hurt	Grading	50,562	6,189	56,751	4,614	61,365
D-3	24	V	"	2	B	San Luis Obispo	Santa Margarita	6.37	7-23-13	Day Labor	R. W. Upson	15 ft.Conc.Base-Oil Surf.	61,751	51,179	112,930	6,189	119,119
84	104	V	"	2	B	Arroyo Grande	San Luis Obispo	11.41	7-23-14	Rogers Bros. Co.	L. A. Moore	Grading, Concrete Base	161,272	69,258	230,530	6,310	236,840
D-49	104	V	"	2	B	Arroyo Grande	San Luis Obispo	11.42		Day Labor	L. A. Peters	Concrete Base	2,606	2,890	5,496	529	6,025
D-49	104	V	"	2	B	Arroyo Grande	San Luis Obispo		1-22-15	Day Labor	L. A. Peters	Concrete Base	5,604		5,604	104	5,708
210	265-311	V	"	2	B	Santa Maria River	Arroyo Grande	11.96	12-24-17	W.A.Pontenville	E. Evers	15 ft. Concrete Base	134,847	106,306	241,153	9,365	250,518
D-115	265	V	"	2	F	Santa Maria River	Nipomo	4.05	12-15-16	Day Labor	E. E. Donahoe	Grading	4,908	44	4,952	93	5,001
D-243	227-311	V	"	2	F	Santa Maria River		7.90	7-25-19	Day Labor	C. D. Cowden	15 ft. Concrete Base	5,112	5,144	10,256	1,298	11,554
280	425	V	"	33	B	Estrella River	Estrella River	11.54	3-25-22	Ralph W. Taylor	E. E. Evers	15 ft. Concrete Base	1,502	153,944	155,446	13,473	168,919
302	429	V	"	33	B	Estrella River	1 Mi.N.E.Shandon Pump.Sta.	10.31	8-14-21	F.C.McIntyre	W. E. Chapman	Grading	70,033	37,647	107,680	6,101	44,808
299	361	V	"	33	B	1 Mi.N.E.Shandon Pump.Sta.	Easterly Boundary	8.71	6-30-19	Andrew Brickhoff	Andrew Brickhoff	Grading	40,819	5,977	46,796	5,374	52,448
D-349		V	"	33	C	At Chalome Creek Bridge			10-28-20	Day Labor		Grade& Gravel&reshape	572		572	9	581
D-184	361	V	"	33	C	At Sta. 145+56			2-8 -18	Day Labor		Test Borings	30		30		30
291	432	V	"	57	A	3 Mi.N.of Santa Maria	Cuyama River	11.25	7-14-19	W.A.Pontenville	C.A.Tilton, Jr.	15 ft. Concrete Base	14,560	14,450	144,015	11,406	155,421
D-365		V	"	57	A	At Cuyama & Alamo Creek, & Cuyama River			4-25-21	Day Labor		Test Borings	1,275	174	1,449		1,449
D-310		V	"		A	At San Luis Obispo			1-30-20	Day Labor		Equipment&Building	533	433	966		966
1	1	IV	San Mateo	4	A	S. San Francisco	Burlingame	6.41	7-23-18	F.M.Hitchie	Leon L. Clarke	24 ft.Asphalt on Conc.	90,899	135	91,004	3,968	94,972
29	29	"	"	4	A	Northerly Boundary	South Line of Daly City	1.02	4-25-13	Flynn & Treat	L. C. Lane	24 ft. Conc. on Conc.	14,569	6,403	20,972	2,937	23,909
52	51	"	"	4	A	Oak Grove Drive	Bellevue Drive, Burlingame	1.02	4-25-13	Flynn & Treat	Leon L. Clarke	24 ft. Conc. on Conc.	14,569	6,403	20,972	2,937	23,909
34	32	"	"	4	A	Cypress Lawn Cemetery	S. San Francisco	2.07	7-2 -14	Mahoney Bros.	W. F. Holley	Grading	41,385	5,799	47,184	1,837	49,021
54	39-75	IV	"	4	A	Cypress Lawn Cemetery	Cypress Lawn Cemetery	4.03	12-22-17	Geo. Sargent & Tyler	C. Lane	24 ft. Conc. on Conc.	56,757	7,836	64,593	1,437	66,030
32	30	"	"	4	B	Redwood City	Southerly Boundary	3.29	3-26-13	S. P. Doyle	Leon L. Clarke	24 ft.Conc. on Asphalt	57,991		57,991	2,637	60,628
36	34	"	"	4	B	San Mateo	Bernsford	1.76	4-23-13	Day Labor	Leon L. Clarke	20 ft. Asphalt Macadam	30,420	404	30,824	1,760	32,584
167	299	IV	"	4	B	Bernsford	Redwood City	4.24	7-10-16	J. A. Turnbull	Miss Anderson	20 ft. Concrete Base	67,978	30,257	98,235	4,638	83,873
299	299	IV	"	4	B	Redwood City	Redwood City	4.24	5-10-21	Pacific Coast Const. Co.	Fred Schreiber	20 ft. Concrete Surface	74,000		74,000	4,638	78,638
D-9	22-63	IV	"	4	B	At San Francisquito Creek		.18		Day Labor	F. Blockley	20 ft. Bituminous Conc.	1,413	4,591	6,004	255	6,259
D-26	22	IV	"	4	B	Redwood City	Southerly Boundary			Day Labor	J. Blockley	Retaining Wall	715	367	1,082	352	1,434
D-134	299	IV	"	4	B	Bernsford	Redwood City	4.24	4-23-20	Cancelled 6-8-20			273		273		273
D-326	299	IV	"	4	B	Bernsford	Redwood City	4.24	10-8 -20	Day Labor	W.M.Schreiber	Concrete Shoulders	27,815	14,548	47,453	1,361	48,794
253	122	V	Santa Barbara	2	A	Cuesta	Santa Maria River	6.47	8-26-18	Day Labor	C. D. Cowden	15 ft.Conc. on Concrete	2,502	2,409	4,911	3,894	8,805
253	122	V	"	2	A	Orcutt	1 Mi. S. of Divide	9.56	9-3 -19	Frank C. McIntyre	[illegible]	15 ft. Concrete Base	49,783	39,879	89,662	3,855	81,117
D-72	103	V	"	2	A	Santa Maria	Santa Maria River	.82	12-30-16	Day Labor	A. A. Peters	Oiled Gravel	700	54	754	22	776
D-43	122	V	"	2	A	Santa Maria	1 Mi. S. of Divide		8-6 -19	Day Labor		Stockpiling	4,279		4,279		4,279
253	122	V	"	2	A	Exceptions			4-8 -20	Day Labor	Cancelled 6-8-20						
D-366	105-286-137	V	"	2	A-C	Exceptions		1.30	5-26-21	Day Labor	C. A. Root	15 & 18 ft. Concrete Base	1,116	1,431	3,468	14	3,502
36	41	V	"	2	B	Lake Station	Bicknell	11.95	7-3 -13	Wayne E. Lewis	L. E. Moore	16 ft.Conc.Base-Oil Surf.	44,818	46,595	1,678	48,582	1,678	50,260
164	137	V	"	C	C	Los Alamos	Los Alamos	8.95	6-6 -17	W.A.Pontenville	E. Evers	15 ft. Concrete Base	65,488	55,178	123,630	7,779	131,409
D-330	137	V	"	C	C	Bridge at Canon		.19	12-22-20	Cancelled 6-8-20				1,759	1,759		1,759
D-125	137-192	V	"	C-D	D	Cuyota	Los Alamos		7-19-17	Day Labor	[illegible] Ross	Cattle Passes	1,140	314	1,454	3	1,457
193	192	V	"	C-D	D	Cuyota Pass	Cuyota Station	13.39	8-10-15	C.M.Hudson	W.E.Chapman	Grading	70,715	31,344	102,059	5,123	107,182
176	249	V	"	D	D	At Santa Ynez River		.58	9-11-16	Day Labor	Werner Traver Co.	Steel Bridge	167,102	7,890	174,992	7,238	182,230
D-18	249	V	"	D	D	At Roquai Creek Bridge, Sta. 248+00		.02	8-1 -17	Day Labor	C. I. Root	Grading Approaches	1,018	5	1,023	41	1,064
D-18	252	V	"	D	D	Santa Cruzan Bridges		.08	8-1 -17	Day Labor	C. I. Root	Grading Approaches	1,018	12	1,030	41	1,071
D-217		V	"	D	D	Through De La Cuesta Property			8-8 -21	Day Labor		Purchase of R/W	250		250		250
115	134	V	"	D	D	Alcatraz	Los Cruces	4.82	12-8 -14	J.M.Callaack	O.C.Trettien	15 ft. Concrete Base	24,978	29,036	104,012	5,576	109,588
182	271	V	"	E	E	Los Cruces	Cuyota Pass	2.93	6-22-17	Ira Hodson	W. S. Henderson	Grading Approaches	50,886	9,270	60,156	1,438	61,594
D-184	134	V	"	E	E	At Tassajara Canyon Bridges		.14	6-4 -17	Day Labor	C. I. Root	Grading Approaches	1,020		1,020	178	1,198
D-140	134-452	V	"	E	E	Alcatraz	Los Cruces	.46	6-19-17	Day Labor	C. I. Root	Concrete Base	2,502	666	3,168	7	3,175
92	115	V	"	E	E	At Alcatraz Creek	Alcatraz	1.41	6-14-17	W. E. Beard	C. M. Hudson	Grading	64,000	6,000	70,000	717	70,717
197	115	V	"	E	E	At Alcatraz Creek	Alcatraz	9.54	8-9 -17	Tryon & Brain	S. D. Cowden	15 ft. Concrete Base	61,054	62,543	123,597	4,629	128,226
209		V	"	F	F	At Arroyo Honda		.10	7-16-18	W.M.Liebetter & Co.	S. D. Cowden	Concrete Bridge	31,617	31,402	63,019	2,790	65,809
D-172	327	V	"	F	F	Refugio & Arroyo Honda Bridges			11-23-17	Day Labor		Bridges	2,502		2,502		2,502
D-207	327	V	"	F	F	At Canada del Refugio		.02	1-13-19	Day Labor	W. S. Henderson	Concrete Bridge	12,544	7,604	20,148	1,629	21,777
D-253	135-327	V	"	F	F	At Canada del Refugio & Arroyo Honda Bridges			12-28-18	Day Labor		Graveling Approaches	2,502		2,502	10	2,512
D-228	327	V	"	F	F	At Canada del Refugio Bridge			4-2 -19	Day Labor		Grading Approaches	1,876		1,876	85	1,961
D-348	115	V	"	F	F	At Refugio & Arroyo Honda Bridges			12-15-19	Day Labor	W. W. Avery	15 ft. Concrete Base	12,436	1,194	28,504	952	29,456
198	266-153-282	V	"	F	F	Elwood	El Capitan Creek	7.70	6-7 -17	Tryon & Brain	S. D. Cowden	15 ft. Concrete Base	41,436	39,669	81,105	4,338	85,443
D-111	153	V	"	F	F	At Sta. 26+50 Near Elwood			6-19-17	Day Labor	C. I. Root	15 ft. Concrete Base	82	80	162		162
199	153-184	V	"	D-1	D	At Gaviota Creek	Tecay Creek	10.00	8-6 -14	C. M. Hudson	W. E. Marshall	Grading, Culverts, Base	90,089	27,807	117,896	5,429	123,325
43	58	V	"	H-1	H	Gaviota Creek	Carpinteria Creek	7.35	11-21-13	Occidental Const. Co.	S. W. Dixon	15 ft. Concrete Base	10,055	8,125	18,180	3,013	21,281

COMPLETED CONTRACTS, JUNE 30, 1922.

Con.No.	L.O. No.	Dist.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Res. Engineer	Type of Work	Final Estimate			Engr. During Const.	Total
													Work	Materials	Total		
1-31	58	V	Santa Barbara	2	N	Pinoso Creek	Carpinteria Creek	2.36	5-25-17	Day Labor	C. L. Cain	Oil Surfacing	1,257	155	1,392		1,392
1-32	124	V	"		I	Stony Creek	Glenn Ann Conres Road	0.64	5-25-17	Day Labor	C. L. Cain	Oil Surfacing	530	113	643		643
1-33	153	V	"		J	County Road	Serena Station	.67	7-1-17	Day Labor	R. B. Green	15 ft. Concrete Base	4,488	3,322	6,143	1,220	9,363
1-34	153	V	"		J	Near Serena		.69	5-25-17	Day Labor	C. L. Cain	Oil Surfacing	135	91	226		226
1-285	289	V	"		J	At Ortega Hill		.04	1-16-20	Day Labor		Guard Rail	135		135		135
1-35	267	V	"		J	At Easterly City Limits of Santa Barbara		.10	1-15-20	Day Labor		26 ft. Concrete Base	1,204	1,036	2,240		2,240
1-286	267	V	"		J	Through Summerland		1.00	4-2-20	Day Labor	C. A. Tilton	15 ft. Concrete Base	11,744	12,041	24,285	777	25,062
1-36	319	2&3	"		K	San Jose Creek	Stony Creek	2.00	8-31-21	C. N. Hudson	W. T. Avery	20 ft.Conc.Base &Rd Story					
1-37	14	V	Santa Clara	4	A	Pala Mitre	Stevens Creek Bridge	6.43	10-30-19	City Street Imp. Co.	E. Blackley	20 ft.Conc.Base on Macadam	103,688	285	103,973	5,619	109,592
1-38	8	IV	"		A	Stevens Creek Bridge	Lawrence Station Road	2.52	10-22-12	A. Teichert & Son	Chas. B. Dugan	20 ft.Conc.Rein-Oil Surf.	35,110	19,348	54,458	3,065	57,417
1-39	37	IV	"		A	Lawrence Station Road	Santa Clara	1.15	5-21-13	John Doyle	Chas. B. Dugan	26 ft.Conc.Base-Oil Surf.	11,240	5,554	16,794	1,947	18,741
1-88	111	IV	"		A	Santa Clara	San Jose	1.93	8-11-14	Bangore Chumsay Co.	Leon L. Clarke	24 ft. Tapered Conc.Base	13,001	20,176	33,177	6,284	39,461
1-40	64	IV	"		A	At San Francisco Creek		.08		Day Labor	R. Sinclair	20 ft. Bituminous Concrete	836	2,042	2,878	109	2,987
1-157	241	IV	"		A	Through Agnew Creek	Santa Clara	.49	9-15-17	Day Labor	Chas. B. Dugan	20 ft.Conc.onCon-Topk.Surf.	6,831	3,187	10,018	760	10,778
1-378	8	IV	"		A	Through Mayfield		.93	8-11-21	Day Labor	C. H. Thomas	Concrete Base	17,013	11,490	28,503	1,674	30,177
2-3	33-35	IV	"		B	Morgan Hill	Morgan Hill	10.95	3-25-13	Richard Hastings & Sons	Chas. B. Dugan	15 ft. Conc.Base-Oil Surf.	63,831	48,007	111,838	4,484	116,322
2-4	35	IV	"		B	San Jose	Redmale	4.24	3-25-13	Harry Hastings & Sons	Chas. B. Dugan	15 ft. Conc.Base-Oil Surf.	29,725	10,359	37,085	1,359	38,444
2-5	35	IV	"		B	San Jose	Wallis	1.33	3-25-13	John W.McDonald, Jr.	Chas. B. Dugan	Topk.on Concrete Base	14,249	994	15,243	668	15,911
2-7	23-139	IV	"		B	Ferry Station	Morgan Hill	4.34	4-26-21	Hugh Gormley	R. B. Brown	15 ft. Asphalt Surface					
2-21	139	IV	"		B	At Morgan Hill		.40	11-5-14	Day Labor	E. Blackley	15 ft. Concrete Base	3,590	1,184	4,774	629	5,403
2-125	23-35	IV	"		B	Wallis	1 Mi. N. of Coyote	7.38	4-3-17	Day Labor	Chas. B. Dugan	Concrete Shoulders	20,568	14,768	35,336		35,336
2-264	23	IV	"		B	1 Mi. N. of Coyote	Ferry Station	4.17	9-23-19	Day Labor	I. W. Atkinson	Topk.Surf.&Conc. Shoulders	30,561	19,353	50,914	908	51,822
2-6	23-139	IV	"		B	Ferry Station	Morgan Hill	4.00	4-2-20	Cancelled 6-8-20		Cancelled-Topk.& Topk.Surf.	1,685		1,685	258	1,943
2-38	40	IV	"		C	Morgan Hill	Gilroy	9.59	7-3-13	R. O. Burge	A. D. Creps	15 ft.Conc.Base-Oil Surf.	37,476	19,643	57,119	4,301	61,420
2-39	96	IV	"		C	Gilroy	Sargent	6.07	5-9-14	M.L.Peterson & A.J.Grier	M.W.Amerikaner	15 ft. Concrete Base	49,220	29,403	78,623	3,318	81,941
2-40	96	IV	"		C	Gilroy	Carnadero Creek	1.72	9-22-21	R. J. Blanco	R. B. Wade	20 ft.Conc.Base 2nd Story					
2-17	96	IV	"		C	At Llagas Creek		.09		Day Labor	Wm. H. Jesnicke	Oil Surfacing	5,297	2,406	7,803	458	8,261
2-18	85	IV	"		C	Llagas Creek		.09	12-31-13	Day Labor	C. Mowbray	15 ft.Conc.Base-Oil Surf.	1,245	1,525	2,770	1,372	10,142
2-19	85	IV	"		C	Over Pacheco River Bridge		.07	1-31-14	Day Labor	Chas. B. Dugan	Asphaltic Concrete	1,176	244	1,420	168	1,588
2-100	60-65	IV	"		C	Gilroy	Gilroy	7.86	10-7-21	Day Labor	C. E. Wade	2-1/2 ft. Concrete Sidwks.	45,311	46,252	91,563	1,362	93,232
2-89	112	IV	"		A	Northerly boundary	San Jose	6.79	8-11-14	John W.McDonald, Jr.	Chas.B. Dugan	18 ft. Concrete Base	40,342	29,309	69,651	4,725	73,376
2-90	112	IV	"		A	Northerly boundary	San Jose	6.79	6-4-15	Day Labor		Oil Surfacing	1,397	1,580	2,977	97	3,074
2-156	215	IV	"		A	At Milpitas		.45	9-15-17	Day Labor		18 ft. Concrete Base	3,534	2,564	6,098		6,098
2-91	215	IV	"		A	Southerly boundary	Los Gatos	7.89	5-25-14	Day Labor	Clay Anderson	Grading	97,129	7,315	104,444	10,377	114,821
2-146	183	IV	"		A	Los Gatos	San Jose	8.89	7-23-15	Marin Rock Co.	Chas. B. Dugan	18 ft. Concrete Base	43,236	37,881	80,897	4,081	84,978
2-78	183	IV	"		B	Sta. 552	Sta. 603	.89	10-11-15	Day Labor		Fencing	43	43	43	47	90
2-79	183	IV	"		B	Alameda Creek Road	The Alameda	1.09	5-25-15	Day Labor	Chas. B. Dugan	Paving Surface	6,844	956	7,800	4	7,800
2-68	421-68-132	IV	Santa Clara	9	A	Glenwood	Los Gatos	13.56	5-15-20	J. L. Conner	E. Blackley	15 & 18 ft. Concrete Base	305,917	162,364	468,481	27,356	495,837
			Santa Cruz		A	Easterly boundary	Glenwood	5.66	2-25-14	Earle Foss & J.A.Marshall	W. A. McKinley	Grading	79,135	6,277	85,312	753	86,065
49	60	IV	"		A	Glenwood	Los Gatos	13.56	5-15-20	J. L. Conner	E. Blackley	15 & 18 ft. Concrete Base	305,917	162,364	468,481	27,356	495,837
83	103	IV	"		A	Los Gatos	Santa Cruz	10.10	7-7-14	Occidental Const. Co.	W. A. Moore	Grading	82,053	4,719	86,772	12,622	99,394
2218	103	IV	"		A	At S. P. of Glenwood	Santa Cruz	6.73	3-15-18	Federal Construction Co.	Leon L. Clarke	15 & 17 ft. Concrete Base	52,660	33,900	86,560	5,384	91,944
2219	103	IV	"		A	At Schoolhouse	Soquel	1.16	5-28-18	J.A.Marshall & J.S.Bower	W. T. Avery	15 & 17 ft. Concrete Base	31,370	21,490	52,860	4,070	56,931
2220	419	IV	Shasta		A	At Cottonwood Creek		.11	8-28-19	Tiedjins Bros.	E. G. Sullivan	Concrete Bridge	65,001	15,796	80,797	5,313	86,110
2-380	419	IV	"		A	At Cottonwood Creek Bridge			11-9-19	Day Labor	E. G. Sullivan	Bridge Approaches	2,607	107	2,714	37	2,751
2-371	419	11	"		A	Anderson Irrigation District			6-6 -21	Day Labor		Lowering Syphon	1,326		1,326		1,326
2-372	3205	11	"		B	At Pitt River		.07	7-25-15	Ross Construction Co.	C. E. Smith	Concrete Bridge	22,943	14,033	36,975	1,426	38,401
2309	3205	11	"		B	At Bridge	Bayha	10.83	6-17-17	Palmer & McBryde	J. S. Bissell	Grading	52,720	8,003	60,723	4,168	64,891
2-308	2905	11	"		B	At Dutton, Boulder Cslt, Knox Spring & Chorn Creeks		.09	7-2-18	DeNord Bros.	E. J. Weir	Concrete Bridges	28,276	9,003	37,279	3,914	41,193
2-47	182	11	"		B	Approach to Sacramento River Bridge at Redding		.09	12-15-13	Day Labor	B. L. Reed	Grading	2,567	389	2,956	153	3,109
86	100-101	11	"		A-C	Bayha	Sacramento River	16.21	7-21-14	Palmer & McBryde	C. E. Smith	Grading	219,448	13,294	232,742	20,524	253,266
2-87	101	11	"		A	Cow Creek & Sacramento River		.13	7-29-16	Ross Construction Co.	W. B. Gehl	Concrete Bridges	23,051	14,389	37,440	1,150	38,590
2-88	2913	11	"		C	Sacramento River	La Moine	14.31	8-28-19	J. F. Fitzpatrick	J. W. Lawlen	Grading	189,361	19,005	208,363	22,004	229,367
2-159	238	11	"		A	At Clara & Dewey Creeks			2-27-18	Day Labor	E. K. Lawlen	Concrete Structure Bridges	9,881	2,982	12,863		12,863
2-220	101-293	11	"		C-D	Baird	County Boundary		10-23-1	Day Labor		Over.Crush.Plant & Graveling	26,184	103	26,287	380	26,667
3-3	68	11	"		B	La Moine	Hazel Creek	9.82	6-9 -14	F. Tolendi	E. J. Barrett	Grading	91,332	8,353	99,685	11,244	110,931
3-148	167	11	"		B	At Castle, Keaton & Shasta Creeks		.13	7-28-15	F. Tolendi	E. J. Barrett	Concrete Bridges	22,203	3,392	25,595	1,280	26,875
3-149	167	11	"		B	Hazel Creek	Northerly Boundary	11.38	6-6 -17	Conners-Green & Co.	E. J. Barrett	Grading	163,487	15,328	178,815	16,153	194,974
3-24	238	11	"		A	At Castle, Keaton & Flora Creeks		.04	11-10-15	Day & Scull	E. J. Barrett	Concrete Bridges	13,241	5,536	18,777	1,214	19,991
3-453	167	11	"		A	At Boulder & Shotgun Creek Bridges			11-10-15	Day Labor		Grading Approaches	366		366	14	380
3-362	85-278	11	"		A	At Hunter Ranch			1-13-21	Day Labor		Gradwrk & Sewer Repair	1,925		1,925		1,925
341	277-278	11	"		A-D	Tower House	Redding	15.84	3-14-19	F. Tolendi	A. F. McCarthen	Grading	190,246	18,874	209,120	19,041	228,161
2-366	277-278	11	"		A-D	Tower House	Redding	15.84	10-14-19	Day Labor		Gravel Surfacing	44,537	977	45,514	1,190	46,719
3-329	277-376	11	"		A-D	At Whiskey and Salt Creek and Sta. 505			4-10-20	Day Labor		Grading Approaches	813	65	878		878
3-339		11	"		A	At Redding			1-6 -20	Day Labor	O. A. Rose	Contractors Building	2,140	342	2,482		2,482
3-126	484-440	111	Sierra	23	A	Westerly Boundary	Downieville	17.33	1-25-17	Day Labor	L. H. Carter	Grading	281,998	15,500	297,498	4,134	301,632
2-351	484	111	"	49	A	Across North Fork Yuba River			7-23-19	Day Labor	W. Brown	Steel Bridge	11,517	6,227	17,744		17,744
1-69	130	111	Siskiyou	3	A	Weed	Dunsmuir	10.50	3-22-14	Tooley & Johnson	H. C. Bowden	Grading	92,203	7,107	99,310	9,344	108,655
1-153	310	111	"		A	Across Sacramento River at Dunsmuir		.10	8-31-15	P. H. Gregor	F. W. Scull	Concrete Bridge	55,745	16,372	72,117	1,022	73,139
238	320	11	"		A	Dunsmuir	Southerly Boundary	1.32	8-26-15	Conners-Green & Co.	E. J. Barrett	Grading	23,103	1,134	24,237	1,322	25,559

COMPLETED CONTRACTS, JUNE 30, 1922.

Con.No.	I.C. No.	Dist.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Res. Engineer	Type of Work	Final Estimate Work	Extras	Total	Over. Under Contr.	Total
1-74	432	III	Sacramento	3	A	Sherman	3/4 Mi. S. of Courtland	.50	4-7-19	Guy Lister	Joseph Brown	Gravelling	6,505	913	9,418	794	10,212
165	308-402	III	"	3	A-B	1/4 Mi. N. of Walnut Grove	1/4 Mi. S. of Courtland	.04	7-26-21	John C. Fay	C. W. Hoyt	Concrete Bridge	6,543	3,464	10,113	794	10,907
1-152	402	III	"	3	B	At Twelve Mile Slough	At Freeport	.01	12-29-20	Guy Lister	Joseph Brown	Steel Bridge Superstructure	3,115	57	3,182	574	3,756
56	84	III	"	3	C	Courtland	Oregon Line	8.61	4-27-14	Hansen & Townsend et al	Lester Hewitt	Grading	37,791	6,644	44,435	6,770	51,205
118	143	III	"	3	C	Courtland	Walnut Grove	5.82	11-7-17	Guy Lister	C. W. Hoyt	Grading	134,885	11,811	146,696	4,304	151,000
1-72	84-145	III	"	3	C	Walnut Grove	Oregon Line	.25	1-16-16	Guy Lister	C. W. Hoyt	Grading	3,129	35	3,164	36	3,164
1-55	84	III	"	3	C	Oregon Line	4.7/8 W. South	4.78	4-3-14	Guy Lister	W. H. Tiller	Gravel Surface	42,172	3,135	45,307	42,693	2,614
79	79	III	Colusa	3	C	Pacific	1.7/8 W. S. of Arbuckle	9.05	6-3-14	Concrete Materials Co. Inc.	Clifford Tyler	16' Concrete Slab	74,310	40,703	115,013	7,922	122,935
1-74	144	III	"	7	B	Arbuckle	1.7/8 Mi. S. of Arbuckle	1.75	11-16-16	Guy Lister	W. H. Tiller	Grading	32,998	31,470	71,468	3,283	75,919
144	144	III	"	7	B	1.7/8 Mi. S. of Arbuckle	Fairfield	8.86	11-16-16	Guy Lister	C. W. Hoyt	Gravel Surfacing	71,474	3,170	74,644	1,275	73,369
3-126	359	III	"	7	B	At Sycamore Creek	Sta. 790	.07	4-2-17	Guy Lister	A. V. Piper	15 ft. Conc. Reinforced Bridge	4,531	2,091	6,622	154	7,076
71	84	III	"	7	C	Fairfield	Cacheville	6.83	6-8-14	Gormley, Peterson Co., Inc.	C. J. Hose	12 ft. Conc. Reinforced Culverts	41,195	33,485	5,313	103,763
127	127	III	"	7	C	Travis Air Base	Vacaville	7.24	11-18-19	Guy Lister	C. W. Hoyt	16' Concrete Slab	30,760	7,760	84,520	3,520	81,000
3-270		III	"	7	D	Cacheville	Near Winters	8.17	12-18-19	Cancelled: 6-8-21			233		233		233
185	273	III	"	7	F	Interior	Putah Creek	6.35	4-4-17	C. W. Oliver	C. W. Hatchet	15 ft. Concrete Span	71,852	36,020	89,548	6,195	94,743
183	308	III	"	8	A	Western Boundary	Cacheville	7.69	4-30-17	Perkins & Dutton	C. W. Hoyt	16' Concrete Slab	40,796	16,108	54,898	6,874	61,772
2-212	269	III	"	8	A	Western Boundary	Cacheville	.44	12-7-20	Guy Lister		Surf'ng	1,478		1,478		1,478
68	68	III	Sonoma	8	A	Cacheville	Northern Boundary	4.55	4-3-14	Hansen & Townsend	C. W. Hoyt	Grading	3,361	55,115	58,476	7,892	63,368
D-409	452	III	"	8	A	Pitruchie	Schmitt	1.90	11-8-22	Guy Lister	C. W. Hatchet	Gravel Surf'g	135	41	176	125	51
16	16-52	IV	"	1	B	Healdsburg	Santa Rosa	13.45	12-22-12	Barnard-Swanston & Sons	H. W. Stevenson	15 ft. Conc. Span-Oil Surf.	134,028	64,054	198,079	4,749	203,819
D-52	16	IV	"	1	B	3 Mi. S. of Healdsburg	"	.04	12-7-14	Guy Lister		Gravel Surface	115		115	70	186
D-57	16	IV	"	1	B	Sta. 144+75.3	Sta. 145+85.7	.20	6-8-15	Guy Lister	A. V. Stockard	15' Concrete Span	11,222	1,661	12,883	1,441	14,324
D-86	223	IV	"	1	B	Healdsburg	Russian River	.58	11-19-15	Guy Lister	A. D. Cottrell	15' Concrete Span	10,743	4,196	14,939	715	15,654
D-446		IV	"	1	B	At Mirabel Rubber Bridge			11-2-22	Guy Lister	A. D. Keller	Bridge Approaches	1,429	3,094	4,523	1,857	6,379
129	149	IV	"	1	C	Willow Creek	Southerly Boundary	6.44	4-30-15	Tenby Wood Co.	A. F. Shaw	15' Ft. Concrete Span	45,966	38,129	73,791	4,405	78,196
177	251	IV	"	1	C	Mumbles Ave.	Willow Brook	3.60	12-11-18	W. C. Price & Co.	Jas. Hawkelman, Jr.	Grading	18,767	8,087	21,794	2,661	25,055
276	283-306	IV	"	1	C	Willow Brook	Mirabel	12.42	11-19-20	Rural Improvement Co.	C. F. Shaw	Earth Concrete Base	147,140	32,080	179,220	10,574	168,646
D-367		IV	"	1	C	At Petaluma-Santa Rosa Hy. Crossing			11-7-21	Guy Lister		Automatic Fire Wire	479		479		479
158	241-194	IV	"	1	C	Healdsburg	Fairville	7.05	11-25-15	Jeffery Bond & Miner	A. D. Greene	Grading	47,257	4,667	52,286	4,082	56,368
D-112	194-241	IV	"	8	A	Sta. 52+2.	Sta. 394+00	6.25	9-3-16	Guy Lister	C. C. Cottrell	Gravel Surface	3,377	3,740	7,017	127	9,144
D-123	194-241	IV	"	8	A	Petaluma Creek	Sonoma Creek	11.11	8-6-17	Guy Lister	C. C. Cottrell	Grading	832		832		832
D-82	194-195	IV	"	8	A-B	Sonoma Creek	Easterly Boundary	8.32	8-24-15	Guy Lister	I. W. Atkinson	Grading	19,096	1,019	21,115	1,640	22,745
163	26-241	IV	Sonoma-Marin	8	A	See D-282, Mrn.-Son-6-4											
D-282		IV	"	8	A	See D-282, Mrn.-Son-6-4											
D-287		IV	"	8	A	See D-287, Mrn-Son-6-4		11.04	8-23-22	S. F. Bowser	J. V. Piper	15 ft. Conc. Beam-Oil Surf.	66,692	23,150	89,225	4,890	93,515
3	5-19-31	IV	Stanislaus	4	A	Southerly Boundary	Ceres	6.04	4-28-21	C. A. Costello, Jr.	C. O. Slagle	15 ft. Conc. Span	217		217		217
302	31-5	IV	"	4	A	Southerly Boundary	Ceres		4-28-21	C. A. Costello, Jr.		15 ft. Conc. Span					
D-189	5	IV	"	4	A	At Turlock City Limits			4-15-22	Guy Lister		Surf'ng	217		217		217
D-353	5	IV	"	4	A	Southerly Boundary	Turlock	0.30	2-15-22	Guy Lister	C. Bovey	Conc. Slab Pvt. Ash Surf.	6,664	11,778	17,102	1,116	18,218
25	30	IV	"	4	B	Ceres	Northerly Boundary	9.61	3-26-13	Contstine & Bates Co	C. W. Hatchet	15 ft. Conc. Span-Oil Surf.	33,447	37,003	70,450	7,551	78,001
30	30	IV	"	4	B	Tuolumne River Bridge	Tuolumne River Bridge	1.89	12-5-13	Guy Lister	C. O. Slagle	15 ft. Conc. Span					
D-120	30	IV	"	4	B	At Tuolumne River Bridge		.09	1-24-17	Guy Lister		15 ft. Concrete Span	461		461		461
223	306-338	IV	"	15	A	Modesto	Oakdale	7.63	4-28-13	Guy Lister et al	A. A. McDuff	16' Concrete Slab	15,414	8,172	24,461	1,155	25,616
30	204	IV	"	13	A	Oakdale	Oakdale	17.81		Guy Lister	W. A. Mason	Gravel Surface	61,430	102,567	163,997	5,259	169,256
D-286	204	IV	"	13	A	Oak Dale Ranch	Oakdale	9.26	11-6-18	Guy Lister	C. W. Hoyt	Concrete Culverts	20,716	16,560	37,276	5,793	31,483
294	390-164	IV	"	13	A	Oakdale	Easterly Boundary	12.79	9-3-19	Volker & Mcintyre	A. V. Piper	15 ft. Concrete Span	192,497	64,363	256,799	11,161	267,960
29	164	IV	"	13	A	Knights Ferry Road	Easterly Boundary	1.32	10-2-13	Guy Lister	C. W. Hoyt	Grading	2,442	254	2,696	4,033	6,729
121	150	III	Sutter	3	A	Yuba City	Northerly Boundary	11.70	1-19-15	Forest City Tel. & Con. Co.	C. W. Hatchet	15 ft. Concrete Span	50,943	45,127	96,144	5,430	101,564
247	347	III	Tehama	3	A	Southerly Boundary	Los Molinos	11.72	11-5-17	Lyle S. Atkinson, Jr.	J. J. White	15 ft. Concrete Span	191,743	137,947	329,690	18,952	348,702
D-235	347	III	"	3	A	At Tehama & Cheerio Creeks			6-11-19	Guy Lister		Grading Bridge Approaches	1,930		1,930	132	2,062
D-444	347	III	"	3	A	Southerly Boundary	Los Molinos		1-23-22	Guy Lister		Filling Cash Points	223		223		223
188	347	III	"	3	A	Los Molinos	Red Bluff	6.36	6-8-15	Forest City Tel. & Con. Co.	W. G. Sullivan	15 ft. Concrete Span	46,823	16,766	67,253	4,633	61,765
172	333	III	"	3	A	1/2 Mi. S. of Red Bluff			6-8-15		W. G. Sullivan	Undergrade Crossing	12,717	2,407	20,124	1,800	21,779
166	222-322	III	"	7-3	A-B	Corning	Proberts	9.75	1-13-15	Carlo C. Bellisar	W. G. Sullivan	15 ft. Concrete Span	54,295	28,852	85,147	5,000	80,147
D-252	222	III	"	3	B	At Stony, Elder, Jackson & Oat Creek Bridges			2-21-19	Guy Lister		Pav. Structural Steel Work	6,445	1,340	7,835	576	8,411
D-342	322	III	"	3	C	At Red Bluff Creek		1.40	10-21-21	Guy Lister	W. G. Sullivan	15 ft. Filling & Grading	1,842	1,842	3,684		3,684
296	420-170	III	"	3	C	Red Bluff	Northerly Boundary	13.60	3-4-22	Henry J. Kaiser	W. G. Sullivan	15 ft. Concrete Span	199,830	106,621	306,451	5,413	311,864
142	170	III	"	3	C	Red Bluff	Northerly Boundary	12.54	7-25-13	Clark Stranahrock	J. J. McDevitt	Grading	40,786	4,923	51,709	3,210	54,919
D-320	420	III	"	3	C	4/5 of I.C. #170	Northerly Boundary	.41	1-23-20	Guy Labor		Grading	4,659	457	5,116	393	5,509
D-358	420-170	III	"	3	C	Red Bluff	Northerly Boundary	13.60	3-22-21	Guy Labor	W. G. Sullivan	Sewer Relaying Across 4 Streets	12,392	344	12,736	1,017	14,356
D-446	420-170	III	"	3	C	Red Bluff	Northerly Boundary	13.60	1-23-22	Guy Labor		Grading Laterals & Surface Filling Cash Points	845		845		845
271	427	III	"	3	C	Los Molinos	Red Bluff	13.52	8-26-18	Lyle S. Atkinson, Jr.	W. L. Hayes	15 ft. Concrete Span	108,258	104,415	412,479	11,134	438,613
D-435	427	III	"	3	C	Los Molinos	Red Bluff		1-18-22	Guy Labor		Driveways to Ind. Prop.	227	947	1,174	46	1,220
76	86	III	"	7	A	Southerly Boundary	Corning	8.81	6-8-14	Harry Cassidy & DeVere	T. A. Sullivan	15 ft. Concrete Span	56,267	20,362	76,654	5,428	82,082
D-81	86	III	"	7	A	At Stony Creek Bridge	Corning	3.23	7-23-19	Guy Labor	T. A. Sullivan	Oil Surfacing	1,437		1,691	254	1,945
D-233		III	"	7	A	At Northern Pacific Railway Crossing			7-23-19	Guy Labor		Retaining & Widening Walls	1,890	565	2,455	57	2,398
D-351	221	III	"	7	A	At Stony Creek Bridge				Guy Labor	T. A. Sullivan	Grading Approaches	1,375	115	1,490	146	1,344
341	381	III	Trinity	20	C	White Lac Creek	Helena	11.40	5-28-17	C. H. Pollock	C. B. Curry	Grading	308,193	14,377	280,570	23,855	304,425

COMPLETED CONTRACTS, June 30, 1922.

Contract No.	L.C. No.	Dist.	County	Str.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Res. Engineer	Type of Work	Fiscal Estimate			Engr. Divisor Const.	Total
													Work	Materials	Total		
183	580	VI	Tulare	4	A	Earlimart	Pixley	5.87	6-5 -17	Geo. S. Seaver & Sons	J. J. White	15 ft. Concrete Base	36,976	26,722	63,698	1,573	65,271
198	259	VI	"	4	A	Southerly Boundary	Earlimart	4.63	6-5 -17	The E. R. Co., Inc.	P. C. Lewis	15 ft. Concrete Base	35,715	36,354	72,070	2,545	74,615
193	397-568	VI	"	4	A	Pixley	Tipton	6.78	7-5 -17	Leigh D. Gurney	R. S. Butler	15 ft. Concrete Base	39,541	30,591	70,132	1,979	72,111
195	398	VI	"	4	C	Tipton	Tulare	5.18	7-5 -17	J. R. Shafer	R. S. Butler	15 ft. Concrete Base	75,902	49,235	125,137	6,898	129,715
189	576	VI	"	4	C	Tulare	Tulare	9.16	6-5 -17	A. J. Shafer	A.J. Darlinghouse	15 ft. Concrete Base	93,259	47,127	140,385	6,809	147,193
149	178-179	VI	"	4-16	B-B	Goshen	Visalia	6.42	8-16-15	White & Cockrill	A.F.Darlinghouse	15 ft. Concrete Base	34,645	27,293	61,938	4,094	66,032
201	179-199	VI	"	4-16	B-B	Visalia	Cakgrove School	3.31	8-16-16	W. A. Darrell	W. A. Reed	15 ft. Asph. Surface	27,288		27,288	3,788	31,076
>265	178-179	VI	"	4-16	B-B	Visalia	Oakgrove School	3.31	10-4-19	Day Labor		Concrete Shoulders	11,018	9,741	20,759	21	20,780
183	71	VI	"	4	B	Traver	Hatherly Boundary	5.20	4-15-16	C. W. Jones	C. W. Jones	15 ft. Concrete Base	28,504	22,878	51,382	2,321	53,703
126	71	VI	"	4	B	Goshen	Traver	8.47	4-15-15	W.A. Cockrill & Sons	C. W. Jones	15 ft. Concrete Base	35,686	33,889	69,545	3,514	73,059
D-15	71-335	VI	"	4	X	At Pixley River crsing		.25	6-26-17	Day Labor		15 ft. Concrete Base	1,297	343	1,640	8	1,648
146	175	VI	"	10	A	Easterly Boundary	Near Goshen	1.84	8-10-15	White & Cockrill	A.F.Darlinghouse	15 ft. Concrete Base	14,417	15,062	29,479	2,158	31,637
>308	175	VI	"	10	A	Easterly Boundary	Southern Pacific Sy	1.84	2-26-20	Day Labor		Oil Surface	3,438	1,684	4,122	2	4,124
D-8	67	III	Tuolumne	13	A	Easterly Boundary	Keystone	10.84		Day Labor	H. C. Darling	Grading	6,847	1,758	71,759	8,687	73,756
D-233	67	III	"	13	A	Westerly Boundary	1 Mi. N. of Keystone		9-11-19	Day Labor	R. A. Reed	Stockpiling Conc.Aggregate	38,691	454	39,145	1,200	40,345
D-31	218	III	"	13	B	Keystone	Sonora	11.01	7-25-15	Day Labor	H. C. Darling	Grading	41,774	3,397	45,376	2,640	48,016
31	36	VIII	Ventura	2	B	Southerly Boundary	Newbury Park	7.34	3-24-13	W. A. Darrell	W. A. Darrell	15 ft. Asph. Surface	33,098	22,476	55,574	4,133	59,707
D-13	36	VIII	"	2	B	Newbury Park	Easterly Boundary	7.34		Day Labor	H. D. Ford	Oil Shoulders	12,847	1,699	14,546	1,000	15,546
261	36-107	VIII	"	2	A-B	Ventura Co. Boundary	Conejo Grade	5.80	11-6 -19	Geo. D. Curtis	Geo. D. Curtis	18 ft. Conc. Slab	112,847	41,000	153,847	5,537	159,384
61	107	VIII	"	2	B	Newbury Park	Springville	11.16	4-7 -14	Leigh D. Gurney	Chas. G. Walker	15 ft.Conc.Base-Oil Surf.	124,264	39,659	151,301	8,040	159,341
175	107	VII	"	2	B	At Arroyo Calleguas		.01	7-28-16	Ehmer & Kuser	L. W. Currings	Concrete Coping	3,280	1,234	4,514	678	5,192
D-171	107	VII	"	2	B	At Arroyo Calleguas Bridge		.05	11-17-17	Day Labor		Channel Protection	2,952	728	3,680	49	3,729
171	107	VII	"	2	B	Springville	Santa Clara River	5.63	7-10-19	Kuser & Construction Co.	L. W. Currings	15 ft. Concrete Base	31,565	14,842	46,407	2,668	49,075
168	263-277	VII	"	2	C	Santa Clara River	Ventura	1.18	8-8 -17	Ehmer Contracting Co.	W. C. Ware	15 ft. Concrete Base	28,345	14,681	43,026	3,041	46,067
277	72-73	VII	"	2	C	Ventura	Sea Cliff	8.02	7-30-14	Carl Leonardt	R. S. Hunt	15 ft. Concrete Base	101,986	33,246	135,232	4,498	139,730
D-34	73-73	VII	"	2	D-3	Ventura	Sea Cliff	8.02		Day Labor	W. S. Hart	Oil Surfacing	3,835	2,087	5,913	771	6,684
D-4	73	VII	"	2	F	Sea Cliff	Rancho El Simeon	1.29	9-26-12	Day Labor	C. E. Lent	Sea Wall & Trestle	21,623	8,216	29,839	9,077	38,916
73	13-83	VII	"	2	F-G	Oxnam	Easterly Boundary	1.70	6-5 -13	Eckert Const. Co., Inc.	C. E. Lent	15 ft. Concrete Base	27,471	16,800	71,271	3,466	74,737
83	13-83	VII	"	2	F-G	Oxnam	Westerly Boundary	4.06		Day Labor	C. E. Lent	Oil Surfacing	1,487	1,904	3,391	572	3,963
124	156-217	III	Yolo	6	A	Davis	Yolo Sy-Sac	4.86	4-6 -15	Palmer T. McBryde	W. H. Hutch	18 ft. Concrete Base	53,371	33,039	86,410	5,832	92,242
D-58	156	III	"	6	A	Davis	Webster	4.29		Day Labor	W. H. Miller	Oil Surfacing	2,695	2,202	5,898	191	5,549
D-95	217	III	"	6	A	Sta. 104+14	Sta. 151+62	41	4-10-16	Day Labor	F. C. Weaver	15 ft. Concrete Base	2,534	2,319	4,853	122	4,975
D-175	156	III	"	6	A	At Sta. 345+50			8-17-16	Day Labor		Gravel Surface	1,442		1,442		1,442
D-147	156	III	"	6	A	S.P.R.R. Crossing at Davis		.03	7-3 -17	Day Labor	R. C. Berwick	Concrete-10 ft.Conc.Base	14,965	5,856	20,821	1,301	22,847
D-148	156	III	"	6	A	Approach to Yolo Trestle		.90	8-3 -17	Day Labor	C. W. Jones	15 ft. Concrete Base	11,492	6,958	18,450	1,215	19,665
66	30	III	"	6	B	Across Yolo By-Pass		3.13	9-29-14	Graff Const. Co.	R. C. Berwick	Concrete Bridge	254,900	142,510	404,440	18,519	423,078
156	30	III	"	6	B	Across Yolo By-Pass	Sacramento River	3.69	12-7 -15	Sequoia Const. Co.	R. C. Berwick	Concrete Bridge	28,554	2,263	30,817	1,000	31,817
D-102	157-220	III	"	6	C	Yolo By-Pass	Causeway-Woodland R.R.	1.69	4-16-15	Day Labor	W. S. Hart	15 ft. Concrete Base	32,132	17,720	49,916	3,799	53,715
D-149	157	III	"	6	C	Causeway-Woodland R.R.	Approach to Yolo Trestle	1.15	8-3 -17	Day Labor	R. S. Miller	15 ft. Concrete Base	1,132	1,183	2,315		2,315
											C. W. Jones		15,063	6,952	22,015	1,389	23,674
62	102-147	III	"	6-7	A	Southerly Boundary	Woodland	12.73	7-7 -16	C. Schwartzkopf	W. S. Kirchell	15 ft. Concrete Base	57,193	47,676	104,869	5,270	110,139
D-67	102-147	III	"	6-7	A	Southerly Boundary	Woodland	12.73		Day Labor	W. H. Miller	15 ft. Surfacing	2,423	603	3,026	321	3,347
D-97	102	III	"	7	A	At Sta. 220			1-20-16	Day Labor		Oil Surface		90	90		90
268	418	III	"	7	B	Woodland	Conowe	10.71	4-28-20	Geo. D. Gunton & Son	W. M. Hiser	15 & 18 ft. Concrete Base	153,301	122,388	275,689	7,908	283,597
191	283	III	"	7	B	Blacks	Knights	10.35	7-12-17	C.N.& A.R. Correll	C. W. Heaton	15 ft. Concrete Base	166,319	70,960	237,279	6,904	244,183
D-198		III	"	7	C	Buckeye Creek Bridge Approaches		.02		Day Labor		15 & 21 ft. Concrete Base	294		294	47	341
128	119	III	"	3	A	Southerly Boundary	Morrison's Crossing	1.33	4-12-16	W. F. Holden & Son	W. F. Ireland	15 ft. Concrete Base	22,417	11,590	34,007	3,360	37,367
D-124		III	"	3	A	Morrison's Crossing	Cottonwood & Seat Creek, Grasshopper & Seat Creek Bridges	.03	9-28-19	Day Labor	Carl V. Watkins	15 & 21 ft. Concrete Base	1,191	554	1,745	453	2,197
D-154	483	III	"	3	B	Morrison's Crossing	Esparsville	9.21	7-23-19	W. E. Very	W. E. Very	15 ft. Oil Macadam	67,436	295	67,731	4,954	72,684
						Southerly Boundary	Easterly Boundary	11.07	9-11-17	Day Labor	F. W. Brown	Grading	94,199	15,440	109,649	1,527	111,176
D-242	483	III	Yuba-Nevada	25	A	Sec 8-T.16N.-R.11W-Yub-25-A											
D-419		IV		58-35		Ct. Shikishi	Redwood Park		11-7 -21	Day Labor		Part Exp.of Telephone Line	499		499		499

INCOMPLETE CONTRACTS, JUNE 30, 1922.

Con.or Sol.No.	L.O. No.	Dist.	County	Hwy.	Sec.	From	To	Length Miles	Contract Date	Contractor	Loc. Engineer	Type of Work	Expenditures to June 30, 1922 Work	Materials	Total	Expr. During Month	Total
365	113-190-284	IV	Alameda	5	A	Eastern Boundary	Greenville	7.99	5-26-20	Oakland Paving Co.	C. F. Casebeer	Oiled Macadam, Par. Surf.				277	277
1-465	114-195-284	IV	Alameda	5	A	Eastern Boundary	Greenville	.94	8-2-22	Day Labor	C. D. Knowlton	Curve Rail	.466	543	2.009	68	2.057
1-458	429	III	Amador	24	A	Western Boundary	Ione	10.74	5-27-21	Day Labor	T. A. Orr	Grading	4.193	4.779	74.978	7.29	82.717
459	394	III	Amador	24	A	Ione	Jackson		5-27-21	" "	" "	Grading					
1-459		III	Butte	3	A	Southerly Boundary	Oroville		5-27-21	" "	" "	Oiled Macadam Surface					
1-87	20-148	III	Butte	3	D	Chico	Northerly Boundary	1.66	12-4-15	Day Labor		Surfacing	72		72	7	79
1-353	161	III	Calaveras	24	A	Eastern Boundary	Valley Springs	7.15	11-5-21	Day Labor		Oiled Surface	11.478	485	13.282		13.282
1-353	161	III	Calaveras	24	A	In the Town of Williams		.38	6-26-22	C. A. Whitelock, Jr.		Oiled Surface					
1-429	112-141	IV	Contra Costa	4	B	Ft. Mason Limit			6-26-22	Day Labor		Grading, Drainage	.655	1.381	20.946		20.946
1-428		IV	Contra Costa	14	B	Antioch River Crossing			11-2-21	Day Labor		Steel Bridge	982	173	1.107	46	1.153
1-344	397	I	Del Norte	1	B	Dunbar Creek	Crescent City	4.08	8-19-20	Day Labor	A. B. Hamilton	Gravel Surface	450	11.448	16.898	876	17.474
1-344	397	I	Del Norte	1	B	Crescent City	Smith River	6.83	8-19-20	Day Labor	A. B. Hamilton	Concrete Bridges & Culverts	2.497	7.597	9.944	1.216	11.160
1-454	446	I	Del Norte	1	B	Wilson Creek	Last Chance Hills	4.35	4-15-22	Day Labor	A. B. Hamilton	Grading					
1-341	391	I	Fresno	10	F	Western Boundary	Mendota	6.07	3-3-20	Day Labor	C. H. Bradshaw	Gravel Surface	1.653	104.067	195.720	3.416	199.136
1-433	131	III	Glenn	7	A	Southerly Boundary	Leesville	3.60	3-6-22	Day Labor		Grading	3.965		3.965	230	4.195
0-387		I	Humboldt	1	A(CE)	Willits	Eversville		9-7-21	Day Labor	C. B. Lane	Widening & Grading	18.421	108	19.079		19.079
1-464	118-11-192	I	Humboldt	1	A(CE)	Arcata	Jordan Creek		1-17-22	Day Labor	Fred Meredith	Grading, Par. Surf.	734		734		734
1-356	373	I	Humboldt	1	C	Sta. 174.5+	Sta. 193+15	0.36	8-20-21	Day Labor		Grading	4.409		4.509	101	4.610
1-461	1-4-397	I	Humboldt	1	A-F	Arcata		1.00	3-20-22	Day Labor	J. Stockard	Paving, Concrete	1.524		1.524	153	1.677
298	457	I	Humboldt	1	I	Mad River	Trinidad	10.64	5-25-21	A. J. Fairbrae	J. Stockard	Grading	110.660	32.060	130.942	14.080	151.630
377	496	I	Humboldt	1	I	Trinidad	Freshwater Lagoon	15.53	6-29-22	Pacific Coast Co.	Thomas	Grading & Gravel Surf.					
1-309	424	I	Humboldt	20	C-D	Redwood Creek	Easterly Boundary	22.00	8-20-20	Day Labor	Gen. D. Grant	Grading	14.713	385.069	13.644	398.533	
1-286		VII	Imperial														
			San Diego	12	H	Westerly Boundary	Mountain Springs Grade	10.02	11-6 -19	Day Labor	C. L. Grace	Grading & Conc. Bar.	60.773	14.405	81.184	2.600	83.784
376	503	VII	Imperial	36	F	El Centro	Imperial	2.00	6-29-22	J. D. Knapp	R. D. Eaton	30 ft. Concrete Base					
1-460		VII	Imperial	86	F	Imperial	El Centro	2.00	3-31-22	Day Labor	A. L. Young	Topping, Concrete Surface	477	3.659	4.136	50	4.186
409	466	VII	Imperial	86	F	San Diego Line Canal	New County Well	10.74	9-26-21	Geo. H. Dewey	A. L. Young	15'Reinforced Concrete Pipe	10.000	66.777	156.804	5.938	162.742
302	462	VI	Inyo	23	H	Sta. 0+00 Red. 33.7 to S.R.33 f.	Bishop	11.66	7-5 -21	Harry Baleon	Harry Baleon	Grading	76.800	1.000	83.371	1.300	84.671
310	483	VI	Inyo	23	H	Bishop	Round Valley Road	8.37	7-5 -21	A. J. Orser	W. J. Reed	15 ft. Bituminized Macadam	111.476	8.213	119.689	10.438	130.127
330	105	VII	Kern	4	B	Grapevine Creek	Sta. 91+97	17.18	10-5 -21	Southwest Paving Co.	S. Rathcombe	15 & 7' ft. Conc. Surf.					
1-65	99-353	VII	Kern	4	C	Stanton #18	Bakersfield	10.90	11-8 -21	Federal Const. Co.	S. Rathcombe	15 ft. Concrete Base					
1-411	99	VII	Kern	4	C	Sec.3 & 7, 32 S., R.28 E.	Bakersfield	2.00	11-17-21	Day Labor	C. DeLancey	Concrete 2nd Story	34.744	34.833	69.777	734	70.511
1-411	99	VII	Kern	4	C	Sta. 442.5	Sta. 0+00	12.40	11-17-21	Day Labor	C. DeLancey	Concrete Base	27.844	27.844	55.688	734	56.422
368	495	VII	Kern	33	B	Junction Pumping Station	Hart Station	17.18	5-24-22	Kelser Paving Co.	E. J. Bair	18 ft. Bituminized Macadam					
361	489	I	Lake	15	A	Westerly Boundary	Upper Lake	9.01	5-3 -22	Day Labor	S. M. Cameron	Grading	6.704	8.746	12.450	573	13.023
1-364	498	I	Lake	15	A	Upper Lake	Lakeport	9.01	6-14-22	Day Labor		Gravel Surface	15.570	6.000	22.646		22.646
1-364	471	I	Lassen	28	B	From the Town of Susanville		6.19	6-29-22	Day Labor	F. W. Macnally	Macadam Surface	2.818		2.818	300	3.118
1-391	498	VI	Lassen	28	C	Susanville	Johnstesville	4.93	9-22-21	Day Labor	F. W. Macnally	Grading	44.895	8.135	50.017	774	50.791
345	159-161	VII	Los Angeles	4	A-C	3/4 M.W.M.Castaic	1.1 M.E.Newhall Tunnel	7.04	1-5 -21	Southwest Paving Co.	N. G. Baleon	20 ft. Asphalt Surface	47.240	18.769	59.034	1.726	60.760
1-470		VII	Los Angeles	9	A	At Tujunga Wash			6-1 -22	Day Labor		Slab Protection					
1-362	256	VII	Los Angeles	9	B	Sta. 60+52	Sta. 60+52		8-26-21	Day Labor		Improving Intersection					
1-362	475	VII	Los Angeles	60	B	Santa Monica	Sta. 74 M.W.M.Castaic	9.39	11-8 -21	Southwest Paving Co.	H. C. Reeder	20 ft. Concrete Base	46.376	3.699	50.075	8.015	58.090
1-426	273	VII	Los Angeles	60	B	Las Flores Canon	Santa Monica		3-3 -22	Day Labor	H. C. Reeder	Removing Bldg. from R/W	8.132		8.132		8.132
317	194-197-254	IV	Marin	6	A	Novato	Petaluma	9.52	6-29-22	Grant Smith Co.	R. D. Reeder	18 ft. Asph. Conc. Base	20.987	532.539	553.526	8.087	561.526
378	512	IV	Marin	62	A	Alto	Belvedere Crossing	3.49	6-28-22	J. A. Wolfe & W. G. Preston	S. F. Wessner	Grading					
1-463	535	IV	Mendocino	18	I	Private Railroad Forest	Drive Road	5.69	3-6 -22	C. A. Nichols	C. A. Nichols	Grading	1.930	3.264	17.154	1.298	18.452
1-463	535	IV	Mendocino	1	I	Forsythe Creek	Ridgewood		3-6 -22	Day Labor	C. V. Jones	Widening	1.435	1.834	54.429	1.701	59.130
1-463	289-535	IV	Mendocino	1	HIF	Forsythe Creek	Willits	17.31	3-6 -22	Day Labor	C. V. Jones	16 ft. Bituminized Macadam	2.818		2.818	300	11.118
1-463	29	I	Mendocino	1	B	Ridgewood	Willetts		3-6 -22	Day Labor	C. V. Jones	Widening	23.899	2.892	26.831	1.506	28.337
331	388	I	Mendocino	1	G	Outer N.W.P.Ry. near Arnold			9-22-21	Rocca & Caletti	C. A. Kitts	Undergrade Crossing	10.655	1.436	11.490	1.013	13.503
1-331	388	I	Mendocino	1	G	Arnold	Sherwood	10.19	9-22-21	Day Labor	C. A. Kitts	Grading	26.738	28.930	234.362	7.022	241.774
1-387		I	Mendocino	1	A(CE)												
		I	Humboldt	1	A(CE)	See D-387. 1-Mun-1-AMO and 1-Mun-1-CM14.											
0-193	262	I	Mendocino	1	H	Sherwood Junction	Rattlesnake Summit	13.76	5-7 -18	Day Labor	C. W. Lane	Grading	155.812	49.168	204.980	7.648	212.628
1-384	2CC-201-262	I	Mendocino	1	I,K	Cottlesnake Summit	Northerly Boundary	23.63	5-14-21	Day Labor	W. W. Baker	Grading	587.548	53.405	785.979	27.464	763.427
1-384	447	I	Mendocino	1	I	Sta. 0+00 S. of Ukiah	Sta. 240+	4.50	5-14-21	Day Labor	C. Summerlin	C. H. Ballard	67.377	10.463	77.840	1.176	79.016
1-384	447	I	Mendocino	15	C	Sta. 240+	Ukiah	2.50	5-14-21	Day Labor	C. W. Lane	Grading	37.431	5.813	43.244	653	43.897
346	1274	I	Mendocino	48	C	Flynn Creek	Konte #1 Reserve River	11.98	11-29-21	J. F. Holland	R. M. Cresciowitz	Grading	39.000	7.591	47.090	3.720	50.811
340	12-18	VI	Merced	4	A-C	Canal Creek-3/4 Mi.N.W.Merced	Franklin School-Owens Creek	6.31	12-31-21	Valley Ford Const. Co.	C. C. Vagus	15 ft. Asphalt Surface	37.536	28.843	66.433	1.492	66.925
371	500	VI	Merced	32	A	Westerly Boundary	San Luis Creek	8.49	6-15-22	Pacific Const. Co.	W. T. Reupke	Grading & 16' Conc. Base					
372	501	VI	Merced	32	B	San Luis Creek	Los Banos	13.26	6-15-22	Blanco & Taylor	J. V. White	18 ft. Concrete Base					
1-372	453	VI	Merced	32	C	Los Banos	Central Boundary	19.38	1-25-21	Bates & Rogers Const. Co.	J. V. White	15 ft. Concrete Base	236.232	246.655	483.887	11.318	495.205
1-366	493	VI	Merced	32	C	San Joaquin Overflow Area			6-5 -22	Day Labor		Willow Mat					
1-366	493	VI	Modoc	28	A	Alma Summit	Canby	10.85	5-28-19	Day Labor	S. W. Lowden	Grading	236.660	11.197	347.877	4.389	352.266
1-393		II	Modoc	26	A	Across Pit River			9-22-21	Day Labor	A. S. McClaxe	Concrete Bridge	15.573	2.709	18.282	33	18.315
1-341	430	II	Modoc	26	B	Canby	Alturas	17.11	5-24-22	Day Labor	S. W. Lowden	Grading	87.283	10.480	97.763		97.763
1-357		II	Modoc	26	C	Alturas	Cedarville		8-11-22	Day Labor	S. W. Lowden	Gravel Surface	926	2.196	3.122	133	3.255
300	426-510	VI	Mono	25	H-I	Sonora Pass Road	Bagdad	19.64	5-25-21	Nevada Contracting Co.	J. C. Murtha	Grading	109.647	10.662	119.709	15.044	134.753
1-357	466	V	Monterey	10	A		0.5/4 M.E.of Long Valley School	10.98	4-13-22	Standard Industrial Pkg. Corp.	H. Stevenson	Grading & Grav. Surf.	1.156	4.624	5.780	1.422	8.204

INCOMPLETE CONTRACTS, JUNE 30, 1922.

Con. or D.L. No.	L.O. No.	Div.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Res. Engineer	Type of Work	Expenditures to June 30, 1922 Work	Expenditures to June 30, 1922 Materials	Expenditures to June 30, 1922 Total	Engr. During Const.	Total
286	318-360	III	Nevada	17	A-B	Southerly Boundary	Grass Valley	14.81	5-11-21	Healy-Tibbetts Const. Co.	J. L. Piper	15 ft. Bit Macadam	75,632	10,031	85,663	6,162	91,825
D-175	482	III	Nevada	25	A	Nevada City	Northerly Boundary	18.00	12-28-17	Day Labor	R. W. Brown	Grading	271,033	40,435	311,468	3,026	314,494
D-155	482	III	Nevada	25	A	Nevada City	North San Juan	14.20	4-25-22	Day Labor	D. D. Breuning	Gravel Surface	3,644		3,644		3,644
D-471		VII	Orange	2	A	Southerly Boundary	San Juan		6-5-22	Day Labor		By-Pass Road					
370	120	VII	Orange	2	C	Irvine	Tustin	5.61	6-6-22	Geo. H. Oswald	H. C. Foster	Conc. Base 2nd Story				227	227
D-134	229	III	Placer	3	A	Roseville	Lincoln	5.00	3-8-22	Day Labor		Concrete Shoulders					
D-165	497	III	Placer	3	B	Through Sheridan		0.26	5-29-22	Day Labor	R. T. Millard	18 ft. Concrete Base	984		984	60	1,044
285	393-491	III	Placer	17	C	Auburn	Northerly Boundary	7.47	5-10-21	Blumenkranz & Vernon	J. L. Piper	15 ft. Bit Macadam	115,860	5,585	121,445	8,888	130,333
D-363		III	Plumas	29	A												
		II	Tehama	39	B-C	Paynes Creek	Chester Grade	44.60	4-11-21	Day Labor	S. W. Lowden	Grading	141,111	10,626	151,737	5,303	157,040
D-477		VII	Riverside	26	B	In the City of Banning		0.70	6-27-22	Day Labor		Concrete Curb					
358	487	VII	Riverside	26	C	Banning	Whitewater	12.30	4-12-22	Lee Moor Contracting Co.	C. P. Montgomery	16 ft. Concrete Base	4,628	1,470	6,098	955	7,053
350	477	VII	Riverside	26	D	Whitewater	Edom	17.65	1-17-22	H. J. Kaiser	L. M. Ransom	16 ft. Concrete Base	7,606	4,105	11,711	1,977	13,688
351	478	VII	Riverside	26	E	Edom	Indio	11.47	1-17-22	Warren Construction Co.	H. C. Foster	16 ft. Asph. Conc. Base	20,374	10,057	30,431	1,935	32,366
362	51	V	San Benito	2	A	San Juan	Pajaro River	4.57	5-2-22	W. A. Dontanville	W. P. Chapman	Conc. Base 2nd Story				644	644
328	467	VII	San Bernardino	31	C	Summit	Victorville	15.74	10-5-21	R. T. Shea & Co	C. G. Kolster	16 ft. Bit. Macadam	133,644	70,421	204,065	5,455	209,520
D-453		VII	San Diego	12	D	E. end of Pavement	Ogden Ranch		4-16-22	Day Labor	H. T. Smith	15 ft. Concrete Base	2,097		2,097		2,097
D-443		VII	San Diego	12	F	At La Posta Creek			3-8-22	Day Labor		Timber Bridge	496		496		496
D-476		VII	San Diego	12	F	At Kitchen Creek			6-21-22	Day Labor		Approach Fills					
D-288		VII	(San Diego / Imperial)	12	H	See D-288-VII-Imp-S.D.-12-H											
349	475-476	IV	(San Francisco / San Mateo)	55	A	Sloat Boulevard	Sneath Road	7.34	12-21-21	P. L. Burr	L. C. Winkelman, Jr.	Grading & Grav. Surf.	50,461	6,180	56,641	6,846	63,487
D-469		IV	San Francisco			State Building at San Francisco			6-2-22	Day Labor		Finish Work					
336	472	III	San Joaquin	24	A	1.3 Mi E. of Plymouth	Easterly Boundary	4.31	11-2-21	Hard Bros.	P. C. Hewitt	Grading	22,658	1,848	24,506	2,144	26,650
D-463	125-325-104	V	San Luis Obispo	2	B-E	Arroyo Grande-Atascadero Creek	San Luis Obispo-Paso Robles	0.72	5-17-22	Day Labor	J. I. Boaz	Paving Exceptions					
360	138-373	V	San Luis Obispo	2	D	San Luis Obispo Creek	Cuesta	3.59	4-25-22	W. A. Kettlewell & Sons	G. H. Major	20 ft. Concrete Base	2,854		2,854	1,081	3,935
D-139	104	V	San Luis Obispo	2	E	Arroyo Grande	San Luis Obispo	0.19	6-19-17	Day Labor		15 ft. Concrete Base	585	168	753		753
D-422	459	V	San Luis Obispo	33	B	Estrella River	1 Mi. N.E. Shandon Pump. Sta.	6.30	1-5-22	Day Labor	S. S. Bennett	Gravel Surfacing	3,879		3,879	89	3,968
D-473		V	San Luis Obispo	33	B	At McMillan Canyon			6-14-22	Day Labor		Concrete Bridge				51	51
D-369	361	V	San Luis Obispo	33	C	1 Mi. N.E. Shandon Pump. Sta.	Easterly Boundary	6.80	5-25-21	Day Labor		Gravel Surface	7,804	365	8,169	12	8,181
331	468	V	San Luis Obispo	56	A	6 Mi. N. San Simeon	Northerly Boundary	9.97	10-5-21	Blake & Heany	W. R. Marshall	Grading	48,246	17,059	65,305	7,134	72,439
337		V	San Luis Obispo	57	A	At Huasna & Alamo Creeks		0.09	11-2-21	Security Bridge Co.	G. A. Tilton, Jr.	Steel Bridges	17,395	7,075	24,470	1,324	25,794
363		V	San Luis Obispo / Santa Barbara	57	A	Across Cuyama River			5-10-22	Parlier & Lowry	G. A. Tilton, Jr.	Steel Bridge		3,950	3,950	207	4,157
D-439	452	V	San Luis Obispo	57	A	3 Mi. N. of Santa Maria	Cuyama River	11.13	3-8-22	Day Labor		Gravel Surface	88		88		88
349	475-476	IV	(San Mateo / San Francisco)	55	A	See Cont. 349 IV-S.F.-S.M.-55-A											
279	192-271	V	Santa Barbara	2	D-E	Las Cruces	Zaca Station	14.64	3-3-21	Fairchild-Gilmore-Wilton Co.	E. B. Brown	20 ft. Concrete Base	185,016	183,379	369,395	11,779	381,174
D-326	(192-271 / 292-248)	V	Santa Barbara	2	D-E	Las Cruces	Zaca Station	14.64	4-2-20	Day Labor	H. S. Bennett	Stockpiling Conc. Aggregate	81,747	10,430	92,177	4,131	96,308
341	115-123-134	V	Santa Barbara	2	EFG	(Los Chiqueros Creek / 2-1/2 Mi. E. of Naples)	Gaviota Creek / Canada de Los Llagos	8.41	11-29-21	Southwest Paving Co.	J. M. Kirrel	(Concrete Shoulders and Asphalt Surfacing)	22,093	41,338	63,431	2,711	66,142
352	4[illegible]	V	Santa Barbara	57	A	Cuyama River	Buckhorn Creek	6.09	2-1-22	Warren Const. Co.	G. A. Tilton, Jr.	Grading	20,600	8,676	29,476	3,049	32,525
363		V	Santa Barbara / San Luis Obispo	57	A	See Contract 363-V-S.L.O.-S.B.-57-A											
343	40	IV	Santa Clara	2	C	Morgan Hill	Gilroy	7.85	12-6-21	Clark & Henery Con. Co.	E. J. Brown	15 ft. Asph. Surf.	24,382	20,337	44,719	1,707	46,426
D-440	96-167	IV	Santa Clara	2	C	Carnadero Creek	Southerly Boundary	4.35	2-24-22	Day Labor	Geo. W. Wade	Concrete Shoulders	4,578	1,565	6,143	369	6,512
355	480-481	IV	Santa Clara	32	B-C	San Felipe	Easterly Boundary	16.76	2-24-22	Rhodes & Price	K. J. Sutton	Grading & Grav. Surf.	12,513	9,244	21,757	7,930	29,687
278	419	II	Shasta	3	A	Southerly Boundary	Redding	15.57	3-3-21	Henry J. Kaiser	E. Q. Sullivan	15 ft. Concrete Base	258,173	134,121	392,294	16,397	408,691
346	419	II	Shasta	3	A	At Anderson & Canyon Creeks and Oregon Gulch		0.05	12-7-21	Thompson, Miller & Thompson	E. Q. Sullivan	Concrete Bridges	8,203	5,353	13,556	750	14,306
D-447	419	II	Shasta	3	A	Southerly Boundary	Redding		3-22-22	Day Labor		Filling Const. Joints					
D-474		II	Shasta	3	A	At Canyon Creek & Oregon Gulch			6-19-22	Day Labor		Approach Fills					
D-429	101-293	II	Shasta	3	C	Baird	Sacramento River		12-28-21	Day Labor		Widening	5,170		5,170		5,170
D-396	378	II	Shasta	20	B	Shilling	Redding		9-29-21	Day Labor	J. S. Wagner	Miscellaneous Repairs	8,692	20	8,712	1	8,713
D-355	441-454-455	II	Shasta	28	ABC	2.3 Mi. S.W. of Ingot	Burney	35.90	2-25-21	Day Labor	H. K. Ward	Grading	217,539	11,708	229,247	7,554	236,801
D-457	484	III	Sierra	25	A	Westerly Boundary	Goodyears Bar	7.62	4-25-22	Day Labor	R. W. Brown	Gravel Surface					
313	130-320-396	II	Siskiyou	3	A	Upton	Southerly Boundary	11.24	7-30-21	Henry J. Kaiser	R. J. Bassett	18 ft. Concrete Base	8,862	4,844	13,706	1,421	15,127
D-374	130-320	II	Siskiyou	3	A	Upton	Southerly Boundary		6-22-21	Day Labor	R. J. Bassett	Widening	16,635	626	17,261	2,056	19,317
373	130-382-396	II	Siskiyou	3	A-B	Upton	Shasta River	10.74	6-22-22	Kaiser Paving Co.	E. J. Bassett	18 ft. Concrete Base					
315		II	Siskiyou	3	B	At Parks & Willow Creeks & Shasta River		0.02	7-30-21	T. H. Polk	L. H. Taylor	Concrete Bridges	17,964	6,649	24,613	1,269	25,882
D-232	382	II	Siskiyou	3	B	Weed	Gazelle	10.84	5-8-19	Day Labor	L. H. Taylor	Grading	173,504	8,463	181,967	10,208	192,175
D-459		II	Siskiyou	46	BCD	Happy Camp	Shasta River	65.00	5-3-22	Day Labor	L. H. Taylor	Grading	580		580	407	987
364	94	III	Solano	7	C	Fairfield	Vacaville	8.85	5-10-22	California Const. Co.	C. O. Dingle	15 ft. Asph. Surf.					
D-414	94	III	Solano	7	C	Fairfield	3 Mi. Easterly	3.00	3-8-22	Day Labor	H. E. Ivle	Concrete Shoulders	36,304	45,105	71,409	333	71,742
339	273	III	Solano	7	E	Batavia	Northerly Boundary	8.35	11-17-21	Clark & Henry Const. Co.	C. O. Dingle	15 ft. Asph. Surf.	38,890		38,890	15	38,905
289	451	III	Solano	53	B	Denverton	Rio Vista	11.87	5-10-21	F. C. McIntyre	C. M. Butts	15 ft. Concrete Base	61,379	68,673	130,052	6,933	136,985
D-411	451	III	Solano	53	B	Denverton	Rio Vista		11-17-21	Day Labor	C. M. Butts	Exp. Sub-grade Treatment	722	2,510	3,232	1	3,233
314	465	IV	Sonoma	1	A	Cloverdale	Healdsburg	15.97	7-30-21	Henry J. Kaiser	M. C. Poggato	18 ft. Concrete Base	163,544	128,222	291,766	16,736	308,502
359	159-261	IV	Sonoma	1	C	Willow Brook	1 Mi. S. of Petaluma	4.29	6-6-22	A. G. Raisch	L. D. Smith	15 ft. Asph. Surf.				15	15
D-486	159-261	IV	Sonoma	1	C	Willow Brook	1 Mi. S. of Petaluma	4.29	2-24-22	Day Labor	J. H. Kreitler	Concrete Shoulders	15,893	22,608	38,[illegible]1	279	38,780

INCOMPLETE CONTRACTS, JUNE 30, 1922.

Contract No.	L.O. No.	Dist.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Res. Engineer	Type of Work	Expenditures to June 30, 1922 Work	Materials	Total	Encr. During Const.	Total
317	194-241-254	IV	Sonoma-Marin	8	A	See Contract XIV-IV-Wro-Son-8-A											
3263	194-195	IV	Sonoma	8	A-B	Petaluma	Easterly Boundary	9.29	9-29-21	Healy-Tibbetts Const. Co.	R. H. Wagner	Grading & Gravel Surf.	39,093	13,344	52,437	5,971	58,408
3393	488	IV	Sonoma	01	A	Santa Rosa	Healdsburg	11.73	4-25-22	Grant Smith & Co.	K. H. Halpen	18 ft. Pvt. Macadam	3,190	2,048	5,238	1,086	6,324
3233	438-493	III	Sutter	15	B	1 Mi. S. Sutter City	Yuba City	8.67	11-3-20	John Seale	B. T. Willard	18 ft. Concrete Base	143,882	2,879	146,761	6,073	152,834
3-449	347	II	Tehama	3	A	Southerly Boundary	Los Molinos		5-24-22	Day Labor		Paving Bridge Approaches	1,249	1,726	2,975	14	2,989
3-448	347	II	Tehama	3	A	Southerly Boundary	Los Molinos		4-5-22	Day Labor		Guard Rail	5		5		5
3-429	9224-69	II	Tehama	3	B	Tehama Junction	Red Bluff		4-5-22	Day Labor		Guard Rail	9		9		9
3-406	100	II	Tehama	3	D	Red Bluff	Southerly Boundary		4-5-22	Day Labor		Guard Rail	14		14		14
3-431	427	II	Tehama	3	D	Los Molinos	Red Bluff		3-20-22	Day Labor		Railing Const. Paints	343		343	2	345
3-431	427	II	Tehama	3	D	Los Molinos	Tehama Junction		4-5-22	Day Labor		Guard Rail	5		5		5
3-433	66-222	II	Tehama	7	A	Tehama Junction	Southerly Boundary		4-5-22	Day Labor		Guard Rail	9		9		9
3-503		II	Tehama	29	B-C												
		III	Plumas	89	A	See Dists. - III-Plu-29-A and	III-Tah-29-B										
311	464	II	Trinity	20	A	2 Mi. S. Weaverville	Ten Long Gulch	10.61	7-14-21	Chadwick & Sykes	E. T. Ward	Grading	97,162	12,822	109,984	15,287	124,271
3-420	464	II	Trinity	20	A	Weaverville	Ten Long Gulch	10.61	1-7-22	Day Labor	E. T. Ward	Gravel Surface		2,547	2,547		2,547
3-354	444	II	Trinity	20	B	Burnt Ranch	Whites Bar Creek	15.60	3-24-21	Day Labor	E. W. Brown	Grading	157,005	7,295	164,300	4,107	168,407
3-370	788	II	Trinity	20	E	2 Mi. S. Macdoel	Pit River		1-7-22	Day Labor	E. W. Brown	Timber Bridge	786		786		786
3-396	200	VI	Tulare	4	W	Tipton Junction		0.45	1-7-22	Day Labor	W.K.Oberteuffer	Concrete Shoulders	131		131	69	200
3-5	71	VI	Tulare	4	E	Visalia	Southerly Boundary	6.39	1-7-22	Day Labor	J. J. Perdue	Oil Surface	661	731	1,392	73	1,465
3-5	71	VI	Tulare	4	E	Visalia	Tipton	8.39	1-7-22	Day Labor		Oil Surface	11		11		11
367	494	VI	Tulare	10	F	Three Rivers	Sequoia National Park	5.85	4-21-22	Memphis Contracting Co.		Grading				222	222
3-322	67	III	Tuolumne	13	A	Easterly Boundary	1 Mi. N. of Keystone	9.40	10-31-21	H. Fehr Const.Co., Inc.		18 ft. Concrete Base	35,024	40,368	75,392	2,349	77,741
3-309	218	III	Tuolumne	13	B	Jamestown	Sonora	3.53	1-7-22	Day Labor	J.F.McDonnell	18 ft. Concrete Base	40,858	21,082	61,940	3,877	65,817
3-397		VII	Ventura	60	A	Fourth Ward	Rice Sycamore Creek	3.70	1-7-22	Day Labor	A. J. Griffin	Grading	60,776	262	61,038	1,895	62,933
3-478		III	Yolo	7	A-B	Willow Slough & Cache Creek		0.71	6-7-22	Day Labor		Surf/Tling&ProtectionWork					
3-384	418	III	Yolo	7	B	Excepticns			4-5-22	Day Labor		Paving Exceptions	5,516	1,214	6,729		6,729
3-376	432	III	Yuba	7	B	1 Mi. S. Marysville	Marysville	1.00	8-28-21	Day Labor	C. Bovey	Conc.Bridge & Oil Mac.Surf.	7,469	7,591	15,060	1,772	16,832
3-425	663	III	Yuba	20	A	Southerly Boundary	Easterly Boundary	0.83	4-5-22	Day Labor		Gravel Surface					
3-431	General					Tittering Test Highway			2-21-22	Day Labor	Lloyd Aldrich	Test Road	14,746	1,164	15,910	242	16,152

BIENNIAL REPORT

OF THE

SECRETARY OF STATE

OF THE

STATE OF CALIFORNIA

FOR THE

Seventy-second and Seventy-third Fiscal Years, Beginning July 1, 1920, and Ending June 30, 1922

FRANK C. JORDAN
Secretary of State



CALIFORNIA STATE PRINTING OFFICE.
SACRAMENTO, 1922.

REPORT OF THE SECRETARY OF STATE.

STATE OF CALIFORNIA, DEPARTMENT OF STATE,
SACRAMENTO, AUGUST 2, 1922.

To His Excellency, WM. D. STEPHENS,
Governor of the State of California.

SIR: I have the honor to present herewith my sixth biennial report as Secretary of State, which contains a statement of all fees received by this office from July 1, 1920, to June 30, 1922, inclusive. The report also includes a statement of expenditures and the amount drawn against the several appropriations made for the support of this department.

The records of this office, kept as provided by subdivisions 2, 3 and 4 of section 408 of the Political Code, show that the Governor has granted 7 pardons, 58 commutations of sentence, and 30 reprieves; has signed 135 restorations to citizenship; has issued 20 holiday and other proclamations; has granted 535 orders of release of prisoners from state prisons under the Goodwin Act; has signed 524 land patents; has commissioned 5844 notaries public and 17 commissioners of deeds; has made 403 executive appointments and has approved 53 official bonds.

The total receipts of this department from all sources during the last two fiscal years, ending June 30, 1922, were $2,523,970.05. Receipts for previous two fiscal years, ending June 30, 1920, were $2,008,989.77, showing an increase of $514,780.28.

The License Tax Department collected from July 1, 1920, to June 30, 1921, $939,227.22; from July 1, 1921, to June 30, 1922, $989,610.26, making the total license taxes collected during the two fiscal years, $1,928,837.48.

An examination of the financial statement shows $595,132.57 was collected during the last two fiscal years as general fees.

The following is a comparative statement of the work done in Registry Department, fiscal years 1919-1920 and 1921-1922:

Kind filed	Fiscal years		Increase	Decrease
	72d, 73d	70th,71st		
Articles of incorporation (domestic)	6,624	4,831	1,793	
Articles of incorporation (foreign)	734	605	129	
Official bonds	53	49	4	
Rewards	2	2		
Designation of agents, foreign corporations	942	698	244	
Certificate increase, capital stock	997	659	338	
Certificate decrease, capital stock	87	139		52
Certificate increase, number of directors	411	291	120	
Certificate decrease, number of directors	127	118	9	
Amended articles of incorporation	571	371	200	
Change of name of corporations	396	304	92	
Removal place of business of corporations	177	148	29	
Dissolution of corporations	1,054	1,132		78
Extension of term of existence	18	16	2	
Withdrawals from state, foreign corporations	92	83	9	
Creation of bonded indebtedness	187	140	47	
Attested and Recorded.				
Restoration to citizenship	135	670		535
Releases from prison (Goodwin act)	535	1,409		874
Commutation of sentence	58	29	29	
Pardons	7	42		35
Reprieves	30	10	20	
Land patents	524	821		297
Notaries public	5,844	4,879	965	
Commissioner of deeds	17	21		4
Executive appointments	403	585		182
Holiday and other proclamations	20	16	4	
Change of name of person	454	900		446
Deeds recorded and filed	98	96	2	
Miscellaneous registrations	672	646	26	
Totals	21,269 19,710	19,710	4,062 2,503	2,503
Increase in past two years	1,559		1,559	

Respectfully submitted.

FRANK C. JORDAN,
Secretary of State.

FINANCIAL STATEMENT.

CORPORATION DEPARTMENT.

RECEIPTS FOR FILING FEES, CERTIFIED COPIES, ETC.

Seventy-second fiscal year, July 1, 1920, to June 30, 1921.		*Seventy-third fiscal year, July 1, 1921, to June 30, 1922.*	
July	$34,053 99	July	$18,946 47
August	23,207 96	August	20,591 49
September	23,241 72	September	17,676 01
October	32,032 58	October	20,391 30
November	39,468 57	November	18,405 89
December	26,828 58	December	21,521 34
January	24,442 95	January	23,312 25
February	22,524 69	February	19,847 31
March	36,246 41	March	27,518 44
April	26,123 37	April	29,152 77
May	21,258 16	May	25,681 30
June	20,684 74	June	21,974 28
Total	$330,113 72	Total	$265,018 85

Receipts seventy-second fiscal year	$330,113 72
Receipts seventy-third fiscal year	265,018 85
Total	$595,132 57

There was collected by the Corporation License Tax Department during the—

Seventy-second fiscal year, July 1, 1920, to June 30, 1921	$939,227 22
Seventy-third fiscal year, July 1, 1921, to June 30, 1922	989,610 26
Total	$1,928,837 48

Receipts from all departments of the Secretary of State for fees during the seventy-second and seventy-third fiscal years:

From Corporation Department	$595,132 57
From Corporation License Tax Department	1,928,837 48
Total	$2,523,970 05

CORPORATION LICENSE DEPARTMENT.

The provisions of Chapter 215, Statutes 1917, and Chapters 414, 443, 497 and 784, Statutes 1921, produced the following revenues:

Seventy-second fiscal year, July 1, 1920, to June 30, 1921.		*Seventy-third fiscal year, July 1, 1921, to June 30, 1922.*	
July	$7,290 00	July	$8,645 00
August	5,667 03	August	7,532 87
September	7,319 60	September	4,501 00
October	4,463 33	October	4,518 33
November	3,134 96	November	2,942 42
December	1,587 53	December	2,175 56
January	474,496 66	January	493,105 00
February	330,793 64	February	347,255 80
March	65,153 44	March	77,687 18
April	16,030 17	April	17,037 50
May	11,537 44	May	13,631 61
June	11,480 42	June	10,577 99
Total	$939,227 22	Total	$989,610 26

There was collected during the period commencing on July 1, 1920, and ending June 30, 1921, inclusive, the sum of $939,227.22 segregated as follows:

15,799 corporations paid the graduated tax under Sec. 3, Statutes 1917	$750,365 00
1,716 corporations paid the revivor license under Sec. 14, Chapter 215	33,597 79
1,286 corporations paid the graduated tax and $10 penalty	71,195 00
3,088 corporations paid the graduated tax under Sec. 5	84,069 43
Total	$939,227 22

The number of domestic corporations which were suspended, and of foreign corporations which forfeited their rights to transact business in this state, was 1965.

Under the act there was collected during the period commencing on July 1, 1921, and ending on June 30, 1922, inclusive, the sum of $989,610.26, segregated as follows:

15,849 corporations paid the graduated tax under Sec. 3 in the sum of	$787,315 00
1,557 corporations paid the graduated tax and $10 penalty	89,053 33
3,222 corporation licenses were issued under the provisions of Sec. 5	87,047 44
455 corporations paid the revivor license under Sec. 14	26,194 37
Total for the seventy-third fiscal year	$989,610 26

The number of domestic corporations whose charters were suspended, and of foreign corporations which forfeited their rights to transact business in this state, was 2548.

SECRETARY OF STATE.

PRINTING, BINDING AND OTHER WORK.

Seventy-second fiscal year, July 1, 1920, to June 30, 1921.

July 1, 1920—Balance	$8,004 08
June 30, 1921—Amount expended during fiscal year	6,031 02
Balance on hand	$1,973 06

Seventy-third fiscal year, July 1, 1921, to June 30, 1922.

July 1, 1921—By appropriation	$11,000 00
By refund	118 35
	11,118 35
June 30, 1922—Amount expended during fiscal year	4,532 55
Balance on hand	$6,585 80

PRINTING AND BINDING.

ROSTER.

July 1, 1920—Balance	$500 00
July 1, 1921—By appropriation	1,000 00
June 30, 1922—Amount expended during fiscal year	500 00
Balance on hand	$500 00
Compiling, printing and distributing Constitutional Amendments, Chapter 305, Statutes 1921:	
July 1, 1921—By appropriation	$50,000 00
June 30, 1922—By amount expended	110 90
Balance	$49,889 10
Office Equipment for Archives:	
July 1, 1922—Balance	$632 30

OFFICE FURNITURE AND EQUIPMENT.

July 1, 1921—By appropriation	$2,500 00
Amount expended	2,500 00

BALLOT PAPER REVOLVING FUND.

Seventy-second fiscal year, July 1, 1920, to June 30, 1921.

July 1, 1920—Balance	$635 95
June 30, 1921—Receipts	68,630 09
Total	$69,266 04
Warrants	69,059 29
Balance	$206 75

Seventy-third fiscal year, July 1, 1921, to June 30, 1922.

July 1, 1921—Balance	$206 75
June 30, 1922—Receipts	4,286 33
Total	$4,493 08
June 30, 1922—Warrants	4,410 11
Balance	$82 97

POSTAGE, EXPRESSAGE AND TELEGRAPHING.

Seventy-second fiscal year, July 1, 1920, to June 30, 1921.

July 1, 1920—Balance	$7,162 63
June 30, 1921—Amount expended	4,204 88
Balance	$2,957 75

Seventy-third fiscal year, July 1, 1921, to June 30, 1922.

July 1, 1921—Appropriation	$11,000 00
June 30, 1922—Amount expended	4,341 36
Balance	$6,658 64

TRAVELING AND CONTINGENT.

Seventy-second fiscal year, July 1, 1920, to June 30, 1921.

July 1, 1920—By appropriation	$1,250 00
Amount expended during fiscal year	1,129 73
Balance	$120 27

Seventy-third fiscal year, July 1, 1921, to June 30, 1922.

July 1, 1921—By appropriation	$1,250 00
Refund from postage and contingent	300 00
Total	$1,550 00
June 30, 1922—Amount expended during fiscal year	1,291 96
Balance	$258 04

Seventy-second fiscal year, July 1, 1920, to June 30, 1921.

Ballot paper (four-ream bundles), 25 x 30, blue.

July 1, 1920—On hand	54.00 reams
June 30, 1921—Sold	23.00 reams
On hand July 1, 1921	31.00 reams

Ballot paper (four-ream bundles), 25 x 30, blue.

July 1, 1920—On hand	286.90 reams
June 30, 1921—Sold	286.90 reams

Ballot paper (four-ream bundles), 25 x 30, green.

July 1, 1920—On hand	13.00 reams
June 30, 1921—Sold	8.00 reams
On hand July 1, 1921	5.00 reams

Ballot paper (four-ream bundles), 25 x 50, cream.

July 1, 1920—On hand	2.00 reams
June 30, 1921—Sold	2.00 reams

Ballot paper, 25 x 30, cream.

July 1, 1920—On hand	62.50 reams
June 30, 1921—Sold	62.50 reams

Ballot paper (four-ream bundles), 22 x 30, green.

July 1, 1920—On hand	29.50 reams
June 30, 1921—Sold	29.50 reams

Ballot paper (two-ream bundles), 25 x 38, light India.

July 1, 1920—On hand	1.00 ream
June 30, 1921—Sold	1.00 ream

Ballot paper (one-ream bundles), 25 x 30, cream.

July 1, 1920—On hand	24.50 reams
June 30, 1921—On hand	24.50 reams

Ballot paper (two-ream bundles), 25 x 30, cream.

July 1, 1920—On hand	66.00 reams
June 30, 1921—Sold	52.00 reams
On hand July 1, 1921	14.00 reams

Ballot paper (three-ream bundles), 25 x 30, cream.

July 1, 1920—On hand	26.00 reams
June 30, 1921—Sold	24.00 reams
On hand July 1, 1921	2.00 reams

Ballot paper (three-ream bundles), 25 x 30, blue.

July 1, 1920—On hand	3.20 reams
June 30, 1921—Sold	3.00 reams
On hand July 1, 1921	.20 reams

Ballot paper (one-ream bundles), 25 x 30, salmon.

July 1, 1920—On hand	13.00 reams
June 30, 1921—Sold	8.00 reams
On hand July 1, 1921	5.00 reams

Ballot paper (three-ream bundles), 25 x 30, salmon.

July 1, 1920—On hand	152.00 reams
June 30, 1921—Sold	53.50 reams
On hand July 1, 1921	98.50 reams

Ballot paper (one-ream bundles), 25 x 30, white.

July 1, 1920—On hand	26.50 reams
June 30, 1921—Sold	26.00 reams
On hand July 1, 1921	.50 reams

Ballot paper (three-ream bundles), 25 x 30, white.

July 1, 1920—On hand ..... 108.70 reams
June 30, 1921—Sold ..... 108.70 reams

Ballot paper (three-ream bundles), 25 x 30, pink.

July 1, 1920—On hand ..... 44.00 reams
June 30, 1921—Sold ..... 44.00 reams

Ballot paper (three-ream bundles), 25 x 50, white.

July 1, 1920—On hand ..... 44.60 reams
June 30, 1921—Sold ..... 44.60 reams

Ballot paper (one-ream bundles), 25 x 50, yellow.

July 1, 1920—On hand ..... 28.00 reams
June 30, 1921—Sold ..... 7.00 reams

On hand July 1, 1921 ..... 21.00 reams

Ballot paper (two-ream bundles), 25 x 50, yellow.

July 1, 1920—On hand ..... 805.50 reams
June 30, 1921—Sold ..... 142.00 reams

On hand July 1, 1921 ..... 663.50 reams

Ballot paper (one-ream bundles), 30 x 44, cream.

July 1, 1920—On hand ..... 139.00 reams
June 30, 1921—Sold ..... 131.00 reams

On hand July 1, 1921 ..... 8.00 reams

Ballot paper (two-ream bundles), 30 x 44, cream.

July 1, 1920—On hand ..... 681.75 reams
June 30, 1921—Sold ..... 225.00 reams

On hand July 1, 1921 ..... 458.75 reams

Ballot paper (one-ream bundles), 30 x 44, green.

July 1, 1920—On hand ..... 136.00 reams
June 30, 1921—Sold ..... 5.00 reams

On hand July 1, 1921 ..... 131.00 reams

Ballot paper (two-ream bundles), 30 x 44, green.

July 1, 1920—On hand ..... 288.65 reams
June 30, 1921—Sold ..... 158.00 reams

On hand July 1, 1921 ..... 130.65 reams

Ballot paper (one-ream bundles), 25 x 30, green.

July 1, 1920—On hand ..... 100.00 reams
June 30, 1921—Sold ..... 7.00 reams

On hand July 1, 1921 ..... 93.00 reams

Ballot paper (two-ream bundles), 25 x 30, green.

July 1, 1920—On hand ..... 156.90 reams
June 30, 1921—Sold ..... 126.00 reams

On hand July 1, 1921 ..... 30.90 reams

Ballot paper (one-ream bundles), 25 x 30, white.

July 1, 1920—On hand ..... 100.00 reams
June 30, 1921—Sold ..... 7.00 reams

On hand July 1, 1921 ..... 93.00 reams

Ballot paper (two-ream bundles), 25 x 30, white.

July 1, 1920—On hand	8.00 reams
June 30, 1921—Sold	8.00 reams

Ballot paper (two-ream bundles), 25 x 30, white.

July 1, 1920—On hand	158.50 reams
June 30, 1921—Sold	90.00 reams
On hand July 1, 1921	68.50 reams

Ballot paper (one-ream bundles), 25 x 30, pink.

July 1, 1920—On hand	100.00 reams
June 30, 1921—Sold	21.00 reams
On hand July 1, 1921	79.00 reams

Ballot paper (two-ream bundles), 25 x 30, pink.

July 1, 1920—On hand	174.00 reams
June 30, 1921—Sold	64.00 reams
On hand July 1, 1921	110.00 reams

Ballot paper (two-ream bundles), 25 x 30, salmon.

July 1, 1920—On hand	150.00 reams
June 30, 1921—Sold	110.00 reams
On hand July 1, 1921	40.00 reams

Ballot paper (one-ream bundles), 25 x 30, salmon.

July 1, 1920—On hand	103.50 reams
June 30, 1921—Sold	1.00 ream
On hand July 1, 1921	102.50 reams

Ballot paper (one-ream bundles), 25 x 30, cream.

July 1, 1920—On hand	101.00 reams
June 30, 1921—Sold	8.00 reams
On hand July 1, 1921	93.00 reams

Ballot paper (two-ream bundles), 25 x 30, cream.

July 1, 1920—On hand	145.50 reams
June 30, 1921—Sold	123.50 reams
On hand July 1, 1921	22.00 reams

Ballot paper (two-ream bundles), 25 x 30, yellow.

July 1, 1920—On hand	200.00 reams
June 30, 1921—Sold	200.00 reams

Ballot paper (one-ream bundles), 25 x 30, yellow.

July 1, 1920—On hand	102.90 reams
June 30, 1921—Sold	86.00 reams
On hand July 1, 1921	16.90 reams

Ballot paper, 28 x 48, cream.

Sept. 29, 1920—On hand	575.60 reams
June 30, 1921—Sold	575.60 reams

Ballot paper, 24 x 50, cream.

Sept. 29, 1920—On hand	305.70 reams
June 30, 1921—Sold	305.70 reams

Ballot paper (two-ream bundles), 25 x 38, cream.

Sept. 29, 1920—On hand ..... 2488.00 reams
June 30, 1921—Sold ..... 1288.00 reams

On hand July 1, 1921 ..... 1200.00 reams

Ballot paper (one-ream bundles), 25 x 38, cream.

Sept. 29, 1920—On hand ..... 101.00 reams
June 30, 1921—Sold ..... 16.50 reams

On hand July 1, 1921 ..... 84.50 reams

Seventy-third fiscal year, July 1, 1921, to June 30, 1922.

Ballot paper (four-ream bundles), 25 x 30, blue.

July 1, 1921—On hand ..... 31.00 reams
June 30, 1922—Sold ..... 1.50 reams

On hand July 1, 1922 ..... 29.50 reams

Ballot paper (four-ream bundles), 25 x 30, green.

July 1, 1921—On hand ..... 5.00 reams
June 30, 1922—Sold ..... 3.00 reams

On hand July 1, 1922 ..... 2.00 reams

Ballot paper (one-ream bundles), 25 x 30, cream.

July 1, 1921—On hand ..... 24.50 reams
July 1, 1922—On hand ..... 24.50 reams

Ballot paper (two-ream bundles), 25 x 30, cream.

July 1, 1921—On hand ..... 14.00 reams
July 1, 1922—On hand ..... 14.00 reams

Ballot paper (three-ream bundles), 25 x 30, cream.

July 1, 1921—On hand ..... 2.00 reams
July 1, 1922—On hand ..... 2.00 reams

Ballot paper (three ream bundles), 25 x 30, blue.

July 1, 1921—On hand ..... .20 reams
July 1, 1922—On hand ..... .20 reams

Ballot paper (one-ream bundles), 25 x 30, salmon.

July 1, 1921—On hand ..... 5.00 reams
June 30, 1922—Sold ..... 5.00 reams

Ballot paper (three-ream bundles), 25 x 30, salmon.

July 1, 1921—On hand ..... 98.50 reams
July 1, 1922—On hand ..... 98.50 reams

Ballot paper (one-ream bundles), 25 x 30, white.

July 1, 1921—On hand ..... .50 reams
July 1, 1922—On hand ..... .50 reams

Ballot paper (one-ream bundles), 25 x 50, yellow.

July 1, 1921—On hand ..... 21.00 reams
June 30, 1922—Sold ..... 1.00 ream

On hand July 1, 1922 ..... 20.00 reams

Ballot paper (two-ream bundles), 25 x 50, yellow.

July 1, 1921—On hand ..... 663.50 reams
June 30, 1922—Sold ..... 18.00 reams

On hand July 1, 1922 ..... 645.50 reams

Ballot paper (one-ream bundles), 30 x 44, cream.

July 1, 1921—On hand	8.00 reams
June 30, 1922—Sold	4.00 reams
On hand July 1, 1922	4.00 reams

Ballot paper (two-ream bundles), 30 x 44, cream.

July 1, 1921—On hand	458.75 reams
June 30, 1922—Sold	94.00 reams
On hand July 1, 1922	364.75 reams

Ballot paper (one-ream bundles), 30 x 44, green.

July 1, 1921—On hand	131.00 reams
June 30, 1922—Sold	1.00 ream
On hand July 1, 1922	130.00 reams

Ballot paper (two-ream bundles), 30 x 44, green.

July 1, 1921—On hand	130.65 reams
June 30, 1922—Sold	62.00 reams
On hand July 1, 1922	68.65 reams

Ballot paper (one-ream bundles), 25 x 30, green.

July 1, 1921—On hand	93.00 reams
June 30, 1922—Sold	22.50 reams
On hand July 1, 1922	70.50 reams

Ballot paper (two-ream bundles), 25 x 30, green.

July 1, 1921—On hand	30.90 reams
June 30, 1922—Sold	23.40 reams
On hand July 1, 1922	7.50 reams

Ballot paper (one-ream bundles), 25 x 30, white

July 1, 1921—On hand	93.00 reams
June 30, 1922—Sold	2.00 reams
On hand July 1, 1922	91.00 reams

Ballot paper (two-ream bundles), 25 x 30, white.

July 1, 1921—On hand	68.50 reams
July 1, 1922—On hand	68.50 reams

Ballot paper (one-ream bundles), 25 x 30, pink.

July 1, 1921—On hand	79.00 reams
June 30, 1922—Sold	5.00 reams
On hand July 1, 1922	74.00 reams

Ballot paper (two-ream bundles), 25 x 30, pink.

July 1, 1921—On hand	110.00 reams
June 30, 1922—Sold	55.00 reams
On hand July 1, 1922	55.00 reams

Ballot paper (two-ream bundles), 25 x 30, salmon.

July 1, 1921—On hand	40.00 reams
July 1, 1922—On hand	40.00 reams

Ballot paper (one-ream bundles), 25 x 30, salmon.

July 1, 1921—On hand	102.50 reams
June 30, 1922—Sold	5.00 reams
On hand July 1, 1922	97.50 reams

Ballot paper (one-ream bundles), 25 x 30, cream.

July 1, 1921—On hand	93.00 reams
June 30, 1922—Sold	13.00 reams
On hand July 1, 1922	80.00 reams

Ballot paper (two-ream bundles), 25 x 30, cream.

July 1, 1921—On hand	22.00 reams
June 30, 1922—Sold	4.00 reams
On hand July 1, 1922	18.00 reams

Ballot paper (one-ream bundles), 25 x 30, yellow.

July 1, 1921—On hand	16.90 reams
June 30, 1922—Sold	1.00 ream
On hand July 1, 1922	15.90 reams

Ballot paper (one-ream bundles), 25 x 38, cream.

July 1, 1921—On hand	84.50 reams
June 30, 1922—Sold	6.50 reams
On hand July 1, 1922	78.00 reams

Ballot paper (two-ream bundles), 25 x 38, cream.

July 1, 1921—On hand	1200.00 reams
June 30, 1922—Sold	60.00 reams
On hand July 1, 1922	1140.00 reams

Number Distributed and Number on Hand.

	On hand July 1, 1920	Number distributed	On hand June 30, 1922
Statutes 1855	2		2
Statutes 1856	4		4
Statutes 1859	2	1	1
Statutes 1863-4	2		2
Statutes 1865-6	1		1
Statutes 1875-6	256	1	255
Statutes 1877-8	200	4	196
Statutes 1880	76		76
Statutes 1881	186	9	177
Statutes 1883	56		56
Statutes 1884-5	1		1
Statutes 1886-7	100	3	97
Statutes 1889	1		1
Statutes 1891	1		1
Statutes 1893	58	2	56
Statutes 1895	1		1
Statutes 1897	25	1	24
Statutes 1899	286	1	285
Statutes 1901	156	3	153
Statutes 1903	143	2	141
Statutes 1905	119	3	116
Statutes extra session 1906	848	9	839
Statutes 1907	186	1	185
Statutes 1909	210		210
Statutes continued in force, 1873	94	10	84
Statutes 1911	81	15	66
Statutes extra session 1911	510	5	505
Statutes 1913	3		3
Statutes 1915	*75	8	67
Statutes extra session	119		119
Statutes 1917	175	16	159
Statutes 1919	118	10	108
Statutes 1921	3075	2226	849
Amendments to Codes, 1875-6	277		277
Amendments to Codes, 1877-8	266	4	262
Amendments to Codes, 1880	128		128
Amendments to Codes, 1873-4	23	1	22
Civil Code, Annotated, 1874	4		4
Civil Code, California, 1871	3		3
California Codes, Practice No. 3, 1871	7		7
California Codes, Political No. 2, 1872	42		42
California Codes, Civil Procedure, 1872	238		238
California Codes, Penal, 1872	6		6
California Codes, Penal, 1871-2	4		4
California Codes, Civil Procedure, 1881-3	13		13
California Codes, Penal Pocket, 1881-3	19		19
Wood's Digest, 1850-1858	1		1
Wood's Digest, 1850-1860	1		1
Hittell's Codes, 1876	25		25
Hittell's Codes, Vols. 1-2, 1876	23		23
General Laws of California, 1850-1864	1		1

INDEX TO LAWS.

	On hand July 1, 1920	Number distributed	On hand June 30, 1922
Index to Laws, 1850-1907	863		863
Index to Laws, 1850-1893	435	6	429

TRANSACTIONS IN MAPS.

	On hand July 1, 1920	Number distributed	On hand June 30, 1922
Detail Irrigation Maps, Southern California, 12 sheets	393	8	385
Detail Irrigation Maps, San Joaquin Valley, 10 sheets, unmounted	1,191	4	1,187
Great Central Valley, mounted	124	4	120
Great Central Valley, unmounted	1,862	12	1,850
Topographical and Irrigation Maps, San Joaquin Valley, 4 sheets, mounted	16½	4	12½
Topographical and Irrigation Maps, San Joaquin Valley, 4 sheets, unmounted	485¾	13	473¾

SUPREME COURT REPORTS.

	On hand July 1, 1920	Number distributed	On hand June 30, 1922
California Report, No. 41	388		388
California Report, No. 42	409		409
California Report, No. 43	429		429
California Report, No. 44	374		374
California Report, No. 45	400		400
California Report, No. 46	684		684
	Received 1920-1921		
California Report, No. 180	430	430	None
California Report, No. 181	430	430	None
California Report, No. 182	430	430	None
California Report, No. 183	430	430	None
California Report, No. 184	430	430	None
California Report, No. 185	430	430	None

CALIFORNIA REPORTS—APPELLATE COURT.

	Number received	Number distributed	On hand June 30, 1922
California Appellate Report, No. 39	430	429	1
California Appellate Report, No. 40	430	429	1
California Appellate Report, No. 41	430	429	1
California Appellate Report, No. 42	430	429	1
California Appellate Report, No. 43	430	429	1
California Appellate Report, No. 44	430	429	1

FRANK C. JORDAN,
Secretary of State.

Subscribed and sworn before me this second day of August, 1922.

FRANK H. CORY,
Deputy Secretary of State.

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20566 8-22 900

PART III

REPORT

of the

Division of Engineering and Irrigation

a subdivision of the

DEPARTMENT OF PUBLIC WORKS

of the

STATE OF CALIFORNIA

to accompany the

FIRST BIENNIAL REPORT

of that department

NOVEMBER 1, 1922

W. F. McCLURE, Chief of Division



CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO, 1923

22252

STATE OF CALIFORNIA

DEPARTMENT OF PUBLIC WORKS

Division of Engineering and Irrigation

AUSTIN B. FLETCHER---*Director of Public Works*
W. F. McCLURE---*Chief of Division of Engineering and Irrigation*
PAUL BAILEY---*Deputy Chief of Division of Engineering and Irrigation*
J. J. HALEY---*Assistant to Chief of Division of Engineering and Irrigation*
R. L. JONES---*Office Engineer*
W. S. POST---*Associate Hydraulic Engineer*
FRED C. SCOBEY---*Associate Hydraulic Engineer*
E. C. EATON---*Irrigation Engineer*
E. A. BAILEY---*Flood Control Engineer*
W. W. WOOLDRIDGE---*River Superintendent*

MEMORIAM

PAUL MANINGHAM NORBOE

Chief Assistant State Engineer

Died November 15, 1921

The death of Major Norboe on November 15, 1921, marked the close of a long and honorable career in the Department of Engineering and in the Department of Public Works.

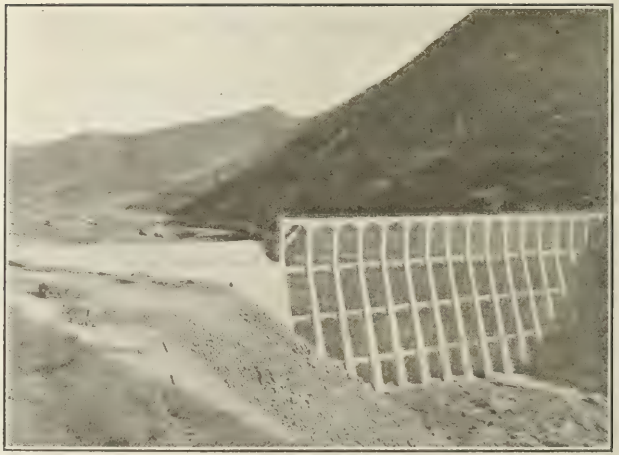
Coming to the Department of Engineering early in 1907 as Assistant State Engineer, Major Norboe was, at the time of his death, the oldest employee in length of service in the department.

From his wide experience as a practicing engineer in various parts of the state, he brought to the department a fund of knowledge only to be acquired by long years of work and study. To his interest as a searcher for truth in his chosen profession, he had, in addition, a keen interest in humanity and in the problems of California.

Born a Californian, he was ever an enthusiastic collector of bits of local history, and it was his favorite diversion to follow in the footsteps of the pioneers.

His loss to California and the Department of Public Works is a great one. To his many friends he will always be remembered for his kindly interest, his ready wit and his loyal and steadfast service.

2—22282



LAKE HODGES DAM—MULTIPLE ARCH TYPE

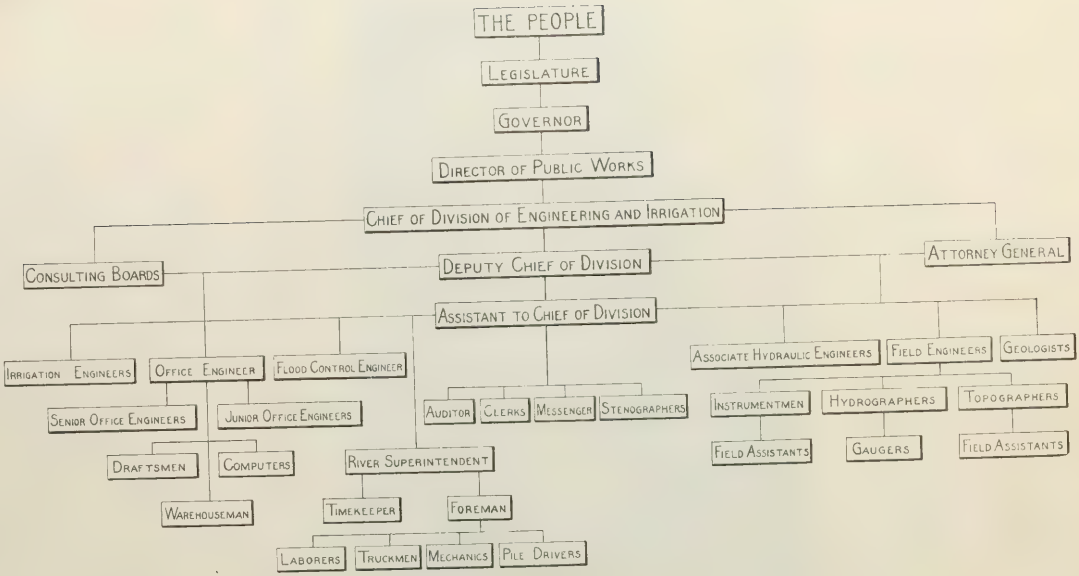
The design of dams aggregating a total structural cost of $7,652,000 were checked and their erection authorized by the Division of Engineering and Irrigation during the past biennium and their construction is under the supervision of the Division.

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THE PEOPLE
LEGISLATURE
GOVERNOR
DIRECTOR OF PUBLIC WORKS
CHIEF OF DIVISION OF ENGINEERING AND IRRIGATION
CONSULTING BOARDS
DEPUTY CHIEF OF DIVISION
ATTORNEY GENERAL
ASSISTANT TO CHIEF OF DIVISION
IRRIGATION ENGINEERS
OFFICE ENGINEER
FLOOD CONTROL ENGINEER
SENIOR OFFICE ENGINEERS
JUNIOR OFFICE ENGINEERS
DRAFTSMEN
COMPUTERS
WAREHOUSEMAN
AUDITOR
CLERKS
MESSENGER
STENOGRAPHERS
RIVER SUPERINTENDENT
TIMEKEEPER
FOREMAN
LABORERS
TRUCKMEN
MECHANICS
PILE DRIVERS
ASSOCIATE HYDRAULIC ENGINEERS
FIELD ENGINEERS
GEOLOGISTS
INSTRUMENTMEN
HYDROGRAPHERS
TOPOGRAPHERS
FIELD ASSISTANTS
GAUGERS
FIELD ASSISTANTS

STATE DEPARTMENT OF PUBLIC WORKS.

DIVISION OF ENGINEERING AND IRRIGATION.

ACTIVITIES.

California ranks fifth in value of agricultural crops among the states of a nation that precedes all the countries of the world in value, quantity, and diversity of foodstuffs grown and marketed. Agriculture, so effective in thus placing the United States in the forefront of nations, is second in total income produced by wealth-creating industries in California. Its progression, resulting in attainment to this position among gainful pursuits, is a recent development, being an achievement of the two past decades.

That this could be accomplished was due to the great strides made in production by the California farmer. This came about through the increased productivity of the agricultural lands occasioned by applying irrigation waters to them. Previous to the time when irrigation received its great impulse, agricultural production was limited to the yield of dry farms in the cultivated area. The limit of expansion of dry farmed area was reached about 1885 and since that time increase in production has been brought about by irrigation and the more intensive cultivation of the land.

Making these supplementary waters available to the agriculturist required diversion works, dams, reservoirs, canals, and other retention and conveying works, and these in their entirety are almost always of such a magnitude that they cannot be undertaken by individuals. To be constructed and adequately financed, it has taken associative effort. This collective effort has been made possible by the California Irrigation District Act, passed in 1897 and amended in 1913.

This act provides for the approval of organization and general supervision of construction by the State Engineer or Chief of the Division of Engineering and Irrigation. The financing of these projects has succeeded through bond issues, the favorable market for which has been created and maintained through the state's approval and certification, acting through the State Bond Commission and the State Engineer or Chief of Division of Enginering and Irrigation. Since the enactment of the laws under which the works are planned and constructed and money spent, after review by the California Bond Certification Commission and with the oversight of the State Engineer, the bonds issued have found a ready market, carry a relatively low rate of interest, and not infrequently are disposed of at a premium.

Experience gained prior to 1913 demonstrated that for successful culmination of effort, the formation of these water developing projects required by the agricultural expansion, has needed state sanction; the bonds issued have necessitated certification, and the adequacy of the water supplies to be developed, the safety of the structures erected, the meritoriousness of the entire proposals, have demanded the state's stamp of approval. This is a function of the Division of Engineering and Irrigation, one of the sections of the Department of Public Works.

The agriculturists in the raising, irrigating and marketing the land products are vitally affected by quality and number of roads as the

means of transport and communication; in streams and rivers as sources of water for irrigation and as means of conveyance of the marketable produce; in the apportionment of waters from these streams for use in irrigation; in the construction of dams and reservoirs to conserve, control and develop water supplies; in canals for drainage and water distribution; and in levee construction and river control to prevent inundation. State surveillance of these undertakings, important to California as a whole, as well as to the agriculturist, requires a division of the state activities. To comply with this need, we have the Department of Public Works.

This department has divisions dealing, among others, with highways, engineering and irrigation, water rights and land settlement. In the partition of these functions of the Department of Public Works, some of the most important are assigned to the Division of Engineering and Irrigation. Having to do with the development and control of waters, it contributes directly to agricultural advancement.

In the aggregate it is charged with assenting to needed improvements, with sanctioning proposals that lead to agricultural and industrial betterment, it is obligated to concur with merited and beneficial projects that enhance the general prosperity, and with the development and realization of the full value of the state's advantages; but of all proposals submitted for approval, those without merit, those whose construction spells financial disaster, those whose failure destroys public confidence and casts odium on legitimate enterprises, the onus of rejection lies in this office.

The functions and duties of the Division of Engineering and Irrigation become more voluminous and complex with the development of this state, involving as it does executive and administrative problems, as well as requiring specialized thought and technical experience for the conduct of the engineering and constructive work of the state. During the past generation most all the proposals of irrigation development undertaken by collective effort, have had their adequacy and general merit concurred with, if satisfactory, or rejected, if defective, by this office. During this generation California, though eighteenth in area of land farmed of the states of the Union, has attained to fifth place in value of farm crops.

This office approves millions of dollars worth of improvements every year. It analyzes and passes upon the irrigation, drainage and reclamation of districts that their bonds may be certified and development started or continued. The Division of Engineering and Irrigation is charged with the approval of dams and with the construction of river control works on channels of which the Sacramento River carries the highest valued tonnage of any river in the United States.

It makes hydrographic surveys and cooperates in surveys with the California State Reclamation Board, with the United States Geological Survey in gaging streams and making topographic maps, with the United States Department of Agriculture in needed investigations and with the federal government in maintaining the navigable streams of this state.

These diverse functions of the Division of Engineering and Irrigation, some administrative, some specialized, others executive, but all constructive, contribute to the advancement and well being of the State of California.

ORIGIN OF DIVISION.

Prior to August, 1921, the State Engineer was chief executive officer of the Department of Engineering, but with the organization of the State Department of Public Works, in August, 1921, the former Department of Engineering became the Division of Engineering and Irrigation under the Director of Public Works, and the State Engineer became the chief of this division. The new division took over all the functions of the former Department of Engineering, except those pertaining to the office of the State Architect.

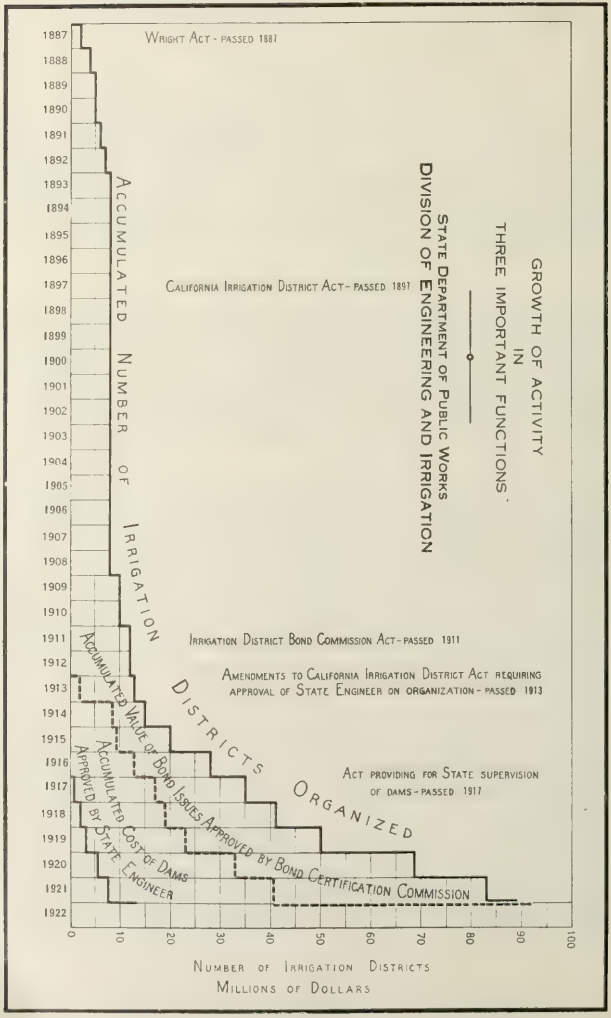
GREAT INCREASE IN ACTIVITIES.

The activities of the division office increased manyfold immediately after the reorganization, principally because of the initiation of the investigation of the water resources of the state. This investigation responded to chapter 889 of the 1921 Statutes, which appropriated $200,000 to prepare a report for the 1923 legislature. To complete the report before this date required the expansion of the organization from 21 employees (excepting laborers on construction) to 109 at the period of maximum pay roll.

At the same time a great increase occurred in the volume of business incident to the permanent statutory functions of the office. During the second year of the biennium about the same number of irrigation districts were reported on for approval of their organization under the Wright Act, but proposed bond issues were investigated for the California Bond Certification Commission amounting to $56,268,000—fourteen times greater than for the first year of the biennium, and more than half of the total bonds issued by all irrigation districts up to the present day. Applications for the approval of construction plans for dams to a structural value of $5,632,000 were acted on during the second year of the biennium, which is about three times as great as for the first year.

Of greater significance, however, is the marked increase in activities under the permanent statutory functions of the office during the past two years. The organization of thirty-three irrigation districts has been investigated, or one-third of the total number of irrigation districts in existence at the beginning of the period, and the first district was organized in 1887. Bond issues of irrigation districts have been investigated aggregating $62,580,150, or one and one-half times the total issues by all irrigation districts up to the beginning of the biennial period. Plans for the construction of dams have been examined, checked and approved, which have a structural value of $7,652,000, or one and one-half times the value of all plans previously approved by the office.

The accompanying plate portrays the growth of activity under three of the most important permanent statutory functions of the office: reporting on feasibility of irrigation districts, reporting on the pro-


GROWTH OF ACTIVITY
IN
THREE IMPORTANT FUNCTIONS
STATE DEPARTMENT OF PUBLIC WORKS
DIVISION OF ENGINEERING AND IRRIGATION
WRIGHT ACT - PASSED 1887
CALIFORNIA IRRIGATION DISTRICT ACT - PASSED 1897
IRRIGATION DISTRICT BOND COMMISSION ACT - PASSED 1911
AMENDMENTS TO CALIFORNIA IRRIGATION DISTRICT ACT REQUIRING APPROVAL OF STATE ENGINEER ON ORGANIZATION - PASSED 1913
ACT PROVIDING FOR STATE SUPERVISION OF DAMS - PASSED 1917
ACCUMULATED NUMBER OF IRRIGATION DISTRICTS ORGANIZED
ACCUMULATED VALUE OF BOND ISSUES APPROVED BY BOND CERTIFICATION COMMISSION
ACCUMULATED COST OF DAMS APPROVED BY STATE ENGINEER
1887
1888
1889
1890
1891
1892
1893
1894
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904
1905
1906
1907
1908
1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
0
10
20
30
40
50
60
70
80
90
100
NUMBER OF IRRIGATION DISTRICTS
MILLIONS OF DOLLARS

priety of proposed bond issues for irrigation development, and passing on plans for dams and the supervision of their construction. This plate shows by the steep ascendency of the three lines plotted thereon, how rapidly irrigation districts are organizing and issuing bonds, and the acceleration in dam construction during the last two years.

The division has successfully coped with the problems of rapid expansion of pay roll necessary to accommodate its organization to this increased volume of technical supervision and scientific inquiry, and is now, as the completion is nearing of the special investigation of the water resources of the state, preparing to reduce the pay roll to that commensurate with the still heavy permanent statutory functions of the office. In expanding the organization, particular effort has been put forth to respond to the popular demand for greater efficiency and more economical operation of state offices. The volume of work handled, and particularly the broad scope and speed attained in the completion (16 months) of the water resources investigation of the state is offered as evidence of accomplishment.

RECOMMENDATIONS TO LEGISLATURE.

Reorganization.

In further response to the behest for practical economy in state affairs, in order that a more thorough and businesslike organization of its activities may be effected, the division urges that certain changes be made in the statutes under which it operates.

At the present time, besides the delegation of duties by special legislative enactments, the division has functions of a permanent character under four separate statutes, the first of which was enacted in 1886 and the last in 1921, and all these functions relate to like activities. These statutes were each prepared to accomplish specific purposes; each separate and distinct. The rush of business of the past biennium afforded the first trial of the combined executive provisions of these statutes. The exigencies of the last two years, with a far greater volume of work in the office than ever before, have indicated certain defects in the provisions of these statutes which are fundamental in character.

As the duties and responsibility of the Division of Engineering and Irrigation increase in coming years, these defects, unless remedied, will stultify the efforts of the division officers to give satisfactory service to the public.

The California Irrigation District Act, under which irrigation districts organize and issue bonds; the Water Storage District Act, under which water storage districts organize; the Bond Certification Commission Act, under which irrigation district bonds are certified to the public as safe investments for trust funds, funds of insurance companies, banks, etc.; and the act of 1917 making it unlawful to construct a dam by other than municipal or public service corporations without first receiving the approval of the State Engineer or Chief of Division on the plans and specifications: all require him to make certain investigation of fact, and then to sit in judgment of his own findings in regard to the organization of districts, approval of bond issues, or plans for dam construction. The Chief of Division and his organization is well

equipped to make these investigations of fact, but to require the same officer to sit in judgment of his own investigations at their completion, and without special provision for public hearings, as all four of these acts neglect,—is both unfair to the state officer and to the public. With the lesser volume of business of the past, and by the use of tact and courtesy, dissatisfaction has been avoided, but with the present increased activities, with less time for personal contact with the public on the part of the Chief of Division, the office should be organized on the same democratic principles which have given satisfaction in the larger governmental departments.

The judicial functions of the office should be grouped in one body, preferably a board of five men, the Chief of the Division the executive officer, but not a member, and to which board the Chief of Division would make reports and recommendations, based on authoritative investigations. This board should hold public meetings at which these reports and recommendations are presented, and at which may be heard such further evidence as the parties interested in the matter may desire to place before them.

Such an organization would afford complete publicity to the decisions of the office, and give full opportunity to all citizens to make such presentations to the board as they may desire. The present statutes have no such provisions, nor is any systematic procedure provided for conducting business. It is only through the personal contact of the officials with the applicants before the office and the confidence inspired thereby that the provisions of the statutes have been in successful operation. The greater volume of business now before the office will, to a large extent, prevent this personal contact in the future.

In making this recommendation to further effect an economical administration, it is not proposed to create a new board, but to enlarge the functions of the present Bond Certification Commission to perform all the judicial or semi-judicial actions now incumbent upon the office of the State Engineer or Chief of Division, and to make the State Engineer or Chief of Division the executive officer of this board. The board would preferably have as members the Attorney General, State Superintendent of Banks, and three other members appointed by the Governor.

With powers and duties so concentrated, the Chief of Division may effectively organize his office, that, distinct from a group of individuals with many dispersed functions, they may be directed in their activities to avoid duplicate and unnecessary work.

An organization so effected would provide proper machinery for the operation of all present state regulatory powers over irrigation development, and such additional powers as future legislation may impose. With these powers centralized in one body, organized on the principles which have given greatest satisfaction to the public in other governmental institutions, a state policy may be initiated in guiding irrigation development which is not now possible, and which is so desirable as development becomes more complex. Perusal of the report on the water resources of the state, which this department will submit to the 1923 session of the legislature, is convincing that the future prosperity of the state is closely coupled with the orderly development of

the state's water resources, and that through a properly conceived state policy, great areas of farm lands may be brought to maximum productivity through irrigation; and that these areas without irrigation, arid of moisture, would remain either wholly unproductive, or nearly so, and contribute but little to the support of the great population which the state's natural advantages are attracting to within its borders.

Just as all judicial functions of the division should be concentrated in this board of five members, similarly all executive functions, some of which are now dispersed in the bond commission and in the executive directors of the Water Storage Act, should be concentrated in the State Engineer or Chief of the Division of Engineering and Irrigation.

Abolishment of Cooperative Investigations with the State Reclamation Board.

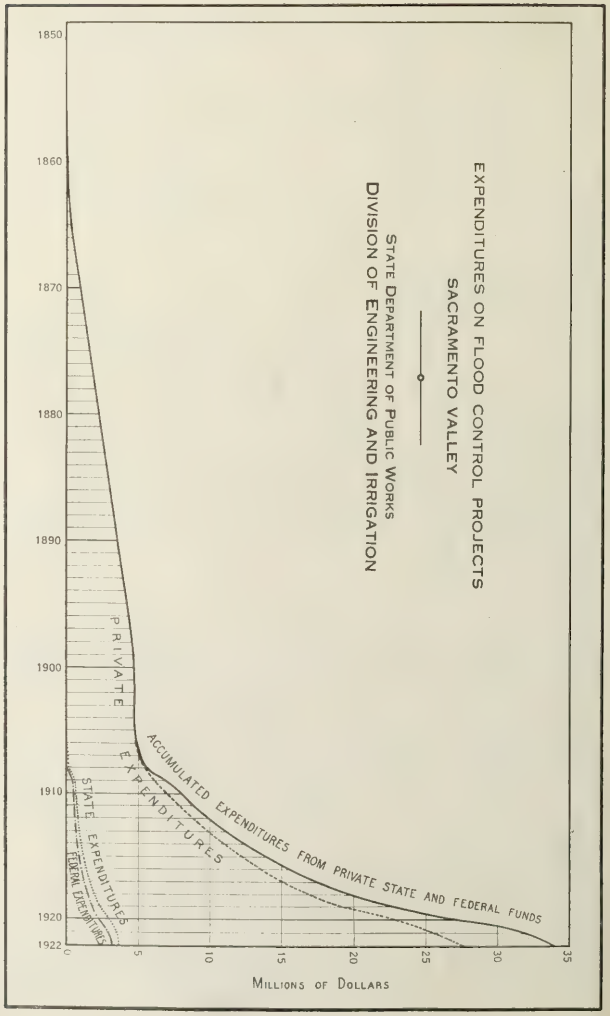
Section 3 of the California Reclamation Board Act, directs the State Engineer or Chief of Division of Engineering and Irrigation, to procure data, make surveys and examinations, to perfect and make additional plans for the reclamation of overflow lands of the Sacramento and San Joaquin rivers and to make reports to the Reclamation Board, and advise and assist them in their work. The same act provides for a separate engineering organization for the board. The board now maintains such a separate organization. These two provisions lead to a duplication of work in the two offices and unnecessary complication to the public in transacting business before the board. As a suggestion for effecting further economy in the executive offices of the state, it is believed that section 3 of the Reclamation Board Act should be repealed, leaving the engineering work of the board to be performed by its own engineering organization.

Bank Protection on Sacramento River.

Appropriations for work of the State Engineer have remained stationary while the purchasing power of the dollar has been shrinking. In 1903 the appropriation for rectifying river channels was $200,000, while in 1921 but $175,000 was allotted for this activity.

During the intervening years, particularly since 1914, large sums have been spent in perfecting the works for controlling floods in the Sacramento Valley. The project of the State Reclamation Board in working out a comprehensive scheme of reclamation for the overflow lands of this valley, has been largely completed, and the fertile bottom lands of the valley are now enjoying their first years of freedom from the jeopardy of floods.

Illustration herewith, sets forth, year by year, the expenditures for reclamation works in the Sacramento Valley. The rapid ascendency of the curved line between the years 1914 and 1922, pictures how at the present time, the low lands of the valley are emerging from a period of construction so greatly exceeding that of any previous period of history, that all previous expenditures appear insignificant. In a manner similar to that here shown for the construction of protective works, the development of the lands themselves has also made rapid strides in the last few years. Many acres of annual cropping have been supplanted by orchards and other permanent crops, particularly in the


EXPENDITURES ON FLOOD CONTROL PROJECTS
SACRAMENTO VALLEY
STATE DEPARTMENT OF PUBLIC WORKS
DIVISION OF ENGINEERING AND IRRIGATION
1850
1860
1870
1880
1890
1900
1910
1920
1922
PRIVATE EXPENDITURES
STATE EXPENDITURES
FEDERAL EXPENDITURES
ACCUMULATED EXPENDITURES FROM PRIVATE STATE AND FEDERAL FUNDS
0
5
10
15
20
25
30
35
MILLIONS OF DOLLARS

fertile soils adjoining the riverbanks. Here also on the higher land of the river banks, amidst trees and gardens, numerous homes have been constructed to replace the cheap dwellings and barns used by the earlier workers of the soil, while living in annual danger of inundation. The danger now removed, beautiful homes, wharves, warehouses, pumping plants, towns and highways appear for miles along the river, where formerly makeshift construction sufficed the gambling farmer to plant and gather the harvest.





Improvements behind levee on bank of Sacramento River.

Biennial appropriations of the succeeding legislatures since 1897, have fixed the state's responsibility to protect the properties along the river bank through the rectification of the meandering river channel and the protection of the eroding banks. Now that protective works along the river have been completed costing $34,000,000 and values of improved property have increased seven-fold, it is imperative for the division office to study the problem of confining the river channel to the small area between the levees on either bank of the river. Massive levees 16 to 20 feet in height have no protecting value if the river bank upon which they stand is washed out from under them. One hole in the levees anywhere along their 361 miles of length, and millions of dollars worth of property damage is incurred.

In past years the funds used for river work have largely been spent in constructing brush mattress protection to the banks at points most severely attacked by the current. Other forms of revetment have been



Caving Banks on the Sacramento River.

tried, but all have proved to be so expensive that in the sixteen years from 1907 to 1923 only four miles of bank protection was constructed on the Sacramento River, while the river has 361 miles of bank exposed to the attack of the flowing stream.

To safeguard the immense property values now accumulating behind the river levees of the Sacramento, following the procedure of the past, would require the expenditure of millions of dollars. The available funds of the last two years have been entirely inadequate to even help individual property owners who have applied to the office for state assistance in preventing the destruction of their property. The sums needed for the next five years have been variously estimated by engineers of the division at $2,500,000 to $3,000,000. Before suggesting the necessity of spending such a huge sum on construction of revetment works, the expenditure of which would entail large additional costs each year in maintenance of the constructed works, the division has,

during the year just past, given most judicious consideration to discovering a scheme of activity along the river channel, which will effectively control the shifting movements of the river to a permanent channel between the two levees.

It is concluded that a new policy should be adopted in this work; that instead of constructing bank protection works at points of acute danger; instead of battling the attacking current at the last trench where retreat spells large costs in moving levees, roads, houses and other improvements, and where defeat spells destruction; instead of interposing rigid structures to withstand by mass action, the direct onslaught of the ever-encroaching waters: skilled engineering talent should be applied to coerce the current and guide the direction of the eroding waters, restraining the river to its channel and repressing the undermining tendencies of its tortuous course. By coercion and guidance, by making it easier for the waters to continue in their channel than to expend their energies in cutting the confining banks, the vagaries of the river can be controlled and its capricious tendencies suppressed. The direction of the river current at the point of incipient attack on earthen banks can be changed by the cutting of brush, by the planting of willows, and the construction of control works at carefully studied locations in the river's course. By these means it is believed that with an expenditure but little exceeding the cost of maintaining the expensive bank protection works if they were constructed, the river banks may be successfully protected from undue erosion and the river levees may be successfully protected from undermining.

Since it is impossible to ascribe the benefits of expenditures for this class of work to individual properties, for practically the entire valley benefits either directly or indirectly from it, it would seem that its initiation, direction and costs should be undertaken by the state. Request for the appropriation of $300,000 is therefore made to carry on this work for the next two years.

In addition to the erosion of the banks by the river current, over that portion of the Sacramento and San Joaquin Rivers navigated by steamer traffic, the waves from passing steamers wash down the banks and levee by the persistency of their continued attack. Revetment has been constructed in many locations where, if it were not for the passing steamers, it is probable that no work would have to be done. In the channels downstream from the cities of Sacramento and Stockton, the slope is quite flat and the velocities of flow of the water and likewise its erosive power, are correspondingly less than in the upper reaches of the river. Nevertheless, of the sums spent on bank revetment work since 1907 three-fourths has been spent downstream from these two cities.

Studies of the division office have revealed that the stratified formation of the banks influence their tendency to cave off, particularly under the attack of steamer waves. In many places the thick and rather hard layers of sediment constituting the river banks are separated with strata of sand, often on planes near the low water line. In such instances it has been observed that the wave action against the sand strata, washes the sand out from between the layers of hard sediment until the overtopping bank caves off in large chunks. The dropping of the large blocks of hard sediment in front of the thinner



Layer of hard sediment breaking off after sand has washed out beneath; on Sacramento River.

layers of sand delays further recession of the banks temporarily, but the chunks of sediment, although hard, seem to break up and be carried away by the current after a time. Broken rock is needed to be dumped in front of these sand strata to prevent further caving of the banks. It is estimated that $1,000,000 will be required for this purpose during the next five years.

Since the principal danger to the river banks and levees below the cities of Sacramento and Stockton is through the wave action caused by steamer traffic, it would seem proper that the federal government in its jurisdiction over navigation, should appropriate funds for the protecting of this section of the river.



SUMMARY OF RECOMMENDATIONS TO LEGISLATURE.

Reorganization.

1. Enlarge functions of the present Bond Certification Commission to include all semi-judicial actions at present incumbent upon the State Engineer or Chief of Division of Engineering and Irrigation and on the executive directors of the Water Storage District Act. Expand Bond Certification Commission to five members, with the Chief of Division of Engineering and Irrigation as executive officer, but not a commissioner. Chief of Division to make reports and recommendations to commission which is to hold public meetings, receive reports and recommendations of executive officer and hear evidence.

2. Repeal all sections of the act that place executive functions of the state's regulatory powers over irrigation developments in the Bond Certification Commission and in the executive directors of the Water Storage District Act, making it the duty of the State Engineer or Chief of Division of Engineering and Irrigation, as executive member of board, to perform these functions.

Abolishment of Cooperative Investigations with the State Reclamation Board.

Repeal section 3 of the Reclamation Board Act which requires State Engineer to do engineering work for the Reclamation Board, and leave engineering work of State Reclamation Board to be performed by its own engineering organization. Present act leads to duplication of work in the two offices and to unnecessary confusion.

Bank Protection on Sacramento River.

California has just completed a construction program of flood control works on the Sacramento River that has entailed an expenditure of $34,000,000. This river now has 360 miles of levees with untold wealth in improvements behind them. The river must be confined to its present channel by construction of control works to prevent the undermining of the levee system completed at so great an expense. For the safety of lives and insurance on the huge sums spent in developing the overflow lands of the Sacramento Valley, $300,000 is asked for the coming biennium for rectification of river channels.

ACCOMPLISHMENTS OF BIENNIUM 1921-1923.

STATE WATER RESOURCES INVESTIGATION.

The first state-wide water resources investigation ever undertaken will be completed within the time limit and within the appropriation. Although delayed in starting, time and money were adequate for giving meticulous care to all aspects of available waters, present uses, costs of control, coordination of the supplies into a comprehensive plan and of the quantities procurable in the ultimate development. Extensive in scope and covering all portions of the state, it comprises data on all sources of water and its useful application and will form a compendium on California's water wealth.

Great interest has been accorded this survey of state waters by the engineering profession who rendered timely assistance, aiding the work by giving data from their office files when this was not otherwise

available to the division. During the conduct of the investigation, volumes of information, hitherto inaccessible, was compiled and graciously offered the division: contributions, gratefully acknowledged, to be absorbed and analyzed; extending the short records or supplying missing measurements; and with the independent investigations of the division, to measurably enhance the value and conduce to the completeness of the report.

Covering, as it does, the greatest area hitherto comprised in any report, this investigation has been continuously prosecuted by this office for sixteen months, has been the largest piece of work by far that has engaged the attention of the division and has occupied the greater part of the pay roll.

Chapter 889 of 1921 Statutes appropriated two hundred thousand dollars ($200,000), and instructed the State Engineer or Chief of Division, to determine the maximum amount of water which can be delivered to the maximum area of land, the maximum control of flood waters, and the maximum storage of waters, as well as all possible and practical uses of water. The State Engineer was further instructed to prepare a comprehensive plan for the accomplishment of maximum conservation, control, storage, distribution and application of all the waters of the state, together with an estimate of the cost of constructing necessary works, and to submit a report, with recommendations, to the 1923 legislature.

These investigations were initiated in August, 1921, immediately following the organization of the Department of Public Works. Following this date, a consulting board of ten members was appointed by Governor Stephens as provided for in this bill, to advise with the department during the progress of the investigations.

The division prepared a program for the collection of data and preparation of the report, which was approved by the consulting board on October 10, 1921.

The program includes:

1. Collection of all data in public and private engineering offices bearing on this investigation.

2. Analysis of stream flow at the head of the main irrigated areas on every stream.

3. Location of reservoirs on each watershed and securing data on their capacity and construction costs.

4. Classification of storage reservoirs according to cost.

5. Construction of mass diagrams of stream flow for each watershed and determination of increase in water available for irrigation purposes by the construction of reservoirs.

6. Analysis of increase in water available for irrigation purposes by utilization of ground water storage.

7. Determination of areas irrigated in 1920 on each watershed, and also the areas on each watershed which will be benefited by irrigation.

8. Determination of the water requirements of all the agricultural lands of the state.

9. Determination of area that can be irrigated on each watershed by construction of reservoirs in each of the cost classes.

10. Analysis of surplus and deficiency of supply of irrigation water on each watershed with view to developing a comprehensive plan for full utilization of all waters and the irrigation of the maximum possible area including the feasibility of diverting the surplus water from one watershed to another.

11. Estimation of the future water requirements of municipalities and the most favorable sources of supply with view to the maximum utilization of the water resources of the state for both municipal and agricultural purposes.

12. Cost estimates of construction of reservoirs on each watershed, and of conveying water to the head of the irrigable areas in accordance with a comprehensive plan for maximum use of the water.

13. Analysis of the effect of the construction of reservoirs on flood flows.

14. Analysis of power development possible on each stream by the construction of reservoirs, including the feasibility of diverting surplus water from one drainage basin to another, first considering primary use of water for irrigation, and second, the primary use of water for power.

15. Classification of power development by cost per horsepower.

16. Study of means for preventing the encroachment of salt water in river estuaries.

17. Summary of information on effects of deforestation on stream flow.

The division then prepared detail schedules for the accomplishment of this program within the sixteen months then remaining before the convening of the 1923 legislature. The report is being assembled with four appendices in which the data and technical discussions pertaining to it are arranged. These are entitled:

"A" Flow in California Streams.
"B" Irrigation Requirements of California Lands.
"C" Utilization of the Water Resources of California.
"D" Relation of Settlement to Irrigation Development.

The construction of irrigation works alone does not cause intensive agricultural development. Large areas of agricultural land, under irrigation, which do not produce adequate returns on land values and costs of irrigation structures, stand as evidence. For this reason the "Relation of Settlement to Irrigation Development" was added to the program originally laid out. It requires many more people for the intensive farming of irrigated land than for the old methods of dry farming large acreages, and unless these people arrive after the construction of the works, there will be a loss in capital investment in the irrigation works. The Division of Land Settlement and the University of California are cooperating with the Division of Engineering and Irrigation in this phase of the inquiry.

The report is being prepared along comprehensive lines and every possible advantage is being taken of data and information already assembled by others. All the engineering offices of the state, both

public and private, have been approached for engineering measurements and facts pertaining to the study, and volumes of valuable information have been obtained. The scope of the endeavors has been enlarged several-fold because of the data contributed by these offices and a report will be presented much more complete than otherwise would have been possible with the expenditure of $200,000.

In addition to the advice of the consulting board appointed by the Governor, the division had consultations with engineers eminent in their profession for attainments in the subjects on which their advice was desired. In this manner the entire report is being completed with the approval of the foremost technical experts in all its phases, and no effort has been spared to make this report a most valuable guide to legislation and the future development of the water resources of the state.

IRRIGATION DISTRICTS.

Since the last biennial report, 23 new districts have been organized under the California Irrigation District Act. Petitions for formation of 35 districts have been filed with various county boards of supervisors.

Under the amendment to the act passed by the 1913 legislature, the State Engineer, or Chief of Division, is required to report on the feasibility of proposed irrigation districts. The law allows 90 days for the investigations of the State Engineer, before the expiration of which time he is required to report to the board of supervisors to whom the petition was presented. On an adverse report, the district may proceed to organize if a further petition signed by three-fourths the property owners of the proposed district is presented to the county board of supervisors. In the event of default by the Chief of Division in reporting to the board of supervisors, the proposed district may also proceed to organize.

Of the 35 petitions to organize irrigation districts since November 1, 1920, the actions are summarized as follows:

Districts organized from approved projects	18
Petitions approved, but districts failed of organization at election	2
Petitions disapproved—districts not formed	3
Districts organized on three-fourths petition	5
No report by State Engineer on account of matter before Superior Court of Los Angeles County—petition later withdrawn	1
No report by State Engineer—election returns not received	1
Petition approved—election returns not received	1
Petitions received—investigations pending	4

In addition to the above, the proponents of six contemplated districts have been given advice on the procedure for organizing irrigation districts.

Since the last biennial report, the Black Rock Irrigation District has been dissolved and proceedings are now under way for the dissolution of the Kasson, Southern Lassen and Honey Lake Valley Districts.

LIST OF IRRIGATION DISTRICTS AS OF OCTOBER 1, 1922.

Name of district	County	Year organized	Area acres	Bonds voted	Address of secretary
Alpaugh	Tulare	1914	8,861	$283,000	Alpaugh
Alta	Tulare-Fresno	1888	130,000	543,000	Dinuba
Anderson-Cottonwood	Shasta	1914	32,500	1,255,000	Anderson
Baker	Glenn	1922	1,280		Butte City
Banta-Carbona	San Joaquin	1921	18,000		Tracy
Baxter Creek	Lassen	1917	11,000	511,000	Lassen
Beaumont	Riverside	1919	3,161	230,000	Beaumont
Browns Valley	Yuba	1888	44,328	140,000	Browns Valley[2]
Butte Valley*	Siskiyou	1920	38,600		Macdoel
Byron-Bethany	Contra Costa	1919	17,600	550,000	Byron
Carmichael	Sacramento	1916	3,006	90,000	R.f.d. 3, bx. 259, Sacramento
Citrus Heights	Sacramento	1920	3,028	262,000	Fair Oaks
Compton-Delevan	Colusa	1920	12,661	575,000	Willows
Consolidated	Fresno	1921	150,000	850,000	Selma
Corcoran	Kings	1919	48.4 8	760,000	Corcoran
Cordua	Yuba	1920	5,422	267,000	Marysville
Crooks Canyon*	Modoc	1919	6,080	80,000	Alturas
El Camino*	Tehama	1921	7,556		Gerber
El Solyo*	Stanisalus	1921	3,783		
Fair Oaks	Sacramento	1917	4,000	200,000	Fair Oaks
Fall River Valley	Shasta	1922	12,820		
Feather River*	Sutter	1920	3,027		Nicolaus
Foothill	Fresno-Tulare	1920	58,000		Orosi
Fresno	Fresno	1920	242,000	2,000,000	Fresno
Glenn-Colusa	Colusa-Glenn	1920	103,000	2,587,000	Willows
Grenada	Siskiyou	1921	5,055	240,000	Grenada
Happy Valley	Shasta	1891	18,210	765,000	Olinda
Honcut-Yuba	Yuba-Butte	1919	31,442		Honcut
Honey Lake Valley*	Lassen	1916	33,150		Amadee
Hot Springs Valley	Modoc	1919	9,640	160,000	Alturas
Imperial	Imperial	1911	603,840	16,000,000	El Centro
Island No. 3	Kings	1921	3,000		Hanford
Jacinto	Glenn	1916	11,300	238,000	Glenn
James	Fresno	1920	26,952	1,000,000	San Joaquin
Kasson	San Joaquin	1921	5,986		Tracy
Klamath-Shasta Valley	Siskiyou	1921	287,000		Montague
Knightsen	Contra Costa	1919	9,561	650,000	Knightsen
Laguna	Fresno	1920	37,000	265,000	Laton
La Mesa, Lemon Grove and Spring Valley	San Diego	1913	14,794	1,232,500	La Mesa
Lemoore	Kings	1920	52,300		Lemoore
Lindsay-Strathmore	Tulare	1915	15,285	1,650,000	Lindsay
Little Rock Creek	Los Angeles	1892	3,672	308,000	Palmdale
Lone Tree	Contra Costa	1920	2,167	160,000	Brentwood
Long Valley Creek*	Lassen	1916	34,000		Doyle
Madera	Madera	1920	353,000	28,000,000	Madera
Maxwell	Colusa	1918	8,832	260,000	Colusa
Medano	Madera-Merced	1921	13,530		Le Grand
Mendota*	Fresno	1921	68,000		Fresno
Merced	Merced	1919	181,920	12,000,000	Merced
Modesto	Stanislaus	1887	81,183	4,226,511	Modesto
Mojave River*	San Bernardino	1917	27,665		Victorville
Naglee-Burk	San Joaquin	1920	3,346	200,000	Tracy
Nevada	Nevada	1921	200,000		Grass Valley
Newport Heights	Orange	1918	1,503	160,000	Costa Mesa
Newport Mesa	Orange	1918	670	50,000	Costa Mesa
Oakdale	Stanislaus-San Joaquin	1909	74,246	2,399,500	Oakdale
Oroville-Wyandotte	Butte	1919	17,700	2,000,000	Oroville
Palmdale	Los Angeles	1916	4,756	445,000	Palmdale
Paradise	Butte	1916	11,200	490,000	Paradise
Plainsburg*	Merced	1919	5,717		Plainsburg
Princeton-Codora-Glenn	Glenn-Colusa	1916	13,861	175,000	Princeton
Provident	Glenn-Colusa	1918	22,861	1,190,000	Willows
Red Rock Creek	Lassen	1918	23,515		Ravendale

*Formed without State Engineer's approval.

LIST OF IRRIGATION DISTRICTS AS OF OCTOBER 1, 1922—Concluded.

Name of district	County	Year organized	Area acres	Bonds voted	Address of secretary
Riverdale*	Fresno	1920	16,000	123,000	Riverdale
San Dieguito	San Diego	1922	3,100		Encinitas
San Ysidro	San Diego	1911	492	25,000	San Ysidro
Scott Valley	Siskiyou	1917	5,131	125,000	Fort Jones
South Capay	Glenn	1921	1,486		Orland
Southern Lassen*	Lassen	1915	21,500		Doyle
South San Joaquin	San Joaquin	1909	71,050	4,335,000	Manteca
Stinson	Fresno	1921	16,020		Helm
Stratford	Kings	1916	9,200		Stratford
Suisun*	Solano	1921	41,075		Suisun
Surprise Valley*	Modoc	1918	17,500		Fort Bidwell
Table Mountain	Butte	1922	3,941		
Terra Bella	Tulare	1915	12,000	1,000,000	Terra Bella
Thermalito	Butte	1922	3,100		
Tracy Clover	San Joaquin	1922	1,107		
Tranquillity	Fresno	1918	11,300	260 000	Tranquillity[1]
Tulare	Tulare	1889	39,760	500 000[3]	Tulare
Tule	Lassen	1920	25,400	806,000	Susanville
Turlock	Stanislaus-Merced	1887	178,798	6,770,000	Turlock
Victor Valley*	San Bernardino	1917	71,517		Victorville
Walnut	Los Angeles	1893	869		Rivera
Waterford	Stanislaus	1914	13,577	670,000	Waterford
Webster	Madera	1916	15 000		Madera
West Side	San Joaquin	1915	11,828	545,000	Tracy
West Stanislaus*	Stanislaus-Merced	1920	35,681		Crows Landing
Williams*	Colusa	1920	9,021	600 000[1]	Williams
Total, 89 districts			3,929,893	$100,566,511[4]	

*Formed without State Engineer's approval.
[1]Issued without approval of Bond Commission.
[3]Tulare bought up its bonds at 53 cents and burned them in 1903.
[4]Less $940,000 Browns Valley and Tulare districts' bonds paid and canceled

The California Irrigation District Act and the Bond Certification Commission Act provide for the approval and certification of bond issues of irrigation districts by the California Bond Certification Commission, of which the State Engineer, or Chief of Division, is a member. The approval and certification of these bonds make them legal investments for trust funds, funds of insurance companies, savings banks, etc. The engineering investigations upon which the Bond Commission bases its judgment are made by the State Engineer or Chief of Division.

The following table presents a summary of this work for the past two years:

APPLICATIONS FOR STATE APPROVAL OF IRRIGATION DISTRICT BONDS, 1921-1922.

Name of district	Amount of approved bond issue	Amount of bond issue not approved
Banta-Carbona	$696,000	
Baxter Creek	511,000	
Citrus Heights	262,000	
Consolidated	775,000	
Consolidated	75,000	
Cordua	75,000	
Crooks Canyon	-------	$180,000
Fresno	2,000,000	
Glenn-Colusa	2,342,150	
Grenada	240,000	
Happy Valley	150,000	
Hot Springs Valley	60,000	
Imperial	7,500,000	
Knightsen	650,000	
Laguna	265,000	
Little Rock Creek	248,000	
Lone Tree	160,000	
Madera	28,000,000	
Merced	12,000,000	
Feather River	-------	95,000
Naglee Burke	200,000	
Palmdale	63,000	
Provident	190,000	
Red Rock Creek	-------	600,000
Riverdale	123,000	
South Capay	-------	88,300
Tule	806,000	
Honcut-Yuba	-------	1,713,400
Oroville-Wyandotte	2,000,000	
Byron-Bethany	176,600	
San Dieguito	335,700	
Totals	$59,903,450	$2,676,700

Expenditures from the construction funds of irrigation districts created from the sale of approved and certified bonds, are under the jurisdiction of the Bond Commission and all budgets of expenditures, proposed contracts, etc., relating to these expenditures are examined by the division office for the Commission. Field inspections of construction work and examination of the affairs of the districts are made from time to time.

WATER STORAGE DISTRICTS.

Under the Water Storage Act of 1921, the State Engineer or Chief of Division receives petitions for the formation of water storage districts. Hearings are then conducted and engineering investigations made to determine the practicability, feasibility and utility of the projects. In

conclusion, an order is made of the findings, and if approved the boundaries are fixed, locations for storage specified, cost of project estimated, and an election held on the organization.

In performing these functions, the law provides for two executive directors to assist the State Engineer. Messrs W. P. Boone of Fresno and D. Joseph Coyne of Los Angeles have been appointed by the Governor.

San Joaquin Water Storage District.

A petition for the organization of a water storage district to include about 550,000 acres of land on the west side of the San Joaquin River, lying under canals mainly in the ownership of Miller & Lux, Inc., was presented to this office in April, 1922, and a hearing held May 26 and 27 at Los Banos. A favorable ruling on the sufficiency of the petition was made at that time. Engineering investigations of the feasibility of the proposed district were undertaken. During July and August negotiations between the Miller & Lux Inc. and the Madera Irrigation District resulted in an agreement under which it was proposed to organize a larger water storage district to include at least part of the lands of the Madera Irrigation District. Investigations concerning the formation of this larger district are now in progress.

Kern River Water Storage District.

A petition for the organization of a water storage district of about 250,000 acres lying on the delta of the Kern River was presented to this office in May, 1922. At a hearing on June 4 a favorable ruling on the sufficiency of the petition was made. Subsequent hearings have been held at which evidence relating to the feasibility of the project has been presented and petitions for the exclusion of lands presented by individual owners. No ruling on the feasibility of the district has been made. The date of the next hearing is set for December 15, 1922.

Buena Vista Water Storage District.

A petition for the organization of lands susceptible of irrigation from the lower reaches of the Kern River was presented to this office in August, 1922, and a hearing held on September 8, 1922. This district proposes to cooperate with the Kern River Water Storage District in storage on the Kern River. The boundaries as described in the petition include all lands lying below the present diversion points of the Miller & Lux canals, which are owned by parties to the Miller-Haggin agreement.

DAM AND BRIDGE CONSTRUCTION.

The statutes provide that no dams shall be constructed by others than municipalities or public utility corporations, except that the plans and specifications be first approved by the State Engineer or Chief of Division. It is also required that the construction of these dams be completed to the satisfaction of the State Engineer. During the past two years plans and specifications for the following dams have been

approved by the office and field inspections made of those under construction:

APPROVED DESIGNS OF DAMS 1921-1923.

Name of Dam.	County.	Type of Dam.	Height feet.
Pacoima	Los Angeles	Concrete arch	375
Everly	Modoc	Earth fill	10
South Tule	Tulare	Concrete curved gravity	42
Mud Flat	Lassen	Earth	27
Deep Cut	Lassen	Earth	35
Cosumnes	Sacramento	Concrete—gravity	10
Live Oak Canyon	Los Angeles	Concrete—gravity arched	76
San Dimas	Los Angeles	Concrete—gravity arched	125
Hole (reconstruction)	Riverside	Hydraulic fill	40
Henshaw	San Diego	Hydraulic fill	120
Dam No. 1, Little Rock Power and Water Co.	Los Angeles	Rock fill	107
Exchequer	Mariposa	Constant angle arch	320
Rhinedollar (Elery)	Mono	Rock fill	28
Little Rock Creek	Los Angeles	Concrete multiple arch	158
Mt. Diablo Country Club Reservoir	Contra Costa	Earth	11
Verdugo Road Reservoir	Los Angeles	Earth, concrete facing	---

The law requires that the plans and specifications for bridges over navigable streams be approved by the State Engineer or Chief of Division. None have been presented for approval during the past two years.

RECTIFICATION OF RIVER CHANNELS.

Construction of Current Retards at Jacinto and Arnold Bends.

A new type of bank revetment was introduced into California with the construction of current retards to protect the caving banks of the Sacramento River at Jacinto and Arnold Bends. This type of protection has been successfully used on the Missouri River to protect dangerously caving banks with a great saving in costs over types previously used there. The retards consist of a windrow of trees built outward from the bank and with their trunks parallel to the bank. The butt ends of these trees are placed upstream and fastened to cables which bind the windrow together and lead upstream to concrete piles jetted down with their tops below the stream bed. These cables hold the windrow in place against the impinging current. Extending out into the stream, these windrows make an effective retard to the current near the bank. Their partial permeability to the flow of the stream tends to relieve the formation of eddies on the downstream side of these retards and make them effective in causing sedimentation. These retards are placed at intervals along the bank to conform to the configuration of the stream channel.

Three retards were constructed during 1922 in the sharp bend of the river near Jacinto. The cost of this construction was shared equally by Reclamation District No. 2047, Levee District No. 1, and the state. Four retards were also constructed during 1922 at Arnold Bend near Colusa. The cost of this work was shared equally by Reclamation District No. 2047 and the state.

Clearing Channel of Sacramento River—Colusa to Chico.

The below-normal run-off in the Sacramento River of several of the recent seasons and the great increase in diversions for irrigation during the spring and summer months have made conditions favorable for the

growth of willows in the bottom and sides of the river channel. From Colusa to Chico, a distance of 51 miles, 425 acres of willows were cut during the summer and fall of 1922. These willows were growing rapidly on the leeward side of bends and on new forming bars, to become dense thickets obstructing the flood channel. The deposit of sand and gravel amongst these bushes by the retarding of the flood current in passing over and through them has been building new bars and enlarging old ones, all to cause further attack by the eroding current upon the river banks on the opposite side of the channel to the building bars. Many of the young willows grubbed out in this work were planted again in advantageous locations to protect exposed banks and by their growth and assistance in causing deposition of detritus, to aid in rectifying the river channel. All together about twelve acres of willows were planted.

Reclamation District No. 1500.

Racetrack and Ministerial bends, about thirty miles upstream from Knights Landing on the Sacramento River, have suffered heavily from the attacks of the river current. Reclamation District No. 1500 has spent large sums in preventing the undermining of their levee in these bends. A project for digging cut-off channels through these bends has been before the State Reclamation Board, but no program for construction has yet been arranged.

To hold the river from breaking through into the highly developed area behind the levee, additional protection had to be placed in these bends. Sixteen hundred feet of brush mattress, sixty feet wide, was placed, together with repairs to old revetment and isolated mats, with a total length of 3000 feet. This work was done in the fall and early winter of 1922. Twenty-three hundred dollars was spent on this work. The state paid one-third and furnished equipment and a superintendent.

Edinger-Johnson Levee.

The bend in the Sacramento River at the Edinger-Johnson place near Hood has been a point of severe attack by the waves and river current for the past several years.

By December, 1921, the banks had caved in several places, so that the levee was materially weakened. Great property values depend upon the protection of this levee in the reclaimed land back from the river. A break in the levee in a time of flood would not only cause serious damage to these properties, but would impair the navigable channel of the Sacramento River.

The caving of the banks at this point is caused by the waves and current washing away the sand which lays below the thick strata of sediment composing the river bank. As the sand washes out from beneath the sediment, the overlying hard bank caves off in chunks to be later broken up and washed away by the waves and river current. In 1919 bricks were dumped in front of the bank at the points of most serious erosion, but this did not prove sufficient for the protection of the bend. Following December, 1921, 1800 cubic yards of broken rock were spread in front of the bank to prevent the waves and current from further attack on the low-lying sand strata.

Rough and Ready Island.

Concrete revetment on Rough and Ready Island having a total length of 3000 feet and a width of 14 feet was completed in September, 1921. This revetment protects portions of the levee along the navigable channel leading to Stockton, from the wash of waves occasioned by steamer traffic on this channel. The property owners paid half the cost of this work. The state paid the other half, and furnished equipment and superintendence.

Reclamation District No. 17 on San Joaquin River.

Work was started in July, 1920, on the front of Reclamation District No. 17 near the mouth of Walthall Slough on the San Joaquin River. The protection was completed in September, 1921. The slopes of the levee were paved with three inches thickness of concrete and a brush mattress thirty feet wide was extended into the river from the toe of the concrete revetment at the low water line. About 900 lineal feet of bank was so protected. The cost was $16,698.98 and was paid for by the property interests. The state furnished its equipment and superintendence.

Lower Sherman Island.

Protection work started in July, 1920, to prevent wave action on the lower Sacramento and San Joaquin rivers from washing down the levees on Lower Sherman Island, was completed in the spring of 1921. This work consisted of the brush fence three feet wide and five feet high, held in place with stakes on six foot centers. It was undertaken on the request of the State Board of Control, who had recently purchased the property for a spoil area to the dredging operations now in progress for opening up the mouth of the Sacramento River. These dredging operations are a part of the flood control project of the Sacramento Valley.

Mad River.

Twelve hundred lineal feet of brush and rock revetment was placed on the bank of Mad River in Humboldt County during July and August, 1920.

INTENSIVE ENGINEERING STUDIES.

Water Resources of Kern River.

Bulletin No. 9, "Water Resources of Kern River and Adjacent Streams and Their Utilization," of the Department of Engineering, was published after completing a field investigation which beginning in December, 1919, continued through the year 1921. These investigations were undertaken at the request of local interests and consisted principally of the study of surface storage possibilities and of ground water supply and its utilization. Conclusion was reached that a reasonably well-maintained supply was available from both sources to irrigate about 300,000 acres, and recommendations were made for the establishment of boundaries for a water storage distrct. A complete description of the work and the results is given in the bulletin. The work was per-

formed with Harry Barnes in the field, under the supervision of S. T. Harding. The cost of the work was paid for as follows:

Kern County	$5,000 00
Kern County Land Company	5,000 00
Tejon Ranch Company	5,000 00
Department of Engineering	10,000 00

Water Resources of Tulare County.

An investigation of the water resources of Tulare County was commenced in 1920 at the request of Tulare County Water Users' Association. Available data on stream flows, storage sites and underground water was assembled and field work conducted to obtain supplementary data. The principal field work was directed toward the study of ground water conditions. Fluctuations of wells were observed, estimates made of the draft on the ground water and compared to the natural replenishment of these underground basins. Surface storage sites were also investigated and several surveys made.

The results of this work are now being printed in Bulletin No. 4 of the Department of Public Works, entitled "Water Resources of Tulare County and their Utilization," which gives a full account of the work.

The field work for this report was handled by G. H. Russell and Chester Marliave, under the direction of S. T. Harding. The cost of the work was paid as follows:

Tulare County Water Users' Association	$1,500 00
Tulare County	5,000 00
Division of Engineering and Irrigation	6,600 00

Water Resources of San Jacinto Valley—Riverside County.

San Jacinto Valley, lying in the westerly portion of Riverside County, has a watershed area of 330 square miles, and there are 248,000 acres of arable land needing irrigation in the valley. The rainfall is only about thirteen inches in the valley and irrigation is essential for agricultural productivity. The water supply being small compared to the area of land to be irrigated, the controversy between the various parties developing the valley had resulted.

To furnish information for the equitable adjustment of claims between the various parties, the Division of Engineering and Irrigation entered into a contract with five of the organizations in the valley and with the Division of Water Rights, for investigating the water resources of the valley and their utilization. The Division of Engineering and Irrigation subscribed $1,000 to this work and the use of an automobile and other equipment, while the Division of Water Rights subscribed $2,000 and the local interests $5,000. The work is now in progress under the direction of the Division of Water Rights and it is expected to reach completion in the spring of 1923.

Water Resources of Mono Basin.

Resulting from much controversy over water rights and rights of way over federal lands in the Mono Lake Drainage Basin, a resolution was passed by the Mono County grand jury in 1921 requesting that an

investigation be made by the Division of Engineering and Irrigation. An engineer was assigned to this work, the history of the acquirement of these rights was reviewed, the plans for additional development examined, and a report is being prepared.

COLORADO RIVER COMMISSION.

The Colorado River flows southerly along the entire eastern boundary of Imperial County, California. During the past twenty years a very prosperous community has been developed in the Imperial Valley, Imperial County, under the authorization of our irrigation district laws. The irrigation district contains something over 500,000 acres of very fertile land, and secures its entire water supply from the Colorado River. During the low water flow of the river of three seasons within the past eighteen years, there has been a shortage of water for irrigation. A larger area of land is now being irrigated and a larger amount of water is needed, hence a much more serious condition is anticipated in the future because of the sure occurrence of other seasons of scant supply.

The other extreme as to the amount of water flowing down the Colorado River, namely: that of floods, creates a very serious condition also. The Imperial Valley Irrigation District has been compelled during a number of years past to spend large amounts of money in constructing and maintaining levees with which to form barriers against the entry of the river into the valley and into the Saltor Sea. In order that protection may be provided for flood damage, and in order that additional water above that now used may be conserved for low flow seasons, and to serve for the extension of the irrigable area: it is necessary that impounding works be constructed at some point on the river. The irrigation district has been cooperating with the U. S. Reclamation Service for some years in investigating the best site for such impounding works.

The proposal on the part of the State of California to so plan and protect the interests of Imperial County is of interest to the other states lying within the basin of the Colorado River drainage area, and in order that there may be general community interest and a general working plan adopted by all such states, certain legislation was proposed and passed by all of them during the year 1921. California's Act is expressed in the language of chapter 88, Statutes of 1921, and is as follows:

CHAPTER 88.

An act authorizing the governor of California to appoint a representative of the State of California to serve upon a joint commission composed of representatives of the states of Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming and the United States of America, and constituted for the purpose of negotiating and entering into an agreement between the several states hereinabove mentioned and between said states and the United States of America, subject to the consent of Congress, respecting further use and disposition of the waters of the Colorado River and streams tributary thereto, and

fixing and determining the rights of each of said states and rights of the United States in and to the use, benefit and disposition of the waters of said stream and its tributaries.

(Approved May 12, 1921. In effect immediately.)

The people of the State of California do enact as follows:

SECTION 1. The governor of California shall appoint the state engineer who shall serve without additional compensation as the representative of the State of California on a joint commission composed of one representative from each of the states of Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming, and two duly authorized representatives of the United States of America, the principal duty of which commission shall be to negotiate and enter into an agreement between the several states hereinabove mentioned and between the said states and the United States of America, subject to the consent of Congress, respecting the further use and disposition of the waters of the Colorado River and streams tributary thereto, and fixing and determining the rights of each of said states and the rights of the United States in and to the use, benefit and disposition of the waters of the Colorado River and its tributaries; *provided, however*, that any agreement so entered into by said states and the United States of America shall not be binding or obligatory upon any of the high contracting parties thereto unless and until such agreement shall have been ratified and approved by the legislature of each of the above mentioned states and by the congress of the United States.

SEC. 2. The governor of California, immediately after such representative of the State of California has been appointed and has qualified, shall notify the governor of each of the above mentioned states of the appointment of the said representative of California, giving his name and address, but said representative shall not enter upon the performance of his duties until a representative to serve upon said joint commission shall have been named and qualified for each of the states named in section one hereof.

SEC. 3. Said representative from California shall have full authority to make any and all investigations of the Colorado River and the drainage area thereof, which may become necessary in order to sufficiently advise said representative of the physical conditions obtaining upon said streams, and of the present and future need of the State of California and its citizens to the use and benefit of the waters of said stream. To that end, said representative shall have authority to administer oaths, examine and require the attendance of witnesses, and to perform such other duties as may be necessary to sufficiently apprise said representative of the facts and furnish him with adequate information in order that he may properly perform his duties as representative of the State of California upon said joint commission.

SEC. 4. Inasmuch as the Colorado River during flood periods constitutes a menace to life and property within this state and the purpose of the commission is to meet immediately upon the appointment and qualification of the representatives of the several states for the purpose of adopting a plan of agreement which will ultimately make possible the construction of impounding dams that will eliminate this hazard, it is hereby declared that this act is an emergency measure necessary for the immediate preservation of the public health, peace and safety, and that under the provisions of section one of article four of the state constitution an urgency exists, and this act shall take effect immediately.

Legislation of similar character was adopted by all of the other states. President Harding appointed Mr. Herbert Hoover, Secretary of the Department of Commerce, as the federal member. The Commission met in Washington, D. C., on January 27, 1922, and chose Mr. Hoover as chairman. Meetings and hearings have been held at

Phoenix, Arizona, March 15, 16, 17, 1922.
Los Angeles, California, March 20, 1922.
Salt Lake City, Utah, March 27, 28, 1922.
Grand Junction, Colorado, March 29, 1922.
Denver, Colorado, March 31 and April 1, 1922.
Cheyenne, Wyoming, April 2, 1922.

No agreement was reached.

The Commission is to meet again at Santa Fe, New Mexico, on November 9, 1922, for further discussion.

FLOOD CONTROL—SACRAMENTO AND SAN JOAQUIN VALLEYS.

(In cooperation with State Reclamation Board.)

In accordance with the *Reclamation Board Act, this division has continued to make surveys and examinations for the Sacramento Flood Control Project, and for the formulation of flood control plans in the San Joaquin Valley. It has also examined and reported upon applications of various reclamation districts, and other matters referred to it by the Reclamation Board.

Descriptions of the Sacramento Flood Control project and the mining debris problem are contained in previous reports of the State Department of Engineering and of the Reclamation Board.

Installation of Recording Gages.

In order to supplement the data collected by the United States Weather Bureau on river gage heights during flood periods in the Sacramento Valley, eighteen recording gages were installed during 1921 at various points on the Sacramento River and its tributaries and on the Calaveras and Mokelumne rivers.

The cost of purchasing and installing thirteen of these Bristol gages was paid by the State Reclamation Board.

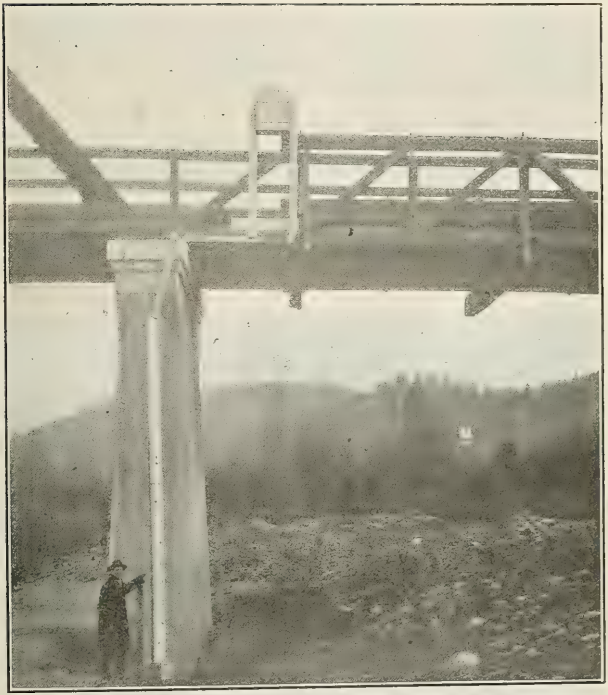
The three located at Yolo, Winters and Lisbon were purchased by the California Debris Commission, and the cost of installation paid by landowners in Yolo by-pass.

The cost of purchase and installation of the two located at Stockton and Jenny Lind was paid by the city of Stockton.

*Chapter 523, p. 1122, Statutes of 1919.

BRISTOL GAGE INSTALLATIONS.

Station	Range of record	Staff gage reading of zero of recorder	Staff gage heights above which telegraphic reports are sent in	Staff gage installed by	Elevation of zero of staff gage and datum	Maximum high-water record
	Feet	Feet	Feet		Feet	Feet
Kennett	30	10.0	12.0	U. S. W. B.	621.6 U. S. E. D.	33.2—Feb. 23, 1907
Simpson's Bridge (Stony Creek)	20	5.0	5.0	(Orland project)		
Ord Ferry	25	0.0	10.0	U. S. W. B.	98.38 U. S. E. D.	23.5—Feb. 4, 1909
Moulton Break	30	60.0	70.0	State	0.0 U. S. E. D.	82.0—Feb., 1915
Butte Basin, 2.2 miles north of West Butte	20	55.0	60.0	State	0.0 U. S. E. D.	
Colusa	30	10.0	20.0	U. S. W. B.	40.4 U. S. E. D.	29.3—Mar. 29, 1907
Long Bridge	20	45.0	50.0	State	0.0 U. S. E. D.	
Tisdale	20	40.0	Local phone available	District No. 1500	0.0 U. S. E. D.	
Lisbon	20	7.0	Local phone available	State	0.0 U. S. E. D.	
Yolo (Cache Creek)	30	1.0	15.0	U. S. G. S.		27.8—Feb. 2, 1915
Winters (Putah Creek)	30	10.0	25.0	U. S. G. S.		39.0—Dec. 31, 1913
Hammonton (Yuba River)	15	0.0	5.0		Top of dam	
Yuba City	30	50.0	55.0	Levee, District No. 1	0.0 U. S. E. D.	
Bear River-Auburn-Grass Valley Road	30	0.0	6.0	State	Removed Aug., 1922	
Auburn, North Fork American River	50	0.0	0.0	U. S. G. S.		
Coloma, South Fork American River	30	10.0	10.0	State		
Stockton	30	83.0	90.0	Stockton (city)	City datum	
Jenny Lind, Calaveras River	25	4.0	8.0	U. S. G. S.		



Bristol gage installation—South Fork of American River at Coloma.

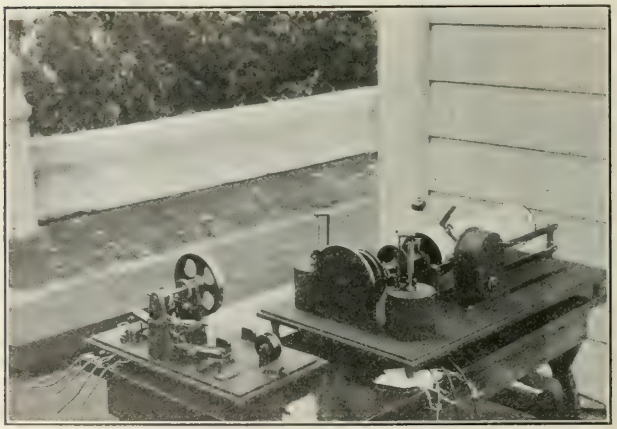
Long Distance Recording Gage.

The gaging station which records the flow for the Sacramento River is six miles upstream from Red Bluff, at the mouth of Iron Canyon. This is a most important station and immediate information on changing gage height during flood periods is invaluable.

There being no one living near this station to send in reports from the recording gage in the gage house, it was desirable to connect this gaging station with the United States Weather Bureau office in Red Bluff by a long distance recorder. This instrument was installed and keeps a record in the Weather Bureau office at Red Bluff, of the gage heights on the Sacramento River, six miles above.

Flood Discharge Measurements.

Current meter measurements of flood discharge have been made at various points in the Sacramento and San Joaquin rivers and tributaries as follows:



Stevens long-distance water stage register on Sacramento River.

FLOOD DISCHARGE MEASUREMENTS.

Stream	Location	Date	Gage Datum.	Gage height, feet	Discharge, second-feet	Remarks
Sacramento River	Sacramento	April 26, 1921		15.4	48,988	
		May 20, 1921		14.6	31,540	
		June 3, 1921	U. S. W. B. gage.	12.6	29,340	
		June 20, 1921	Zero equals 3.1 ft.	7.68	15,310	
		June 30, 1921	U. S. E. D.	5.5	11,290	
American River	Near Sacramento	April 27, 1921	Temporary		6,091	
Butte Slough By-pass	Long Bridge	Nov. 20, 1920		48.43	20,722	
		Dec. 10, 1920		45.95	5,941	
		Dec. 11, 1920		47.12	10,908	
		Jan. 30, 1921		49.87	39,440	
Sutter By-pass	Near Gilsizer Slough	Dec. 13, 1920		37.30	22,127	
		Dec. 14, 1920	State gage. Zero	38.20	25,113	
		Jan. 22, 1921	equals zero	40.35	49,401	
		Feb. 2, 1921	U. S. E. D.	41.91	70,040	
		Feb. 17, 1921		36.27	16,852	
Tisdale By-pass	Tisdale Weir	Dec. 10, 1920		45.55	2,745	
		Dec. 11, 1920		46.00	9,725	
Calaveras River	At Stockton	Jan. 18, 1921	Temporary	32.84	14,521	35.6 on temporary gage equals level of deck of highway bridge at south end.
		Jan. 19, 1921		30.62	8,810	
San Joaquin River	San Joaquin City	Dec. 21, 1920		2.93	3,673*	
San Joaquin River	Lathrop	Nov. 29-30, 1920		2.66	3,206	
		Jan. 3-4, 1921		4.26	4,805	
		Jan. 20, 1921		12.06	13,179	
		Jan. 20, 1921		12.55	14,648	
		Jan. 22, 1921		14.34	16,082	
		June 27, 1921	U. S. W. B. gage	10.55	10,830	
		May 15, 1922	near Lathrop.	12.95	14,433	
		May 15, 1922	Zero equals 5.5 ft.	12.97	14,688	
		May 18, 1922	U. S. E. D.	15.50	20,900	In cooperation U. S. G. S. and City of Stockton.
		June 1, 1922		17.28	22,300	
		June 9, 1922		18.20	28,200	

*Gage measurement at San Joaquin City referred to U. S. Weather Bureau gage near Lathrop.

FLOOD DISCHARGE MEASUREMENTS—Continued.

Stream	Location	Date	Gage Datum.	Gage height, feet	Discharge, second-feet	Remarks
San Joaquin River	Durham Ferry Bridge	July 12, 1922		11.18	10,600	
San Joaquin River	Below Middle River, Brandt Bridge.	May 16, 1922		10.17	10,000	
		May 19, 1922	Zero equals 3.4 ft.	12.00	11,800	
Brandt		June 2, 1922	U. S. E. D.	12.83	12,700	
		June 10, 1922		13.17	12,600	
Middle River	Below Salmon Slough, Mowrey Bridge	May 16, 1922		4.92	1,920	
		June 2, 1922	Zero equals 6.6 ft. U. S. E. D.	6.58	2,370	
		June 10, 1922		7.80	2,680	
				8.60	3,160	
Paradise Cut	Highway Bridge	May 15, 1922		4.35	2,760	
		May 18, 1922	Zero equals 10.67 ft. U. S. E. D.	8.25	5,690	
		June 1, 1922		9.90	9,060	
		June 9, 1922		10.70	10,600	
Old River	Below Tom Paine Slough at Bridge	May 16, 1922	Zero equals zero	6.98	1,690	
		June 13-14, 1922	U. S. E. D.	10.28	4,400*	In cooperation U. S. G. S. and City of Stockton (no check).
Grant Line Canal	Near Lathrop	June 13-14, 1922	Zero equals 8.5 ft. U. S. E. D.	0.88	13,700*	
San Joaquin River**	Half mile below Stockton channel	Dec. 2-3, 1920		2.54	1,550	
		Dec. 22-23, 1920		3.07	1,875	
		Jan. 5-6, 1921		4.07	2,165	
		Jan. 17-18, 1921		3.14	2,070	
		Jan. 24-25, 1921		11.39	7,220	
		Feb. 10-11, 1921	U. S. W. B. gage.	6.76	3,910	
		Mar. 1-2, 1921	Zero equals 5.5 ft.	6.19	3,575	
		Mar. 28-29, 1921	U. S. E. D.	6.66	3,805	
		April 29-30, 1921		7.41	4,175	
		June 9-10, 1921		13.81	8,240	
		June 28-29, 1921		9.18	4,954	

*Mean discharge for tidal cycles in cooperation with U. S. G. S. and City of Stockton. Mean discharge for tidal cycle.
**Measurement taken half mile below Stockton channel and referred to U. S. Weather Bureau gage near Lathrop same day.

Progress on Plans for Flood Control.

Upper Colusa Basin Flood Channel. A flood channel is required for the flood waters carried by the various streams that enter the Upper Colusa Basin from the west. As these streams enter the basin at intervals, the flood channel was required to have a varying capacity, increasing in the downstream direction. The dimensions of this channel have been determined and its course located during the past biennium.

Cherokee Canal. An estimate of the quantity of flood waters which may be expected in Cherokee Canal was made from a study of rainfall records in the vicinity of its watershed and a determination of the flood channel necessary for this run-off.

Mokelumne River. A study of the run-off per square mile of the streams on both sides of the Mokelumne River watershed was made for the purpose of determining what run-off might reasonably be expected from the Mokelumne drainage basin for a storm having its full intensity over that watershed, it being conceded that the intensity of both the 1907 and 1911 storms was greatly diminished before reaching this area, the one being more intense to the north, and the other to the south.

Studies of flood control on the Mokelumne River were made, including the probable effect on conditions in case proposed reservoirs should be constructed in the foothill area of this watershed.

It was found that the north and south forks of the river could be widened as far as necessary below New Hope Landing to care for the run-off at considerably less cost than by the construction of any by-pass.

If, however, the proposed reservoirs should be built with sufficient intake canal capacity, and operated with the object of controlling the flood waters, the only work necessary on the north and south forks would be the raising of the levees to a standard grade and section.

San Joaquin Valley.

A careful study and revision of the analysis of the 1911 flood, including the possible effect upon such a flood by construction of reservoirs contemplated on the San Joaquin River and its tributaries, were made in conjunction with studies of various plans for flood channels in this valley.

From the studies for the San Joaquin Valley, plans have been worked out for the upper end of the San Joaquin by-pass; setting levee heights and grades.

Applications Before Reclamation Board.

Investigations and reports have been made to the Reclamation Board upon eighty-three applications for reclamation and drainage works, including pumping plants, and upon four applications for the construction or reconstruction of bridges over river and flood channels in the Sacramento and San Joaquin valleys. Various complaints of land owners and districts have also been investigated and reported upon.

Levee Standardization.

Plans for the completion to standard grade and the protection of the east levee of the Sacramento River from Reclamation District No. 744 to Reclamation District No. 755, a distance of 4.3 miles, were completed and reported to the Reclamation Board.

Plans, profiles and levee sections showing work necessary to bring the levee to standard grade have been reported to the Reclamation Board covering the east levee of the Sacramento River from Sacramento City to Portuguese Bend below Freeport, a distance of 10.7 miles and from Reclamation District No. 551 to the mouth of Old River, a distance of 13.8 miles, also for the west levee of the Sacramento River along Reclamation Districts Nos. 765 and 307, a distance of 8.3 miles.

Annual Report of Local Expenditures on the Sacramento Flood Control Project.

Two annual reports have been prepared, showing the amounts expended by local interests upon various portions of the Sacramento flood control project. The 1922 report shows a total expenditure by various districts, cities, and private interests amounting to $28,035,-887.76. State appropriations for this project have been made amounting to $2,850,000, making a grand total of $30,885,887.76.

The accumulative expenditures by local interests, state and federal governments, upon reclamation works forming portions of the Sacramento project are shown graphically on Diagram No. 2.

COOPERATIVE INVESTIGATIONS WITH FEDERAL GOVERNMENT.

Restraining Debris—Yuba River.

The California Debris Commission has constructed additional works in the bed of the Yuba River during the past two years. This construction work is located above Marysville and was undertaken for the purpose of confining the large volume of debris deposited there since the days of hydraulic mining. Without retention this debris would be washed downstream to fill the channels of the Featner and Sacramento rivers and obstruct navigation.

The work has consisted of constructing dams across the heads of old channels where the river had threatened to enter and scour out the sand deposits. The cobble and earth retaining wall previously built to guide the river through the debris deposits had protecting parts added to it. Also many snags were removed from the channel, hard pan blasted, overhanging trees cut from the banks, and bank protection placed at a caving bend in the river six miles upstream from Marysville.

This work has been carried on by the California Debris Commission, and funds have been supplied equally by the state and federal governments.

STREAM GAGING.

Progress Report by H. D. McGLASHAM, District Engineer, Water Resources Branch, United States Geological Survey.

The cooperative investigation of the surface water resources of the State of California during the years 1921 and 1922 has been maintained on about the same basis as given in your last biennial report, except that through ecoperation with permittees and licensees of the Federal Power Commission, 23 new stations have been established. These stations are all located at high elevations and will furnish very valuable run-off records.

The following table gives the river measurement stations maintained during the two-year period ending September 30, 1922. This list does not include stations maintained by private parties, for which complete records are furnished for publication in our annual progress reports. These stations are distributed among the major drainage basins of the state as follows: Sacramento 27 per cent, San Joaquin 33 per cent, South Pacific 27 per cent, North Pacific 6 per cent, and Great Basin 7 per cent.

Stream.	Location.
Alameda Creek*	Niles
American River	Fairoaks
American River, Middle Fork	East Auburn
American River, North Fork	Colfax
American River, South Fork	Placerville
Antelope Creek*	Macdoel
Arroyo Seco*	Pasadena
Arroyo Seco	Soledad
Bear Creek	Dana
Bear Creek*	Macdoel
Bear Creek*	Vermillion Valley
Bear River	Colfax
Bear River	Van Trent
Black Canyon Creek	Mesa Grande
Boulder Creek	Julian
Burney Creek	above Burney
Burney Creek at Burney Falls	Burney
Butte Creek*	Macdoel
Cache Creek	Yolo
Cajon Creek*	Keenbrook
Calaveras River	Jenny Lind
Carson River, East Fork	Markleeville
Carson River, West Fork	Woodfords
Cherry Creek*	Hetch Hetchy
Chiquito Creek*	Arnold Meadow
City Creek*	Highlands
Clear Lake	Lakeport
Cosumnes River	Michigan Bar
Cosumnes River, North Fork	El Dorado
Coyote River	Coyote
Coyote River	Edenvale
Coyote River	Madrone
Cuyamaca Water Company's flume at diverting dam	Lakeside
Cuyamaca Water Company's flume	Lakeside
Dalton Creek*	Glendora
Deer Creek	Hot Springs
Deer Creek	Vina
Devil Canyon Creek*	San Bernardino
Dinkey Creek*	Dinkey Meadows
Dinkey Creek*	at mouth
Eaton Creek*	Pasadena
Eel River	Scotia
Eleanor Creek*	Hetch Hetchy
Eleanor Lake	Hetch Hetchy
Elsinore Lake	Elsinore
Fall River	Fall River Mills
Fall River*	Glenburn
Falls Creek*	Hetch Hetchy
Feather River*	Nicolaus
Feather River*	Oroville
Feather River, Middle Fork	Oroville
Feather River, Middle Fork*	Sloat

*Station equipped with a water-stage recorder.

Stream.	Location.
Feather River, South Fork	Enterprise
Fish Creek*	Duarte
Fresno River	Knowles
Gobernador Creek	Carpinteria
Goodyear Creek	Goodyear Bar
Granite Creek*	Granite Creek bridge
Haines Creek*	Tujunga
Hat Creek*	Carbon
Hat Creek at Wilcox Ranch	Cassel
Helms Creek*	near mouth
Indian Creek	Happy Camp
Jackass Creek*	Jackass Meadows
Kaweah River	Three Rivers
Kaweah River, North Fork	Kaweah
Kaweah River, South Fork	Three Rivers
Kern River*	Kernville
Kern River No. 3 canal*	Kernville
Kings River*	Hume
Kings River*	Sanger
Kings River, North Fork*	Cliff Camp
Kings River, North Fork*	above Dinkey Creek
Kings River, North Fork*	below Meadow Brook
Klamath River	Requa
Klamath River	Seiad Valley
Little Santa Anita Creek*	Sierra Madre
Lone Pine Creek*	Keeubrook
Long Valley Creek	Scotts
Lytle Creek and Fontana pipeline*	Fontana
Markleeville Creek	Markleeville
Markleeville Creek	above Markleeville
McArthur drainage canal	McArthur
McCloud River	Baird
Medley Lakes outlet*	Echo
Meeks and Daley canal*	Colton
Merced River*	Exchequer
Merced River*	Livingston
Merced River at Happy Isles*	Yosemite
Merced River at Pohono bridge*	Yosemite
Merced River, South Fork	Wawona
Middle Eel River	Covelo
Mill Creek*	Craftonville
Mill Creek power canal No. 1*	Craftonville
Mill Creek power canal Nos. 2 and 3*	Craftonville
Modesto Canal	La Grange
Mokelumne River	Clements
Mokelumne River, Middle Fork	West Point
Mokelumne River, South Fork	Railroad Flat
Mono Creek*	Vermillion Valley
Mono Lake	Mono Lake
Monrovia pipeline	Monrovia
Oakdale Canal	Knights Ferry
Oregon Creek	North San Juan
Owens Lake	Lone Pine
Owens River	Big Pine
Owens River*	Round Valley
Pacoima Creek*	San Fernando
Palermo Land and Water Company's canal	Enterprise
Pauma Creek*	Nellie
Pauma Creek at Pauma Indian Reservation*	Nellie
Pine Creek	Alturas
Pine Creek	Round Valley

*Station equipped with a water-stage recorder.

Stream.	Location.
Pit River	Bieber
Pit River below Fall River*	Fall River Mills
Pit River*	Henderson
Pit River*	Pecks bridge
Pit River	Ydalpom
Pitman Creek*	Big Creek
Plunge Creek*	East Highlands
Putah Creek	Winters
Rising River	Cassel
Rock Creek	Goodyear Bar
Rock Creek	Round Valley
Rogers Creek*	Azusa
Sacramento River	Antler
Sacramento River*	Butte City
Sacramento River	Castella
Sacramento River*	Colusa
Sacramento River*	Knights Landing
Sacramento River*	Red Bluff
Salmon Creek*	Kernville
Salton Sea	Salton
San Antonio Creek*	Claremont
San Diego River*	Santee
San Dimas Creek*	San Dimas
San Gabriel River*	Azusa
San Jacinto River*	Elsinore
San Jacinto River*	San Jacinto
San Joaquin River*	Big Creek
San Joaquin River*	Friant
San Joaquin River	Newman
San Joaquin River*	Vernalis
San Joaquin River, Middle Fork*	Miller Bridge
San Joaquin River, North Fork*	Iron Creek
San Joaquin River, South Fork*	Hoffman Meadows
San Joaquin River, South Fork*	Lake Florence
San Luis Rey River	Bonsall
San Luis Rey River*	Mesa Grande
San Luis Rey River, West Fork*	Nellie
San Pablo Creek	San Pablo
San Pablo Creek	Near San Pablo
Santa Ana River*	Mentone
Santa Ana River*	Prado
Santa Anita Creek*	Sierra Madre
Santa Ysabel Creek*	Mesa Grande
Santa Ysabel Creek*	Ramona
Santiago Creek*	Villa Park
Sawpit Creek*	Monrovia
Scott River	Callahan
Scott River, East Fork	Callahan
Serrano and Carpenter canal*	Villa Park
Sespe Creek	Sespe
Shasta River	Montague
Shaver flume*	Shaver
Sierra & San Francisco Power Company's canal	La Grange
Silver Creek*	Placerville
Silver Lake outlet*	Kirkwood
Southern California Edison Company's canal	Azusa
Southern California Edison Company's canal	Claremont
Silver Lake outlet*	Kirkwood
South San Joaquin canal*	Knights Ferry
Spanish Creek	Keddie
Stanislaus River*	Knights Ferry
Stanislaus River, North Fork	Avery

*Station equipped with a water-stage recorder.

Stream.	Location.
Stevenson Creek*	Shaver
Strawberry Creek*	Arrowhead Springs
Susan River	Susanville
Sutter Creek	Sutter Creek
Sweetwater River	Descanso
Temescal Creek	Elsinore
Tenaya Creek*	Yosemite
Thomas Creek	Paskenta
Trinity River	Lewiston
Tujunga Creek*	Sunland
Tulare Lake	in Kings County
Tule River	Porterville
Tule River, South Fork	Porterville
Tunnel diversion	Azusa
Tuolumne River*	Buck Meadows
Tuolumne River*	Hetch Hetchy
Tuolumne River above La Grange dam*	La Grange
Tuolumne River, Middle Fork*	Buck Meadows
Tuolumne River, South Fork*	Buck Meadows
Turlock canal	La Grange
Twin Lakes outlet*	Kirkwood
Utica Gold Mining Company's canal	Avery
Ventura River	Ojai
Warm Creek*	Colton
Waterman Canyon Creek*	Arrowhead Springs
West Walker River*	Coleville
Yosemite Creek	Yosemite
Yuba River	Smartville
Yuba River, Middle Fork	North San Juan
Yuba River, North Fork	Goodyear Bar
Yuba River, North Fork of North Fork	Downieville

*Station equipped with a water-stage recorder.

This work has been maintained in accordance with cooperative agreements with the State of California, through the Divisions of Engineering and Irrigation and of Water Rights, Department of Public Works; the city and county of San Francisco, through M. M. O'Shaughnessy, city engineer; Los Angeles County, through the board of supervisors; city of Los Angeles, through the department of public works; San Bernardino, Riverside, and Orange counties, through the boards of supervisors; United States Forest Service; United States Weather Bureau; United States Indian Service, and National Park Service. In addition, the following public service companies have furnished very substantial cooperation: Pacific Gas and Electric Company, Spring Valley Water Company, San Joaquin Light and Power Corporation, Southern California Edison Company, Southern Sierras Power Company, and Western States Gas and Electric Company. Also, assistance has been furnished by irrigation districts, private companies, and individuals.

The amount of work done and its costs, including estimated expenditures for complete records furnished free for publication, for the two-year period ending June 30, 1922, were as follows:

STREAM GAUGING PROGRESS AND EXPENDITURES.

June 30, 1920 to June 30, 1922.

Drainage	Number of stations			Number of discharge measurements			Cost		Average cost per station of 12 months' maintenance, not including construction, equipment and office work
	Established	Discontinued	Maintain June 30, 1922	At regular stations	Miscellaneous	Total	Operation and maintenance	New construction	
Sacramento	21	0	57	538	88	626	$11,236 74	$10,749 78	$323 18
San Joaquin	24	0	72	1666	223	1889	83,907 49	56,144 18	1,194 36
South Pacific	11	3	58	2334	758	3092	22 661 14	4,779 08	353 76
North Pacific	3	0	9	122	1	123	2 260 90	1,683 44	337 54
Great Basin	0	0	14	119	19	138	2.259 84	0	123 20
Totals	59	3	210	4779	1089	5893	$122.326 11	$73,356 48	

In my last report emphasis was placed upon the necessity for a rapid development of all feasible storage, to meet the then urgent irrigation and power requirements, and it was recommended that a thorough study be made of the storage possibilities throughout the state. You are now completing a comprehensive survey of the water resources of the state which includes a thorough study of storage possibilities. To supplement this work, additional funds should be made available for construction and maintenance of new river measurement stations, to be established at each feasible reservoir site and at other critical points where your studies show the necessity for additional stream flow records. Also it is highly desirable to install additional water-stage recorders on all main streams, especially in the Sacramento and San Joaquin drainages, in order that more complete and accurate records will be available in advance of actual developments.

An unpublished report has been prepared covering the developed water power in California. There are 133 water power plants in the state, having a capacity of 100 horsepower or more, with a total installed capacity of 1,239,839 horsepower. The average capacity per plant is 9322 horsepower and the average horsepower per wheel unit is 3734. The maximum head developed is 2131 feet and the minimum 10 feet. Shasta County leads all other counties in the state in developed water power, its 12 plants having a total installed capacity of 181,450 horsepower. The total installed capacity of water power plants, in each of the major drainage basins in California, is as follows:

TOTAL INSTALLED CAPACITY OF WATER POWER PLANTS ON THE MAJOR DRAINAGE BASINS OF CALIFORNIA.

Drainage basin from which water is diverted	Number of plants	Total installed horsepower
Sacramento	48	532,862
San Joaquin	35	472 263
Great Basin	22	163,675
North Pacific	12	45,934
South Pacific	16	25,105
Totals	133	1,239,839

In the United States there are 3120 water power plants of 100 horsepower or more, with a total capacity of installed water wheels of 7,926,958 horsepower. New York ranks first, with 1,291,875 horsepower; California is a close second, with 1,239,839 horsepower; Washington is third, with 454,356 horsepower; Maine closely follows in fourth place, with 449,614 horsepower; and Montana is fifth, with 344,420 horsepower.

Although occupying second place among the states of the Union in capacity of water power plants, California, in 1921, ranked first in the production of hydro-electric power, furnishing 21.6 per cent of the total for the United States and making a gain of 5.7 per cent over 1920. New York came second with 14.7 per cent of the total, a loss of 4.1 per cent over 1920; and Washington third with 7.6 per cent, a gain of 0.5 per cent.

The following Surface Water-Supply Papers, containing California records, have been published since your last biennial report:

Paper 447, Surface Water Supply of the Pacific Slope of Southern California, which contains all stream flow records collected in Southern California to September 30, 1918.

Paper 460, Annual Progress Report of Great Basin for the year ending September 30, 1917.

Paper 461, Annual Progress Report of California for the year ending September 30, 1917.

Paper 481, Annual Progress Report of California for the year ending September 30, 1918.

Water-Supply Paper 480, for 1918; 510 and 511, for 1919 and 1920, and 530 and 531, for 1921, are in process of publication. All California records included in these unpublished reports and many complete records for 1922 are now available for distribution upon application to this office. In addition, monthly summaries of stream flow, for all the years of record, have been compiled for all river measurement stations now in operation. These tables are very convenient for the public as many of the Water-Supply Papers are out of print and the latest records are not yet available in printed form.

In the administration of the work of the Water Resources Branch of the Geological Survey, the district office is maintained at 328 Custom House, San Francisco. A sub-office is retained at 602 Federal Building, Los Angeles, for the convenience of southern California and as a headquarters for work in the South Pacific drainage. Records of stream flow for all sections of the United States and data collected by other branches of the Survey may be consulted at either office.

The water resources investigation in California is under the general supervision of Mr. N. C. Grover, chief hydraulic engineer, and Mr. John C. Hoyt, hydraulic engineer in charge of surface waters for the Geological Survey.

UNDERGROUND WATERS.

Progress Report by C. E. Meinzer, Geologist in Charge, Division of Ground Waters, United States Geological Survey.

The following reports were published during the biennial period as water-supply papers:

Water-Supply Paper 468. Records of water levels in wells in Southern California, by F. C. Ebert, 1921. 156 pp. 4 pls. Many of these records have been published in different reports, but the present volume brings together all the records, including the unpublished data obtained in recent years.

Water-Supply Paper 490-a. Routes to desert watering places in the Salton Sea region, California, by J. S. Brown, pp. 1-86, pls. i-vii. This guide-book contains concise but specific directions for finding practically all watering places in a desert area of 10,000 square miles, together with two large relief maps on which the watering places and connecting roads are shown.

Water-Supply Paper 490-b. Routes to desert watering places in the Mohave Desert region, California, by D. G. Thompson, pp. i-vii, 1-4, 87-269, pls. i-iv, viii-xvii. This guidebook is similar to Water-Supply Paper 490-a. It covers, in like detail, an area of about 25,000 square miles in San Bernardino and adjacent counties. It contains five large relief maps.

One comprehensive report, "Geology and ground-water resources of Sacramento Valley, California," by Kirk Bryan, is in press and will be issued in the near future as Water-Supply Paper 495.

Three reports were completed but not published because of lack of funds. They were, however, made available to the public by being filed in the branch offices of the United States Geological Survey at San Francisco or Los Angeles, where they can be consulted by all interested persons. These reports are as follows:

"Ground Water in Santa Clara Valley, California," by W. O. Clark.

"Available Supply of Ground Water in Antelope Valley, California, with notes on recent developments," by D. G. Thompson.

"Ground Water Resources of Mohave Valley, California," by D. G. Thompson.

The following report has been completed for some time and is still awaiting publication:

"The Salton Sea Region, California, a Geographic, Geologic, and Hydrologic Reconnaissance," by John S. Brown. This report covers the same region as is covered by Water-Supply Paper 490-a. It will be a rather large volume, full of new information of much scientific and practical value.

A large report entitled "The Mojave Desert Region, California, a geographic, geologic, and hydrologic reconnaissance," by David G. Thompson, has been nearly completed.

A brief report on ground water in the Napa Quadrangle has been prepared by Norah E. Dowell on the basis of field work previously done by W. O. Clark. This report will be included in the forthcoming geologic folio on the Napa Quadrangle.

A brief investigation and report was made by Kirk Bryan in regard to an increased water supply for the Mariposa Grove of Yosemite National Park. A brief report in regard to a water supply on San Miguel Island was made by D. G. Thompson.

Water levels were measured in selected wells in Southern California,

TOPOGRAPHIC MAPPING.

Progress Report by THOS. G. GERDINE, Topographic Engineer. United States Geological Survey.

In accordance with the cooperative agreements signed July, 1920, and August, 1921, by George Otis Smith, Director, for the United States Geological Survey, and by W. F. McClure, State Engineer, for the State of California, the Federal Survey allotted $14,000 each year and the state an equal amount for cooperative topographic surveys in the State of California for the fiscal years ending June 30, 1921, and June 30, 1922.

The following is a summary of the field and office work accomplished during the above periods under the general direction of C. H. Birdseye, chief topographic engineer, and under the immediate supervision of George R. Davis, topographic engineer in charge of the Pacific division, and T. G. Gerdine, his successor.

The office drafting of the Academy, Biola, Chaney Ranch, Clovis, Firebaugh, Fresno, Herndon, Kearney Park, Kerman, Laguna Seca, Little Panoche, Malaga, Monocline Ridge, Nos. 21, 25, 27, Orangedale School, Reedley Special, Round Mountain, Sanger, Sheep Ranch, Squaw Valley, Sultana, Tierra Loma School, Tufts Ranch, and Wahtoke topographic maps was completed, and the maps are being transmitted for engraving.

Progress in the drafting of additional sheets was made as follows: Klink, 9 per cent; Mendota, 90 per cent; No. 26, 90 per cent; Tumey Hills, 90 per cent.

Primary level circuits were adjusted for 31 quadrangles.

Geographic positions were computed for 50 quadrangles.

IRRIGATION INVESTIGATIONS.

Progress Report by SAMUEL FORTIER, Associate Chief, Division of Agricultural Engineering, United States Department of Agriculture.

Work in California under the cooperative agreement between the State Department of Engineering (later the State Department of Public Works) and the Division of Agricultural Engineering, Bureau of Public Roads, has embraced in the main the following activities:

a. Revision of irrigation map of California.
b. Establishment of duty of water and irrigation experiments with alfalfa at the State Land Settlement Colony at Delhi.
c. Continuation of work on reports of the silt problems of Colorado River and Imperial Valley.
d. Cost of water under southern California irrigation systems.
e. Organization and operation of mutual water companies in California.

Work under the first two headings has been in cooperation with the Division of Irrigation Investigations and Practice of the College of Agriculture, University of California. In addition some assistance has been rendered on problems under investigation by the Division of Irrigation Investigations and Practice of the College of Agriculture in which the State Department of Public Works and the Division of

FIELD WORK—TOPOGRAPHIC MAPPING.

Quadrangles	Counties	Publication scale	Area mapped square miles	Primary levels		Sec'dy traverse miles	Triangulation	
				Miles	Bench marks		Station occupied	Station marked
Auckland	Tulare	1:31,680	1					
Biola	Fresno / Madera	1:31,680	60				1	
Chaney Ranch	Fresno	1:31,680	60					
Clovis	Fresno	1:31,680	60					
Firebaugh	Fresno / Madera	1:31,680	60					
Fresno	Fresno	1:31,680	60				1	
Helm	Fresno	1:31,680					3	3
Herndon	Fresno / Madera	1:31,680	60				1	1
Jamison	Fresno	1:31,680					2	
Kearney Park	Fresno	1:31,680	60				4	
Kerman	Fresno	1:31,680	60				2	
Malaga	Fresno	1:31,680	60				1	1
Mendota	Fresno / Madera	1:31,680	60					
Monocline Ridge	Fresno	1:31,680	39					
No. 21	Fresno / Madera	1:31,680	54					
No. 25	Fresno	1:31,680	60				1	1
No. 26	Fresno	1:31,680	60				1	1
No. 27	Tulare	1:31,680	30					
No. 31	Fresno	1:31,680					2	1
No. 32	Fresno	1:31,680					1	1
Oil City	Fresno	1:31,680					4	1
Orangedale School	Fresno	1:31,680	18					
Raisin	Fresno	1:31,680					3	2
Reedley Special	Fresno / Tulare	1:31,680	60					
Round Mountain	Fresno	1:31,680	60					
Sanger	Fresno	1:31,680	53					
Squaw Valley	Fresno / Tulare	1:31,680	36					
Sultana	Fresno / Tulare	1:31,680	60					
Tierra Loma School	Fresno	1:31,680	17					
Tranquillity	Fresno	1:31,680					1	
Tufts Ranch	Fresno	1:31,680	60					
Tumey Hills	Fresno / San Benito	1:31,680	20	10	2			
Wahtoke	Fresno	1:31,680	60					
Wheatville	Fresno	1:31,680					1	
Totals			1228	10	2		29	12

Agricultural Engineering, Bureau of Public Roads, has a mutual interest with the College of Agriculture, namely, studies of soil moisture, soil moisture movements as affected by irrigation, cultivation and the growth of crops generally, irrigation of deciduous orchards, and the irrigation of field crops. Efforts along the foregoing lines have been supplemented by general assistance to the State Engineer in the matter of irrigation district organization and irrigation district legislation and to communities which have requested our aid in connection with miscellaneous movements and problems such as the organization of irrigation districts and mutual water companies, water requirements of crops, duty of water, underground water conditions, general irrigation organization, opportunities for both underground and surface storage, need for drainage especially in relation to irrigation, cost of irrigation water, etc. Since the close of the biennium an important new field of work has been begun relating to extent and prevention of seepage losses and economic questions connected therewith.

Irrigation Map of California.

The irrigation map of California prepared jointly by the Department of Public Works, the Division of Irrigation Investigations and Practice of the California Agricultural Experiment Station, and the Division of Agricultural Engineering of the U. S. Bureau of Public Roads, has been issued during the year and distributed widely. It is printed in nine different shades or colors on a scale of 8 miles to the inch, and is issued mainly as separates embracing northern, central and southern California. A limited edition has also been printed in 4 sheets to mount as a single map of the entire state, measuring 79 by 93 inches. This map is available without charge on application to any of the agencies concerned in its preparation.

The features shown on the map, in addition to the most complete and accurate base thus far assembled for the entire state, include the following: irrigable areas, irrigated areas, principal irrigation canals, principal power canals, principal U. S. Geological Survey and private stream-gaging stations, principal U. S. Weather Bureau and private rainfall stations, hydro-electric plants, and relief, the latter being executed and published from topographic sheets and unpublished data by John H. Renshawe, the leading relief artist of the U. S. Geological Survey. An edition of 10,000 each of the separate maps of northern, central, and southern California was printed, also a limited edition of 2000 of a full state map combining into a single map all of the data presented in the three separate maps.

In connection with the preparation of the irrigation map, a new tabulation has been made of the agricultural and irrigated areas of the state as of 1920-1921. This shows a total agricultural area of 23,912,100 acres and a total irrigated area of 5,999,300 acres, the latter figure including all land for which irrigation facilities have been provided and not abandoned and which are irrigated annually or as needed whenever water is available. This is an increase of 2,046,900 acres in the total agricultural area and of 2,806,654 acres in the total irrigated area over the areas shown on the irrigation map issued in 1912. Furthermore, the irrigated area for 1920-1921 is an increase of 1,780,260 acres over the figures obtained by the 1920 irrigation census, the census figures relating only to the areas actually receiving water in 1919. The new tabulation is as follows:

SUMMARY OF AGRICULTURAL AND IRRIGATED AREAS IN CALIFORNIA AS SHOWN ON 1922 REVISION OF IRRIGATION MAP OF CALIFORNIA.

County	Valley		Plains		Foothill		All classes	
	Total agricultural area. Acres	Irrigated area. Acres	Total agricultural area. Acres	Irrigated area. Acres	Total agricultural area. Acres	Irrigated area. Acres	Total agricultural area. Acres	Irrigated area. Acres
Alameda	118,200	14,200					118,200	14,200
Alpine	4,800	4,800					4,800	4,800
Amador			1,400		153,400	200	154,800	200
Butte	304,600	85,600	81,700	3,700	163,900	8,900	550,200	98,200
Calaveras					195,900	100	196,900	100
Colusa	383,000	135,260	42,400	500			425,400	135,700
Contra Costa	161,900	67,300					161,900	67,300
Del Norte	41,000						41,000	
El Dorado					235,600	6,100	235,600	6,100
Fresno	1,536,000	585,700	75,000	14,700	1,700		1,612,700	600,400
Glenn	307,000	118,500	77,800	1,000			384,800	119,500
Humboldt	112,700	2,500					112,700	2,500
Imperial	891,100	463,900					891,100	463,900
Inyo	348,200	70,700					348,200	70,700
Kern	1,809,700	320,100	295,300	1,000			2,105,000	321,100
Kings	729,700	445,000					729,700	445,000
Lake	54,800	1,400					54,800	1,400
Lassen	570,200	62,300					570,200	62,300
Los Angeles	1,064,300	307,300					1,064,300	307,300
Madera	387,000	136,200	108,700	100	38,700		534,400	136,300
Marin	31,900	300					31,900	300
Mariposa			500		180,900		181,400	
Mendocino	86,900	2,500					86,900	2,500
Merced	737,700	384,800	151,700	3,600	79,900	100	969,300	388,500
Modoc	376,100	121,000					376,100	121,000
Mono	262,800	59,500					262,800	59,500
Monterey	319,000	72,000					319,000	72,000
Napa	73,500	2,500					73,500	2,500
Nevada					170,600	4,400	170,600	4,400
Orange	278,600	149,600					278,600	149,600
Placer	80,500	900	61,900	1,900	153,200	33,200	295,600	36,000
Plumas	115,800	33,900			5,100		120,900	33,900
Riverside	930,800	173,100					930,800	173,100
Sacramento	380,300	119,400	184,600	10,300	61,500	700	626,400	130,400
San Benito	95,000	23,300					95,000	23,300
San Bernardino	1,715,800	126,800					1,715,800	126,800
San Diego	565,300	42,300					565,300	42,300

San Francisco	400	400					400	400
San Joaquin	677,200	302,000	100,600	1,600	28,300	400	806,100	304,000
San Luis Obispo	137,500	8,200					137,500	8,200
San Mateo	54,000	12,200					54,000	12,200
Santa Barbara	247,300	16,700					247,300	16,700
Santa Clara	203,700	95,400					203,700	95,400
Santa Cruz	33,100	1,700					33,100	1,700
Shasta	132,200	44,700	126,900	4,400	135,600	3,800	394,700	52,900
Sierra	39,800	13,900					39,800	13,900
Siskiyou	398,100	76,000					398,100	76,000
Solano	319,300	89,900	85,300	200			404,600	90,100
Sonoma	194,900	2,600					194,900	2,600
Stanislaus	349,400	221,800	137,700	17,300	148,700	5,200	635,800	244,300
Sutter	321,400	85,400	12,300				333,700	85,400
Tehama	171,700	44,500	222,300	3,000	182,300	2,000	576,300	49,500
Trinity	13,500	7,100					13,500	7,100
Tulare	882,800	487,800	124,700	27,600			1,007,500	515,400
Tuolumne					81,200	500	81,200	500
Ventura	211,300	47,900					211,300	47,900
Yolo	370,200	124,600	93,900	300			464,100	124,900
Yuba	109,200	22,400	60,400	1,300	109,300	3,400	278,900	27,100
Totals	19,741,200	5,837,800	2,045,100	92,500	2,125,800	69,000	23,912,100	5,999,300

Water Requirements of Alfalfa.

The investigations on water requirements of alfalfa have been begun on the experimental irrigation tract on the Land Settlement Colony at Delhi. These are supported by the Division of Irrigation and Engineering, the Division of Agricultural Engineering of the U. S. Bureau of Public Roads, and the Division of Irrigation Investigations and Practice of the College of Agriculture, University of California. They seek to determine the economic duty of water for alfalfa under the soil and climatic conditions of the San Joaquin Valley. Various blocks of a uniform stand of alfalfa are being subjected to a seasonal application of 12 inches, 18 inches, 24 inches, 30 inches, 36 inches, 48 inches, 60 inches and 72 inches per acre. No results from these various applications are as yet available. The differentiation in treatment started with the season of 1922.

It has been assumed that the economical duty of water for alfalfa in the San Joaquin Valley is thirty-six acre-inches per acre. This amount is being delivered to several plots in varying amounts and in varying numbers of applications, in an effort to determine the most economic seasonal distribution of this water.

Investigations in Southern California.

The regular work conducted from Los Angeles headquarters and relating more particularly to southern California and the Colorado River was interrupted in 1921 by the assistance given in the preparation of the irrigation map of California and again, to some extent, in 1922 by the aid given the State Water Resources Investigation. These, together with continued demand by the public for technical advice on irrigation problems, has delayed the publication of reports on several subjects for which the field work has been completed; namely the silt problem of Colorado River and Imperial Valley, the Cost of Water under Southern California Irrigation Systems and the Organization and Operation of Mutual Water Companies. Whereas, at one time the inquiries received pertained largely to such matters as irrigation practice and water rights, more recently there has been a greater proportion of those pertaining to irrigation organization, and the reclamation problems of the Colorado River.

Further irrigation development in southern California must depend principally on the storage of flood water. The normal flow of the streams is already appropriated and the draft on the underground waters has apparently about equalled the supply in most of the valleys. The great danger is in overdeveloping the underground supplies for there is no law to govern the matter and it is not easy to determine when an underground supply is fully appropriated until it is too late to forestall an overdraft. The spreading of water, although of certain value in stablizing the underground basins, can not be regarded as a means to enable any large increase of the area irrigated. In answer to an inquiry this department recently prepared an estimate showing that about 70 per cent of the land irrigated in the coastal region is dependent on water pumped from wells.

Outside of San Diego County good reservoir sites are not found in abundance on the large streams where water now wastes to the ocean

in winter but the time has arrived when sites, although not economically feasible at an earlier period, can be reconsidered for the reason that the demand for, and value of water has increased, and the cost of storage may now in some cases be in part charged to power development and flood control. The reservoirs being constructed by Los Angeles County for the purpose of flood control are not expected to be great aids to irrigation because when filled they must be emptied to catch the next floods so they can not well be used to hold water for the irrigation season. This need not be the case with other reservoirs constructed primarily for irrigation and power and with flood control as a secondary purpose.

It has become necessary for this department to give some attention to drainage conditions in southern California. Inquiries received indicate that some erroneous ideas prevail as to the causes of the excess moisture in some of the lands that have been drained or that need drainage in the coastal region. It has been taken for granted that the moisture is the result of irrigation. Practically no land and none of that which has been drained has been damaged by irrigation. The lands, moist originally, have been dried up and made suitable for profitable tillage by pumping down the water levels for irrigation. This general result, differing from that commonly found in the irrigated valleys of the west, would probably not occur were it not that so much of the water used in irrigation is pumped from the underground and applied to crops under a high duty. Fears are expressed that drainage may become necessary in San Fernando Valley as a result of the irrigation under the Los Angeles aqueduct. This valley is closed to both surface and underground water except for its one main narrow outlet through which flows Los Angeles River. Nearly all of the 100,000 acres of the basin are now irrigated and owing to restrictions put on pumping by the city of Los Angeles under authority of a legally sustained Pueblo water right the underground water may not be held down as it has been in other valleys. In such case water logging might be avoided by allowing more pumping as well as by draining the wet surface stratum.

The chief moist areas are of 10,000 to 40,000 acres in extent and they are located near the coast in Ventura, Los Angeles and Orange counties. Smaller moist areas generally not exceeding 6,000 acres are found in the lower portions of San Bernardino, San Gabriel and San Jacinto valleys and on Chino Creek and on Santa Ana River near Arlington and Corona. In nearly all of these areas numerous flowing wells have been obtained. Considerable portions of all the larger areas have been drained by underground tile and open ditch systems installed by drainage districts and private parties. Coachella and Antelope valleys both situated on the inland side of the coast range contain moist and flowing well areas in their lower levels and in both, the effect of pumping for irrigation on the higher levels has had, as in the coast valleys, the effect of contracting instead of expanding the areas of moist land.

Drainage may become necessary in portions of all of the large Colorado River valleys. The Imperial Irrigation District is now proceeding with the preliminary work for the drainage of portions of its territory under a bond issue of $2,500,000 for the purpose.

The plans now being formulated for further work from Los Angeles headquarters include the enlargement of the investigation on the cost of irrigation water to embrace all of the representative water companies and irrigation districts in the state. This course has been deemed advisable in response to an indicated wide demand for information on the subject.

FINANCIAL STATEMENT

COOPERATIVE IRRIGATION INVESTIGATIONS IN CALIFORNIA.

	Expenditures			
	1920-1921		1921-1922	
	State	Government	State	Government
Irrigation map	$6,414 75	$7,968 28	$8,725 40	
Delhi experimental tract	3,918 32	79 38	1,663 43	
Silt and cost of water	1,219 77	5,807 63	449 12	5,730 59
Investigation of irrigation enterprises	1,941 12	1,140 30	1,900 79	1,601 76
Miscellaneous office	1,614 50	2,157 18	2,675 00	1,056 43
Unexpended balance	388 09		96 26	
Total	$15,494 55	$17,152 77	$15,510 00	$8,397 95

IRRIGATION OF SHASTA VALLEY.

Cooperative Investigation with the United States Reclamation Service and Klamath-Shasta Valley Irrigation District.

The Shasta Valley, which is located in the extreme northern part of California, pours its drainage into the Klamath River about midway along the river's course to the Pacific Ocean. This valley, situated at an elevation of about 2000 feet above sea level, is the largest body of agricultural land in the extreme northern part of the state. It contains 164,000 acres of agricultural land well fitted for dairying purposes and raising stock feed to supplement the grazing lands of the surrounding mountains. The rainfall in this valley is about 12 inches per annum and falls almost entirely in the winter season, so that without irrigation stock feed can be raised only in the spring months.

The Klamath Shasta Valley Irrigation District was organized under the Wright Act in 1921 and includes 125,000 acres of this valley. It does not include land already under irrigation, approximately 43,000 acres.

The 1921 legislature appropriated $20,000 of state money to be used with a sum double this amount to be furnished by the Irrigation District and $5,000 from the United States Reclamation Service, for an engineering investigation of the project. Accordingly, a contract was executed in October, 1921, between the three parties for the advancement of the investigations as provided by the legislative enactment. The first work undertaken was the mapping of the irrigable area on a scale of 2,000 feet to the inch, with 5 foot contour intervals. This work was completed by the topographers of the U. S. Geological Survey in September, 1922.

A survey of the main canal diversion from the Klamath River, the source of the water supply, by the engineers of the U. S. Reclamation Service, has also been completed. The proposed main canal heads at

Keno on the Klamath River and is 62 miles in length to the Little Shasta River.

A study of the irrigable area for design of distribution and drainage system is now in progress and should be completed at an early date. Reclamation Service engineers are also making a determination of the available unappropriated water and the best plan of development to secure the greatest use of this water on the lands of the Klamath Shasta Irrigation District. The cost of this work to September 1, 1922, has been approximately $28,000 for topographic service, $6,600 for canal survey, and $2,600 for engineering investigations, making a total of $33,000.

Applications to use the waters of the Klamath River for developing power in California have been made to the Division of Water Rights by the Electro-Metals Company and H. L. Jackman, of San Francisco. These applications propose to develop 375,000 theoretical horsepower, requiring a maximum of 9000 second feet, a distance of 100 to 125 miles downstream from the confluence of the Shasta River with the Klamath. Should these applications be granted with priority over the applications of the Klamath Shasta Valley, the waters of the Klamath River would flow by the Shasta Valley to be used in power development of these applicants, and it would be illegal to divert them for the irrigation of the Shasta Valley.

The State Engineer or Chief of Division, under provisions of section 2*a* of the Wright Irrigation District Act, has requested that no action be taken on the applications of the Electro-Metals Company until a report on the feasibility of the Klamath-Shasta Project is completed. Section 2*a* places this power in the hands of the State Engineer to request deferred action on applications before the Division of Water Rights whenever such applications appear to interfere with future development of irrigation,—such deference of action for the period of investigation by the State Engineer's office.

FUNCTIONS OF THE DIVISION OF ENGINEERING AND IRRIGATION.

The Division of Engineering and Irrigation is directed by law, through its executive officer, the Chief of Division and State Engineer, to perform many functions relative to the organization and construction of works by irrigation, reclamation and water storage districts, and in the development of the water resources of the state. Specifically, the principal functions are:

1. To investigate and report on feasibility of proposed irrigation districts.

2. To investigate and report on proposed bond issues by irrigation districts before the California Bond Certification Commission for approval.

3. To supervise expenditure of funds from approved bond issues and to inspect generally the construction work of irrigation districts.

4. To collect data, make surveys and perfect plans for reclamation of Sacramento and San Joaquin Rivers in conjunction with work of State Reclamation Board and to advise and assist the Board.

5. To investigate feasibility of water storage districts, the fixing of their boundaries and passing on their organization.

6. To pass on plans and specifications for construction of dams by other than municipalities or public utilities and inspect their construction.

7. To pass on plans for bridges across navigable streams.

8. To plan and construct works for rectification of river channels and protection of property from flood damage on the rivers of the state.

9. To direct cooperative stream-gaging, topographic surveying and irrigation investigations in cooperation with the Federal Government.

10. To direct cooperative work with the Federal Government in restraining debris on the Yuba River.

Along with these many permanent statutory duties which continue through succeeding years, the State Engineer is enjoined by legislative enactments to make special engineering investigations concerning the water resources of the state and to serve on special state commissions.

EXPENDITURES FOR BIENNIAL PERIOD 1920-1922.

Expenditures by Division of Engineering and Irrigation, July 29, 1921 to June 30, 1922.

Chapter	Name of appropriation	Balance July 29, 1921	Expended	Balance June 30, 1922
419–1921	Rectifying river channels	$175,000 00	$61,796 79	$113,203 21
889–1921	Investigation of state waters (3)	200,000 00	89,716 72	110,283 28
704–1909	Gaging streams (2)	12,579 34	11,467 56	1,111 78
704–1909	Irrigation investigation (2)	7,374 84	7,374 84	
704–1909	Topographical surveys (2)	14,500 12	13,928 62	571 50
754–1921	Shasta Valley irrigation investigation	20,000 00	5,036 91	14,963 09
469–1919	Rectifying river channels (1)	30,885 39	8,968 68	21,916 71
526–1911	Mad River bank protection (2)	1,776 79	1,731 90	44 89
14–1901	Restraining debris (2)	20,174 76	11,861 43	8,313 33
645–1919	Contingent, seventy-second fiscal year	638 32	536 76	101 56
905–1921	Contingent, seventy-third fiscal year (4)	6,484 03	6,051 47	412 56
905–1921	Salaries (July, 1921)	3,968 67	3,968 67	
905–1921	Salaries, seventy-third fiscal year	15,435 75	15,052 09	383 66
905–1921	Printing, seventy-third fiscal year	1,000 00	474 90	525 10
905–1921	Salaries, seventy-fourth fiscal year	16,504 00		16,504 00
905–1921	Contingent, seventh-fourth fiscal year	5,000 00		5,000 00
905–1921	Printing, seventy-fourth fiscal year	500 00		500 00
324–1921	Cooperative river work (restraining debris)	30,000 00		30,000 00
	Totals	$561,802 01	$237,967 34	$323,834 67

Expenditures by Department of Engineering, Bureau of Engineering and Irrigation, June 30, 1920 to July 29, 1921.

Chapter	Name of appropriation	Balance June 30, 1920 and appropriations	Expended	Balance July 29, 1921
469–1919	Rectifying river channels	$120,212 41	$89,327 02	$30,885 39
25–1911	Sacramento River flood control	29 86		29 86
503–1909	Humboldt Bay survey	499 46		499 46
526–1911	Mad River bank protection	3,045 92	1,269 13	1,776 79
14–1901	Restraining debris	40,968 41	20,794 15	20,174 76
742–1911	Canals and canalization of rivers	3 47		3 47
502–1911	Eel River bank protection	50		50
645–1919	Contingent, seventy-first fiscal year ($2,258.00)			
645–1919	Contingent, seventy-second fiscal year ($20,000.00)	22,258 00	21,619 68	1,638 32
905–1921	Contingent, seventy-third fiscal year (month of July, 1921)	2,083 34	202 64	1,880 70
905–1921	Salaries (July, 1921)	3,968 67		3,968 67
	Totals	$193,070 54	$133,212 62	$59,857 92

FIFTH BIENNIAL REPORT

OF THE

California State Civil Service Commission

TO THE GOVERNOR

DECEMBER 15, 1922



CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO, 1923

22330

COMMISSIONERS.

DAVID J. REESE,
President and Executive Member.

CLYDE L. SEAVEY.

JOHN F. GALVIN.

LODEMA SHURTLEFF,
Secretary.

JULIAN C. WHITMAN,
Chief Examiner.

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FIFTH BIENNIAL REPORT OF THE CALIFORNIA STATE CIVIL SERVICE COMMISSION TO THE GOVERNOR

To His Excellency WILLIAM D. STEPHENS,

Governor of the State of California,

State Capitol, Sacramento, California.

Subdivision eight, section five of the Civil Service Act of California provides that the Civil Service Commission shall:

> "Make a biennial report to the Governor for transmission to the legislature, showing the action of the Commission, including all the rules and regulations adopted by it during such period and those that are in force at the time of making such report, information as to the exempted positions as required by this act, and the effects of this act and of all proceedings under it, and any suggestions the Commission may deem practical for the more effectual accomplishment of this act."

In accordance with this provision of the law, the State Civil Service Commission has the honor to submit its fifth biennial report.

In addition to the presentation of the activities of the Commission during the present biennium, this report includes:

Appendix I.—A list of persons who assisted in conducting examinations during the biennial period 1920-1922.

Appendix II.—A list of exemptions created during the biennium.

Appendix III.—A table showing the status and number of employees in the state service, November 1, 1922.

Appendix IV.—A tabular statement of examinations held and results obtained during the biennium.

Appendix V.—Financial statement for the seventy-second and seventy-third fiscal years.

Appendix VI.—Rules and regulations of the Commission which were rewritten and adopted following the reorganization of the Commission, July 30, 1921.

DEVELOPMENT OF CIVIL SERVICE.

Civil Service was made a part of the statutory laws of California by act of the legislature of 1913. By the adoption of the Civil Service Law, the citizens of California, through their legislative agents, committed themselves to the proposition that it was necessary and wise for the state to establish a policy for recruiting trained and capable employees for the carrying on of its increasingly important business. Civil Service was not popular at the time of its adoption. It has not been popular in all circles since that time. Exemptions of whole departments of state government from civil service operation were sought and secured then, and attempts have been made repeatedly since that time, to secure other exemptions and even to break down the whole civil service system. Misunderstood at first, unwelcomed by many in the meantime, it has been a difficult task to lay the foundation

for, and to build thereon a correct civil service control and administration.

There has been a change, however, in public and official sentiment, together with a manifest improvement in the attitude of appointing powers toward civil service methods and administration, and instead of being assailed by criticism and lack of recognition, the Civil Service Commission is now pleased to report that it has the cooperation and endorsement of practically every department of state government. It has succeeded, as attested by this general acceptance and cooperation, in building up a new employment policy as an effective part of the state governmental system.

COOPERATION OF THE GOVERNOR.

In its efforts to advance and improve the civil service of the state, this Commission has had the interested, active and intelligent cooperation of the Governor of this state. Legislation, which otherwise would have impaired the working of the merit system has had his disapproval, and he has ever concurred in those suggestions of the Commission for the administration of civil service which have seemed wise and reasonable to him. The plan of reorganization of this Commission, which was proposed by the Governor and adopted by the legislature, demonstrates his interest in civil service and the successful working out of his plan is sufficient proof of the soundness of his civil service ideas. Civil service has been most fortunate in having the support and cooperation of the executives of the state administration since it was made a part of the state law. The act was passed during Governor Johnson's administration and received his unqualified support, and that support has been continued during the administration of Governor Stephens. At the end of the first year, following its reorganization, this Commission feels that distinct progress has been made in proving the moral and economic value of the act requiring the selection of employees by competitive methods.

SAVING TO THE STATE.

The value of the practical application of the civil service system to the state has been so thoroughly demonstrated and civil service is so generally accepted as an established part of our state government, that it is not necessary to discuss here, either the previous development and advance of the merit system or its purposes and underlying principles. The Commission, however, does desire to impress upon the people of this state the necessity of the method of selecting public employees which tends to put to the front character, ability, and industry and thus to secure the most satisfactory return from what is now an extremely large item in the state's annual expenditure. Without any criticism, implied or otherwise, of any department or agency of state government, this Commission submits that when the organization and payrolls of state departments are considered and analyzed, it will be found in all probability that the selection of employees under the competitive merit system and the compensation of those employees under the standard salary schedules of the Commission result in saving to the state many thousands of dollars.

THE STATE PAY ROLL.

The amount of money expended by the State of California each year for personal service is very impressive and gives emphasis to the scope and magnitude of the activities that the state government has been called upon to administer.

The annual state payroll estimated as of January 1, 1921, was $10,521,231.92. This amount is greater than the total sum paid out for all materials, supplies and equipment, and other state expense during the fiscal year. And what is more significant is, that it represents an expenditure which is incomparably more important in its effect upon the economy and efficiency with which the affairs of the state are administered. Economical and effective purchasing is not a difficult thing to bring about, but the building up of an efficient working force to carry on effectively the many and diversified tasks which the state has to perform is a very difficult task, indeed, and one which calls for the most thoughtful study and intelligent action. It must be kept in mind that the state's function is largely that of rendering service, by aiding and contributing to the financial, industrial, social and general welfare of its citizens, all of which fields of endeavor call for departmental staffs of skilled and specialized persons in these various lines.

The responsibility not only of selecting competent employees to enter the service, but of encouraging them to stay in the service when once trained to do effective work, cannot be overestimated, and the Civil Service Commission is devoting its thought and attention to creating a working force of which the citizens of the state and those responsible for the administration of its governmental affairs may well be proud.

The Commission has established entrance requirements which are reasonable, and yet stringent enough to give assurance of merit and fitness, and it has set salary standards which insure equality of pay for equal service, and which are in tune with current commercial and industrial practice. It is needless to say that the greatest public concern is not with the amount of the payroll, but with the efficiency with which the service is rendered for which it is expended.

OUTSTANDING FEATURES.

Three features of civil service administration are outstanding in the biennium. These are:

(1.) The reorganization of the Civil Service Commission.

(2.) The increase in the number of employees of state departments.

(3.) The increase in the number of examinations by this Commission and the substantial increase in the number of applicants.

REORGANIZATION.

Under the Statutes of 1921, chapter 590, one of the reorganization measures, the Civil Service Commission was reorganized. The Commission formerly consisted of three members, each serving at a salary of $3000 a year. The act of 1921 provided for a Commission of three members, one of whom is designated as the president and executive member of the Commission, and two associate members. In August, 1921, the Governor named Mr. David J. Reese of Ventura as executive member of the Commission to serve until July 1, 1925; Mr. Clyde Seavey of Sacramento to serve until July 1, 1924, and Mr. Edgar

Williams of Palo Alto to serve until July 1, 1922. In January, 1922, Mr. Williams resigned and Mr. John F. Galvin of Richmond was named to serve for the unexpired term. The reorganization of the Commission is in line with the advanced thought of Civil Service leaders of the day. Because of it the business of the Commission has been expedited and results have been more satisfactory. The amended statutes of 1921 provide that the approval and consent of a majority of the three commissioners is necessary in the case of (1) the adoption of rules; (2) exemptions; (3) changes in classification, and (4) conduct of trials.

INCREASE IN EMPLOYEES.

The report of this Commission in 1920 showed that there were in the employ of the state, under Civil Service jurisdiction, on December 1, 1920, 6161 employees. On November 1, 1922, the total number had increased to 7197, a total of increase of 1036 employees. An analysis of the reports of the various departments shows that the largest increases have been made in the Department of Public Works, the Department of Institutions, and the Department of Agriculture where, because of greatly increased activities, the increase in the number of employees was necessary. There has been a gradual increase in all state departments, though of course some few departments show a slight decrease and some departments are functioning with the same number of employees as two years ago.

INCREASE IN EXAMINATIONS.

During the past two years, the character and work of 498 positions were considered and the qualifications of 8610 persons have been passed upon by written or oral examinations or by both. In practically all of these examinations this Commission has had the assistance and cooperation of some of the best qualified, most capable, and highest salaried men and women in California, most of whom are either in responsible positions with private corporations or who are managers or owners of great business enterprises themselves; and the services of these assistant examiners have been given to the Commission and to the state generously and gratuitously and often at great sacrifice on the part of these examiners. Due acknowledgment is made for this assistance in another part of this report.

The past two years has witnessed a marked increase in the work of the Commission. The period of industrial readjustment which is still much in evidence has caused an increase of nearly 100 per cent in the the number of persons examined. During this period, because of the natural growth of the state's organization, and because of the very heavy program of highway and building construction, the number of employees in the service under the jurisdiction of the Commission has increased from 6161 to 7197, or slightly over 1000. Even with this unprecedented increase of work, the Commission has been able to hold its own and keep the existing list of temporary appointments from increasing; in fact, a distinct reduction in the number of authorizations for such appointments will be possible within the immediate future through certification from a large number of eligible lists just now becoming available for use.

TESTS ARE PRACTICAL.

There is, unfortunately, a general impression that the examinations conducted by the Commission are stilted, academic or scholastic and illy-fitted to the needs of the positions which the applicants seek. On the contrary nothing could be farther from the actual situation.

Examinations, as now conducted by this Commission, are based upon the practical knowledge of the applicant for the position, and previous experience is given full weight in the rating of the competitors. Training for the particular work; education, general and special; and so far as is possible, personal qualifications are given full consideration. The Commission, in many examinations, has dispensed with the written test and has depended solely upon oral interviews, given by impartial boards, where education, training, experience and knowledge of the particular position and its duties, as shown by answers to oral questions, are the basis of the competitive rating. These examinations give equal opportunity to every citizen to demonstrate his fitness for the work for which the state and its citizens have to pay. In fact, the methods employed by civil service today are the methods of every well managed private business concern. Every large corporation has its personnel and employment department, whereby it secures and holds competent employees and if this system is successful in private business, it must have advantages for the state, which in the past and before the establishment of civil service, employed men not competent and not fitted for the positions they occupied.

EXAMINATIONS FOR POSITIONS OF HIGH SALARY.

In accordance with the Civil Service Law, examinations have been held for many positions, in many departments paying salaries considerably above the average. These examinations include:

Title of Position.	Salary.
Accountant, senior	$200—$265
Accountant, principal	275— 325
Buyer, fabric	225— 275
Deputy, Corporation Department	225— 325
Deputy (chief), Real Estate Commission	225— 300
Designer, assistant architectural	235— 280
Designer, architectural	285— 350
Director of Bureau of Child Hygiene	250— 300
Draftsman, architectural	235— 280
Draftsman, civil engineering, Grade 4	235— 280
Draftsman, civil engineering, Grade 4 (promotional)	235— 280
Engineer, assistant civil	235— 280
Engineer, assistant civil (asphalt concrete)	235— 280
Engineer, assistant civil (asphalt macadam)	235— 280
Engineer, assistant civil (locating)	235— 280
Engineer, assistant civil (promotional)	235— 280
Engineer, associate highway	285— 350
Engineer, highway	360— 420
Engineer, associate hydraulic	285— 350
Engineer, assistant hydraulic	235— 280
Engineer, associate highway (equipment)	285— 350
Engineer, assistant mechanical	235— 280
Engineer, associate mechanical	285— 350
Engineer, assistant mining	235— 280
Engineer, associate mining	285— 350
Engineer, assistant structural	235— 280
Engineer, chief, Bureau of Architecture	375— 400
Engineer, safety (lumber)	— 250
Engineer, assistant safety (mechanical)	235— 280
Engineer, safety (mines)	250—
Estimator, assistant	235— 280
Manager (business), State Hospitals	150— 300-M
Physician, assistant	170— 270-M
Secretary in charge of credentials, assistant	200— 250
Superintendent of construction, buildings	220— 285

STANDARDIZATION AND CLASSIFICATION.

With the cooperation and assistance of the State Board of Control, the Civil Service Commission has been engaged in and has practically completed the classification of all positions under civil service jurisdiction as well as the standardization of salaries for all such classified positions. This has been an arduous task and has required research and investigation into all positions in the state service, accurate information of the duties of all such positions, investigation of salaries for these positions, and a comparison of these salaries with the salaries paid for similar positions in private employment.

The Civil Service Law provides (section 5) that the Civil Service Commission "shall classify positions to be held under the state authority in accordance with the provisions of this act and in accordance with the duties attached to such positions. The Commission shall grade all positions within each class with respect to salaries, to the end that like salaries shall be paid for like duties."

Like salaries for like duties, or in other words, equal pay for equal work, seems so just a principle that it should be accepted without argument. There can be no "like salaries for like duties," however, in a governmental system where many positions are statutory both as to creation and salary, and where many positions are exempt by law and even whole departments are exempt. Overpay for one individual is a constant irritation to others and tends to impairment of service. It is useless, as well, to discuss equalization of pay for public employees without taking into consideration equal hours of service, equal working conditions, leaves of absence and similar factors.

There is a noticeable dissimilarity in these conditions in state employment, so noticeable, in fact, that this Commission, in connection with its classification and standardization work has endeavored, without avail, by personal suggestion, to bring about uniformity in some particulars. There can be no harmony among employees where those in one department work from nine until five, with an hour for lunch, while those in another department work from nine until four, with, perhaps, a longer luncheon period. In this connection, however, this Commission desires to report that during the past two years, conferences have been held with the Department of Institutions, as a result of which there is now a uniformity in salaries in all of these institutions based upon length of service and duties of position.

There has been a tendency, here and there, to question the value of and the jurisdiction of the Civil Service Commission in these classifications of positions and the standardization and control of salaries, but this is due evidently to a misconception of the principles and purposes of the plan. The terms "classification" and "salary standardization" mean only the application of businesslike methods in classifying and grouping the various employments in state service and the determination of minimum and maximum compensation rates for each of these employments, based upon the duties and responsibilities carried, the service performed and the current value of such service in the industrial world. Such a provision does not take away the proper authority of the heads of departments, but on the other hand, the investigations and research of the Civil Service Commission furnish to such department heads complete, unprejudiced information respecting the state service and private employment as well.

THE WORK OF THE COMMISSION.

We have referred to the examination work and to the classification and standardization functions of the Commission. In addition to these duties the Civil Service Act places upon the Commission the duty of certification of pay rolls of all departments under civil service jurisdiction. Each time any person in the classified service is to receive pay, the legality of his employment under the Civil Service Law must be certified to by the Civil Service Commission. This certification necessitates a detailed examination by the Commission, in many cases twice each month, of the legality of the appearance of each name upon the pay rolls of the respective departments which are under the jurisdiction of the Commission. The names of over 7,000 persons are carried on these rolls and during the past two years their salaries aggregated more than $21,000,000. There is no question that this pay roll inspection and certification is of value to the state in probable saving and that this is one of the important functions of this Commission.

PREFERENCE LEGISLATION.

The legislature of 1921 amended the Civil Service Act by providing that the Commission shall establish preference for veterans, who become eligible by attaining the passing mark in examinations, by granting such successful veteran applicants additional credit of five points which shall be added to the percentages obtained in the examinations. This provision has been strictly complied with since the law became effective and preference ratings have been given to 491 veterans who have been successful applicants in the respective examinations.

In the State of New York a veteran preference provision was declared unconstitutional by the Court of Appeals and later an amendment to the constitution providing for such preference was defeated.

CIVIL SERVICE PROCEDURE.

Procedure in the Civil Service Commission is governed by the laws and rules and regulations of the Commission. Some details of interest are:

1. Vacancies in positions in all state departments under civil service jurisdiction are reported to the Civil Service Commission, with request for certification.

2. Upon request for such certification, the Commission certifies to said department the names of the three highest available eligibles upon the list from which such certification must be made, or from "the eligible list most nearly appropriate for the position to be filled." Said department must select one from among the three certified.

3. In the absence of an eligible list, temporary authorization is issued for the appointment outside of civil service but such temporary authorization does not hold good for longer than three months.

4. In the absence of an eligible list the Commission at once proceeds to hold an examination, if practicable, and such examination is announced about thirty days before it is held. Applications must be filed a reasonable time before the examination.

5. Public announcement is made of all examinations, and such announcement must include information as to time and place, duties of position, salary and requirements.

6. Applications are made upon written blanks furnished by Commission. It is the practice of the Commission to hold written examinations simultaneously in Sacramento, Los Angeles and San Francisco.

7. Papers are rated as quickly as possible after the examinations and as soon thereafter as is practicable, oral examinations are conducted by the Commission, assisted by competent examiners comprising an oral examining board. Following the oral examinations ratings based upon both oral and written tests are compiled and the eligible lists are issued and made public.

8. An eligible list continues in existence for at least one year.

9. Eligibles may waive certification for reasons considered satisfactory by the Commission.

10. To meet an actual emergency, any person whether an eligible or not, may be appointed to serve for a period not exceeding fifteen days.

11. Every person appointed from an eligible list must serve a probationary period of six months. After that time the appointment becomes permanent and the appointee is entitled to all civil service rights.

12. Leaves of absence and sick leaves with or without pay must be submitted to and approved by the Commission before becoming effective.

13. Changes of status and salary must be submitted to and approved by the Commission before becoming effective.

REMOVAL OF INCOMPETENTS NOT RESTRICTED.

Objection to civil service methods has been voiced because appointing powers have to select men from the eligible list who have not been tried out and who may not make good. The best conducted and most perfect scientific or psychological examination in the world will not always reveal the defects in an applicant, but the average employer selects his employees practically as the civil service selects them, though obviously with less thoroughness. If the official or the private employer selects his employee solely through friendship or political favoritism, then he is not fair or just to the state or to his business. This being admitted, it must follow that the appointing power, which selects an employee from an eligible list, has the same opportunity to determine the fitness of the employee for the position as he would have in the absence of an eligible list. With every appointee under six months probation before becoming a permanent civil service employee, there is ample time to discover any defects in such employee, and it is the duty of the appointing power not alone to supervise his employees during their probationary period, but also thereafter, as long as the employee continues his employment under that appointing power. The head of a department has full control over his employees. If they are inefficient or incompetent he can suspend them or dismiss them, the only modification of this power being that he must give them opportunity to answer the charges he must make and to be heard on

such charges. The merit system is not responsible for the retention of incompetent employees; rather does it insist upon and provide for the elimination of such employees as demonstrate their unfitness, and the responsibility for the retention of an incompetent employee must be borne by the head of the department which that employee serves.

PENSION AND RETIREMENT.

What we must do with aged employees is a question that will ere long confront the State of California. Civil service has been in existence for nine years. Hundreds of employees who were in the employ of the state at the time of the adoption of Civil Service were "blanketed" into the service. Unfortunately there comes a time in the lives of men when they are not able to give the service required of them and which can be given by men younger and more physically able. These aged employees have all the rights which civil service gives them and they can only be removed by resignation or by the filing of charges. While efficiency may demand such action, there is a sentimental side which deters it. Efforts have been made in the past to secure the passage by the legislature of an adequate pension and retirement system for state employees but these efforts have failed. Los Angeles County has established such a system to the satisfaction of employees, department heads and taxpayers. Various municipalities in the state now have pension and retirement provisions for policemen and firemen and the state has a satisfactorily working plan for the pensioning and retirement of school teachers. The same arguments that may be advanced for a pension plan for policemen, firemen and teachers apply with equal force to every employee in the state service. It is just as important for the clerk or the bookkeeper or the assistant bank examiner, grown old in the service of the state, to be pensioned and just as necessary for the efficiency of the state service. As civil service expands and continues with the years, it will be a wise policy for the state to adopt a pension and retirement system upon correct principles and patterned after systems which have proven successful in other states.

NATIONAL CIVIL SERVICE ASSEMBLY.

The fifteenth annual convention of the National Civil Service Assembly was held at San Francisco, California, June 6 to 10. It was attended by delegates from all civil service jurisdictions in the United States and in Canada and the Philippines. The convention was welcomed by Governor Stephens, and the California Civil Service Commission was honored in providing as president of the assembly, the president of this Commisison, and in furnishing as secretary of the assembly for next year, the chief examiner of this Commission. The great objective of the National Assembly for a number of years past has been the organization of a central civil service bureau, to act as a clearing house for civil service procedure, to the end that every state, county and municipal commission in the United States may have the benefit of the best thought and most improved practice in handling the many problems that arise. The committee appointed for the purpose has elicited the interest and support of the ablest scientific thinkers of the nation as well as one of the foremost philanthropists of the day

and has recently announced that the sum of $75,000 has been provided for a period of three years to cover every detail of investigation into civil service methods and procedure. Every civil service commission now in existence will directly benefit as a result of this great work and the merit system will be placed upon a more substantial basis than ever before in its history. The sixteenth annual convention of the Civil Service Assembly will be held in New York City and it is respectfully urged that provision be made for representation of this Commission at said convention.

FOR GREATER EFFICIENCY AND ECONOMY.

The Civil Service Commission has no province nor is it concerned in the organization, administration or policy-fixing powers of any other department. It is concerned, however, in the policy of "like salaries for like duties" and it now respectfully recommends that steps be taken to establish a system whereby there may be uniformity of hours and duties.

The surveys which have been made by this Commission for the purpose of establishing new classifications and standardizing salaries, have demonstrated that there are certain costly departmental organizations and duplication of work and of effort. In accord with the demand for greater efficiency and economy in state departments, should come a reorganization and a reduction of "over head" expenditures. It is imperative, if the state is to reduce its great expenditures, that the work of each department be accomplished with a minimum number of employees, and to that end the Civil Service Commission, because of information at hand and because of its survey of departments, is ready to offer cooperation and suggestion.

There is no good reason for the exemption from civil service of a large proportion of the civilian employees of the state. It has been shown that the merit system, with its classification of positions, its standardization of salaries and its certification of pay rolls is working a financial saving to the state. Civil service is no longer an experiment in California. There is no longer a question as to the value of the application of the merit system to public employment control and this Commission believes that the civil service system should be extended to include with some few exceptions those departments which are now exempt under the laws by which they have been created, or which are exempt under the civil service law. The exceptions referred to would properly include the State University and normal schools and the public school system of the state.

In view of the need for economy in all branches of the public service the Commission recommends for your consideration the adoption of appropriate legislation which will include legislative employees under the classified service. The states of Wisconsin and New York have adopted such legislation. Wisconsin adopted the merit system for the selection of legislative employees several years ago, and as a result, the cost of such employees has been reduced to a figure far below that of any other state of similar size and importance.

RECOMMENDATIONS.

Because the pay roll of state employees represents the greatest outlay of the funds of the state and because the Civil Service Commission by reason of its duties is in close touch with that pay roll, it has endeavored to present in this report a concise review of its activities and its recommendations in connection with state service. Much has been done by the state departments and the legislature in the advancement of civil service control and administration, and it is with a desire to still further advance the merit system that the following suggestions are made:

1. The adoption of a policy that will work for uniformity and harmony in hours of work, nature of duties and the elimination of unequal statutory salaries, to the end that there may be "like salaries for like duties."

2. The adoption of a comprehensive and equitable pension and retirement system for civil service employees.

3. The extension of the civil service system to exempted departments of the State.

4. A survey of the departmental working forces that there may be a reorganization of such departments, where deemed advisable, to the end that there may be a minimum number of employees.

5. The inclusion of the civil service system as a part of the organic law of the state.

CONCLUSION.

The State of California has a right to demand of its employees in the discharge of public business a maximum of ability and service at an expense no greater than that of private employment. With constantly increasing demands made necessary by growth of population and development of its resources, it has a right to expect increasingly intelligent work from its civil servants. And it cannot secure such work unless merit and fitness are demanded for entrance into service and form the basis for continuance and promotion.

The Civil Service Commission believes that only by a strict compliance with the merit system as laid down in the Civil Service Law, will the state be able to keep the cost of personal service within bounds for the future. Every deviation from that law makes more difficult the personal service problem and more unequal the salary expenditures. The objective of the merit system, the purpose of the Civil Service Commission, is to make it possible for every citizen to demonstrate his fitness for state employment, and for the state to secure those best qualified to serve, and thus to enable every governmental agency to fulfill its functions efficiently and economically.

Respectfully submitted.

DAVID J. REESE
President and Executive Member.
CLYDE L. SEAVEY
JOHN F. GALVIN
Associate Commissioners.

December 15, 1922.

NOTE.—Due acknowledgment is hereby made to the Civil Service Commissions of New York and New Jersey and Los Angeles County for valuable assistance and suggestions in the compilation of this report.

APPENDIX I.

LIST OF PERSONS WHO ASSISTED IN CONDUCTING EXAMINATIONS DURING THE BIENNIAL PERIOD 1920-1922.

The governmental activities of the State of California are remarkably diversified and in its field of examinations the Civil Service Commission has found itself confronted with well over five hundred different and distinct kinds of positions for which separate examinations must be held. It is obvious, therefore, that the staff of the Civil Service Commission could not be self-sufficient in conducting all of these examinations, because many of them are highly specialized trade and professional positions, and to meet the situation adequately, the Commission has had to rely upon experts and specialists in the different fields of work for which examinations have been given. One of the pleasantest experiences of this Commission has been the prompt and cordial response with which technical, professional, trades and business men have responded to the call for this very important public service. The Commission takes this opportunity to make public acknowledgement of this service, and to express its gratitude to those who have so generously contributed gratuitously of their time and abilities.

For convenience of reference, the names of these examiners have been arranged by groups in accordance with the fields of work for which they rendered service.

ACCOUNTANT.

C. L. Avery, accountant, Los Angeles; C. De Saules, superintendent of accounts, Department of Finance, Sacramento; John F. Forbes, resident manager, Haskins and Sells, San Francisco; W. K. Mitchell, accountant, Los Angeles; J. R. Ruckstell, accountant, San Francisco.

AGENT, PURCHASING.

S. Dinkelspiel, Dinkelspiel and Company, wholesale dry goods, San Francisco; H. B. Drescher, Mebius and Drescher, Co., wholesale grocers, Sacramento; B. P. Jaggard, Schmidt Lithograph Company, San Francisco; Harry F. Kolb, purchasing agent, Hercules Powder Company, San Francisco; D. P. Nicklin, purchasing agent, Department of Public Service, Los Angeles County; G. C. Noble, purchasing agent, Shell Company of California, San Francisco; C. H. Plummer, County Purchasing Agent, Los Angeles; C. F. Prentiss, Thomson Diggs Company, Sacramento; Perry W. Stamps, purchasing agent, California Central Creameries, San Francisco.

ARCHITECTURAL POSITIONS. (Architectural Draftsman; Architectural Designer; Engineer of Estimates and Costs, Buildings; Assistant and Junior Estimator.)

George J. Adams, Deputy State Architect, Sacramento; Edwin Bergstrom, architect, Los Angeles; Morris M. Bruce, architect, San Francisco; George J. Calder, engineer, City Filtration Plant, Sacramento; James Dean, architect, Sacramento; W. B. Faville, architect, San Francisco; H. H. Gutterson, architect, San Francisco; Wm. C. Hays, architect, San Francisco; Roy Mitchell, structural engineer, R. C. Mitchell Company, Los Angeles; S. Schmittacher, architect, San Francisco; Leonard F. Starks, architect, Sacramento; C. L. Weeks, architect, Los Angeles; John W. Woollett, architect, Sacramento; A. C. Zimmerman, architect, Los Angeles.

ASSISTANT TO SURVEYOR GENERAL.

R. E. Collom, State Oil and Gas Supervisor, State Mining Bureau, San Francisco; Alfred Jones, Chief Deputy County Surveyor, Los Angeles; J. A. McGilvray, assistant, Legislative Counsel Bureau, Sacramento.

CLERICAL SERVICE POSITIONS. (Bookkeeper; Stenographer and Typist; Telephone Operator and Office Attendant.)

Paul W. Brown, assistant examiner, Los Angeles County Civil Service Commission; Mrs. Lillian Cross, central office inspector, Sutter Office, Pacific Telephone and Telegraph Company, San Francisco; C. De Saules, superintendent of accounts, Department of Finance, Sacramento; F. E. Doty, secretary and chief examiner, Civil Service Commission, Los Angeles; H. G. Fredericks, Board of State Harbor Commissioners, San Francisco; R. L. Hatch, accountant, State Board of Control, Sacramento; P. B. Potter, accountant, State Board of Control, Sacramento; Miss Wylie, Pacific Telephone and Telegraph Company, Los Angeles.

ENGINEERING POSITIONS, CIVIL. (Civil Engineer, Grades 1, 2, 3, and 4; Civil Engineering Draftsman, Grades 1, 2, 3, and 4; Delineator; Assistant Civil Engineer, Grade 4, Asphalt-Concrete, Asphalt-Macadam, Locating.)

W. Lewis Clark, assistant highway engineer, California Highway Commission; W. C. Elsemore, civil engineer, Eureka; Frank H. Joyner, assistant highway engineer, California Highway Commission, Los Angeles; G. L. Lewis, county surveyor, Crescent City, Del Norte County; H. M. Malpas, Hobbs Wall Company, Crescent City; F. H. Somner, division engineer, California Highway Commission, Willits; C. E. Tabor, civil engineer, Eureka.

ENGINEERING POSITIONS, ELECTRICAL. (Electrical Engineering Draftsman, Grade 3; Assistant Electrical Engineer, Grade 4.)

A. L. Black, Electrical Engineer, San Francisco; H. E. Carse, Consulting Engineer, Los Angeles; R. L. Daugherty, Professor of Electrical Engineering, California Institute of Technology, Pasadena; R. E. Shonerd, Assistant Mechanical Engineer, Los Angeles County; G. M. Simonson, Electrical Engineer, Division of Architecture, Sacramento; Harry L. Wood, Engineer, Los Angeles Fire Department, Los Angeles; Chas. Z. Yost, Electrical Engineer, Pacific Gas and Electric Company, San Francisco.

ENGINEERING POSITIONS. (Highway Associate Highway Engineer, Grade 5.)

A. B. Fletcher, director, State Department of Public Works, Sacramento; R. I. Hewes, district engineer, U. S. Bureau of Roads, San Francisco.

ENGINEERING POSITIONS, HYDRAULIC. (Hydraulic Engineer, Grades 3, 4 and 5; Assistant Hydraulic Engineer, Grade 4, [promotional]; Associate Hydraulic Engineer, Grade 5, [promotional].)

Paul Bailey, assistant chief, Division of Engineering and Irrigation, State Department of Public Works, Sacramento; G. A. Elliot, chief Engineer, Spring Valley Water Company, San Francisco; B. A. Etcheverry, Professor of Hydraulic Engineering, University of California, Berkeley; H. Hawgood, consulting engineer, Los Angeles; F. C. Hermann, consulting engineer, San Francisco; A. Kempke, consulting engineer, San Francisco; A. L. Sonderegger, consulting engineer, Los Angeles.

ENGINEERING POSITIONS, MECHANICAL. (Assistant Mechanical Engineering Draftsman, Grade 2; Assistant Mechanical Engineer, Grade 4 and Grade 4 [promotional]; Mechanical Engineering Draftsman, Grade 3; Associate Mechanical Engineer, Grade 5.)

H. E. Carse, consulting engineer, Los Angeles; R. L. Daugherty, Professor of Electrical Engineering, California Institute of Technology, Pasadena; Wm. Davidson, chief techanical engineer, Los Angeles County; C. H. Delaney, chief Mechanical engineer, Pacific Gas and Electric Company, San Francisco; G. D. Flint, chief engineer, county mechanical department, Los Angeles; W. W. Hanscom, consulting mechanical engineer, San Francisco; C. H. Kromer, structural engineer, Division of Architecture, Sacramento; Thos. Morrin, consulting mechanical engineer, San Francisco; H. D. Saville, building superintendent, Merchants Exchange Building, San Francisco; R. E. Shonerd, assistant mechanical engineer, Los Angeles County; G. M. Simonson, electrical engineer, Division of Architecture, Sacramento; H. E. Warrington, assistant highway engineer, Division of Highways, Sacramento; C. R. Weymouth, chief engineer, C. C. Moore Company, San Francisco; Harry L. Wood, engineer, Los Angeles Fire Department, Los Angeles.

ENGINEERING POSITIONS, MINING AND PETROLEUM. (Mining Engineer, Grades 3, 4, and 5; Petrographer, Grade 3; Petroleum Engineer; Office Inspector Petroleum and Gas.)

Cyrus Bell, production engineer, Union Oil Company, Los Angeles; R. E. Collom, State Oil and Gas Supervisor, State Mining Bureau, San Francisco; Dr. A. S. Eakle, Professor of mining, University of California, Berkeley; F. F. Hill department Superintendent, Union Oil Company, Los Angeles; Desair B. Myers, mining engineer,

Los Angeles; F. L. Sizer, mining engineer, San Francisco; Earl W. Wagy, chief petroleum engineer, Standard Oil Company, San Francisco; H. M. Wolfin, superintendent of safety, Industrial Accident Commission, San Francisco.

ENGINEERING POSITIONS, STRUCTURAL. (Junior Structural Engineer, Grade 3; Assistant Structural Engineer, Grade 4.)

Geo. Calder, engineer, City Filtration Plant, Sacramento; W. W. Hanscom, consulting engineer (mechanical), San Francisco; R. E. Homann, building contractor, R. E. Homann Company, Los Angeles; C. H. Kromer, structural engineer, Division of Architecture, Sacramento; H. D. Saville, building superintendent, Merchants Exchange Building, San Francisco; H. E. Warrington, assistant highway engineer, Division of Highways, Sacramento.

FIRE RANGER, DISTRICT.

R. L. P. Bigelow, U. S. Forest Service, Los Angeles; C. V. Brereton, U. S. Forest Service, San Francisco; R. H. Charlton, U. S. Forest Service supervisor, Angeles Forest, Los Angeles; J. E. Elliott, deputy forest supervisor, U. S. Forest Service, Red Bluff; O. E. Fowler, State Forestry Department, Sacramento; M. B. Pratt, State Forester, Sacramento; W. B. Rider, assistant State Forester, Sacramento.

GENERAL FOREMAN OF MAINTENANCE AND REPAIRS, BRIDGES.

C. F. Green, superintendent of bridge and building department, Southern Pacific Company, Sacramento; Geo. W. Jones, Los Angeles County Road Commissioner, Los Angeles; Harlan D. Miller, engineer, Division of Engineering, Sacramento; P. M. Nelson, bridge and building department, Southern Pacific Company, San Francisco; H. E. Warrington, assistant highway engineer, Division of Highways, Sacramento.

IMMIGRATION AND HOUSING COMMISSION, POSITIONS IN. (Camp Inspector; Complaint Officer.)

J. S. Blair, Deputy Labor Commissioner, Sacramento; R. W. Kearney, executive officer, Immigration and Housing Commission, San Francisco; L. T. Mott, chief housing inspector, Immigration and Housing Commission, San Francisco; P. Scharrenburg, member, Immigration and Housing Commission, San Francisco; C. B. Sexton, superintendent, free employment bureaus, San Francisco; W. C. Sharpsteen, attorney, San Francisco.

INSPECTOR, MOTOR VEHICLE.

J. K. Flynn, Mecum, Hunter and Flynn, motor car dealers, Sacramento; I. K. Hampson, motor car dealer, Sacramento; H. P. Hubbard, Hubbard Auto Sales Company, Los Angeles; W. J. Mannix, Cadillac agency, Sacramento; P. Mickle, Buick agency, Sacramento; E. W. Milburn, manager, Greer, Robbins Company, San Francisco; Royal Miller, Miller Auto Company, Sacramento; Steve Neal, chief inspector, Motor Vehicle Department, Sacramento; E. L. Robbins, Union Motors Company, Los Angeles; C. N. Weaver, Chester N. Weaver Company, auto dealer, San Francisco.

INSTITUTIONS, POSITIONS AT STATE. (Druggist; Business Manager; Matron and Assistant Matron; and Other Institutional Positions.)

Paul Bailey, assistant chief, Division of Engineering and Irrigation, Department of Public Works, Sacramento; J. H. Bean, supervisor of Los Angeles County, Los Angeles; Dr. F. O. Butler, medical superintendent, Sonoma State Home, Eldridge; W. H. Chestnutwood, business manager, Stockton State Hospital, Stockton; Geo. H. Frates, vice president California Drug Clerks' Association, San Francisco; Dr. F. S. Marnell, assistant physician, Stockton State Hospital, Stockton; E. J. Molony, State Board of Pharmacy, San Francisco; Dr. Eva C. Reid, physician, University of California Hospital, San Francisco; G. M. Simonson, electrical engineer, Division of Architecture, Sacramento.

LABOR STATISTICS, POSITIONS IN BUREAU OF. (Agent; Placement Clerk; Manager, Free Employment Bureau; Deputy Labor Commissioner; Director, Free Employment Bureau; Statistician.)

J. A. Burton, paving contractor, Los Angeles; R. M. Carson, Carson Glove Company, San Francisco; J. R. Douglas, assistant vice president, Security Trust and Savings Bank, Los Angeles; W. G. Mathewson, State Labor Commissioner, San Francisco; C. B. Sexton, superintendent, free employment bureau, San Francisco; H. M. Wolfin, superintendent of safety, Industrial Accident Commission, San Francisco.

OCCUPATIONAL THERAPIST.

Dr. W. J. Barlow, physician, Los Angeles; F. E. Doty, secretary and chief examiner, County Civil Service Commission, Los Angeles; Edna Gearhart, teacher, Los Angeles high school; Dr. Frank L. Kelly, epidemiologist, State Board of Health, Berkeley; Dr. Esther Rosencrantz, physician, San Francisco; Miss Helen S. Watson, assistant superintendent of schools, Los Angeles.

PHYSICIAN, ASSISTANT. (State Hospitals for the Insane.)

Dr. D. H. Calder, physician, Los Angeles Hospital, Los Angeles; Dr. Francis J. Gertie, Cook County Psychopathic Hospital, Illinois; Dr. R. W. Harvey, physician, San Francisco; Dr. C. A. Neymann, physician, Cook County Psychopathic Hospital, Illinois; Dr. Victor Parkin, Psychiatrist, Los Angeles County Hospital, Los Angeles; Dr. G. V. Price, physician, Spokane, Washington; Dr. Eva C. Reid, physician, University of California Hospital, San Francisco; Dr. J. M. Semple, physician, Spokane, Washington; Dr. Neal N. Wood, first assistant superintendent of charities, Los Angeles County Hospital.

REAL ESTATE DEPARTMENT, POSITIONS IN. (Deputy; Chief Deputy.)

Charles A. Adams, attorney, San Francisco; Leslie E. Burks, secretary of San Francisco Real Estate Board, San Francisco; A. F. Dessouslavy, attorney, San Francisco; C. W. Fellows, manager, compensation insurance fund, San Francisco; C. R. Jones, realtor, Sacramento; A. E. Kern, realtor, San Francisco; C. C. Tatum, realtor, Los Angeles; Carlos G. White, attorney, Oakland.

SUPERINTENDENT OF CONSTRUCTION; AND GENERAL FOREMAN OF CONSTRUCTION.

J. E. Allison, architect, Los Angeles; J. W. Dutton, superintendent of construction, State Department of Public Works, Sacramento; A. W. Norris, building contractor, Sacramento; A. H. Potbury, engineer, Coast Equipment Company, San Francisco.

SUPERINTENDENT OF OPERATION AND MAINTENANCE, BUILDINGS.

Paul Bailey, assistant chief, Division of Engineering and Irrigation, State Department of Public Works, Sacramento; Geo. Bassett, manager, McGillivray Construction Company, Brighton; John H. Bean, supervisor of Los Angeles County, Los Angeles; Chas. Brockhoff, superintendent Grant Building, San Francisco; Frank Herrick, manager W. P. Fuller Company, San Francisco; L. Luppen, mechanical engineer, Sacramento; John H. Mc Callum, president, Board of State Harbor Commissioners, San Francisco; Wm. A. Sherman, manager Merchants' Ice and Cold Storage Company, San Francisco.

TRADES POSITIONS, BUILDING.

Howard Booker, contracting plasterer, Los Angeles; S. C. Brown, master plumber, Los Angeles; J. C. Duncan, building contractor, Los Angeles; J. W. Dutton, superintendent of construction, Division of Architecture, Sacramento; E. Hogberg, contracting bricklayer, San Francisco; R. E. Homans, building contractor, Los Angeles; L. J. Neal, contracting painter, San Francisco.

TRADES POSITIONS, MARINE.

Capt. F. M. Edwards, general superintendent, Matson Navigation Company, San Francisco; M. R. Hickman, engineer, Matson Navigation Company, San Francisco; H. Murray, Healy-Tibbitts Construction Company, San Francisco; J. H. Witham, foreman, Board of State Harbor Commissioners, San Francisco.

TRADES POSITIONS, PRINTING.

Alex Dulfer, Dulfer Printing Company, San Francisco; W. F. McKanney, Independent Press, San Francisco; Bert D. Morris, superintendent manufacturing department, H. S. Crocker Company, San Francisco; P. J. O'Leary, T. J. Cordoza Company, bookbinders, San Francisco.

TRADES POSITIONS, RAILROAD.

J. D. Brennan, trainmaster, Southern Pacific Company, San Francisco; P. S. Gillette, Southern Pacific Company, Oakland; Hamilton Glass, retired railroad man, San Francisco; W. E. Shafer, master mechanic, Board of State Harbor Commissioners, San Francisco.

TRADES POSITIONS, GENERAL SKILLED.

B. S. Bennett, superintendent, California Highway Commission, Shandon; F. E. Burnside, foreman, California Highway Commission, Sacramento; W. B. Cannon, Superintendent, California Highway Commission, Lankershim; W. L. Clark, assistant highway engineer, California Highway Commission; W. D. Cook, Foreman, California Highway Commission, Sacramento; R. P. Hamlin, California Highway Commission, San Luis Obispo; M. A. Hendrix, auto dealer, Red Bluff; M. J. How-

ard, Little Lake garage, Willits; J. D. Hurdle, auto dealer, Fresno; F. H. Joyner, assistant highway engineer, California Highway Commission; Frank Killam, superintendent, Capitol Building, Sacramento; T. B. Landres, California Highway Commission, Brawley; W. C. Miller, superintendent, California Highway Commission, Fresno; W. W. Patch, division engineer, California Highway Commission, Lankershim; Ed. Rawson, California Highway Commission, Brawley; Geo. M. Roe, mechanical inspector, California Highway Commission, Dunsmuir; C. B. Sexton, superintendent free employment bureau, San Francisco; W. B. Stout, California Highway Commission, Willits; Frank J. Vogt, California Highway Commission, Redding; H. E. Warrington, assistant highway engineer, California Highway Commission Sacramento.

TYPEWRITER REPAIRMAN.

J. L. Carpenter, chief repairman, Underwood Typewriter Company, Sacramento; J. M. Deyle, Underwood Typewriter Company, San Francisco; H. A. Ecclestone, Remington Typewriter Company, Los Angeles; C. P. Faunce, chief repairman, Remington Typewriter Company, Sacramento; H. L. Jackson, chief mechanic, Remington Typewriter Company, San Francisco; R. M. Rowland, manager, Underwood Typewriter Company, Sacramento; G. W. Walker, foreman, Remington Typewriter Company, San Francisco; C. B. Waters, manager, Remington Typewriter Company, San Francisco.

ZOOLOGIST, ASSISTANT.

F. E. Doty, secretary and chief examiner, Los Angeles County Civil Service Commission; W. C. Jacobsen, superintendent of rodent control, Department of Agriculture, Sacramento; W. S. Killingsworth, executive assistant, Department of Agriculture, Fresno; L. B. Mallory, representative, Industrial Accident Commission, Fresno; E. Williams, deputy, Real Estate Commission, San Francisco.

APPENDIX II.

POSITIONS EXEMPTED FROM PROVISIONS OF THE CIVIL SERVICE ACT BY RESOLUTION OF THE COMMISSION. FROM JULY 1, 1920, TO JUNE 30, 1922.

Department.	*Position.*	*Reasons for Exemption.*	*Names of Incumbents.*
Department of Public Works, Division of Architecture and Division of Land Settlement.	All workmen in the field employed by the Division of Architecture below the grade of journeyman and all casual or common laborers employed in the development of the Durham and Delhi State Land Settlements.	The short term of these employments places them outside the intent of the Civil Service Act and imposes a great deal of additional labor on the Civil Service Commission and the Department of Public Works.	Owing to the limited tenure of employment and the heavy turnover resulting therefrom, the Department of Public Works has not been required to report appointments under this exemption.

APPENDIX III.

Table Showing Status and Number of Employees in the Service of the State November 1, 1922.

Department	Exempt	Original employees	Taken from eligible lists	Appointed under temporary authorization	Totals
1. Accountancy, Board of	5				5
2. Adjutant General	6				6
3. Advisory Pardon Board	5				5
4. Agricultural Association, Sixth District	10		6	5	21
5. Agricultural Society, State	13	1	2	21	37
6. Agriculture, Department of	12	9	87	264	372
7. Architecture, Board of	11		1		12
8. Attorney General	17	3	4	1	25
9. Banking Department	3	3	7	21	34
10. Building and Loan Commissioner	2	1	1		4
11. Charities and Corrections, Board of	8		6	7	21
12. Civil Service Commission	4		19		23
13. Controller	13	8	22	4	47
14. Corporation Department	2	1	56	14	73
15. Court of Appeals, First District (Divisions 1 and 2)	13	2	4		19
16. Court of Appeals, Second District (Divisions 1 and 2)	6	2	3		11
17. Court of Appeals, Third District	6	2	2		10
18. Criminal Identification, Bureau of	3		9	3	15
19. Dental Examiners, Board of	7			3	10
20. Education, Department of—					
a. Office of Board of Education and Superintendent of Public Instruction	18	1	32	12	63
b. School for Deaf and Blind	36	13	18	31	98
c. Polytechnic School	30		3	28	61
21. Embalmers, Board of	5				5
22. Equalization, Board of	6	2		1	9
23. Department of Finance—					
a. Division of Claims and Disbursements and General Staff	12	4	47	25	88
b. Division of Libraries	2	12	24	28	66
c. Division of Motor Vehicles	2	1	179	116	298
d. Division of Printing	1	51	92	40	184
e. Division of Purchases and Custody	4	25	59	9	97
24. Fish and Game Commission	6	52	17	121	195
25. Forestry, Board of	7		30	13	50
26. Harbor Commissioners, Board of State	8	164	256	76	504
27. Health, Board of	17	9	60	42	128
28. Historical Survey Commission	5				5
29. Department of Institutions—					
a. General Staff, Department of Institutions	3	2	5	4	14
b. Agnews State Hospital	6	39	128	41	214
c. Mendocino State Hospital	6	20	86	62	174
d. Napa State Hospital	6	68	212	93	379
e. Norwalk State Hospital	6		77	68	151
f. Sonoma State Home	6	27	107	70	210
g. Southern California State Hospital	6	24	192	80	312
h. Stockton State Hospital	6	70	191	82	349
i. California School for Girls	8		29	39	76
j. Industrial Farm for Women	6			17	23
k. Industrial Home for Adult Blind	6	1	10	21	28
l. Pacific Colony	4			8	12
m. Preston School of Industry	6	9	14	109	138
n. Whittier State School	4	8	14	74	100
30. Insurance, Department of	3	4	5	12	24

APPENDIX III—Continued.

Table Showing Status and Number of Employees in the Service of the State November 1, 1922.

Department	Exempt	Original employees	Taken from eligible lists	Appointed under temporary authorization	Totals
31. Labor and Industrial Relations, Department of—					
a. Division of Workmen's Compensation Insurance and Safety:					
1. Compensation Insurance Fund	2	1	143	141	287
2. Industrial Accident Commission	11	5	107	31	154
b. Division of Immigration and Housing	7	-------	16	4	27
c. Division of Industrial Welfare	6	-------	18	9	33
d. Division of Labor	3	5	66	9	83
32. Legislative Counsel Bureau	2	-------	2	3	7
33. Medical Examiners, Board of	13	1	4	25	43
34. Mining Bureau	8	4	32	24	68
35. Optometry, Board of Examiners in	1	-------	-------	2	3
36. Panama-California State Building	-------	-------	-------	2	2
37. Pharmacy, Board of	2	2	2	9	15
38. Prison Directors, Board of	11	-------	-------	-------	11
39. Public Works, Department of—					
a. Division of Architecture	1	6	81	72	160
b. Division of Engineering and Irrigation	1	5	46	40	92
c. Division of Highways	7	35	632	860	1,534
d. Division of Land Settlement	4	-------	3	10	17
e. Division of Water Rights	14	-------	28	14	56
40. Real Estate Department	1	-------	34	10	45
41. Reclamation Board	11	1	15	12	39
42. Redwood Park, California	6	1	1	9	17
43. Secretary of State	3	14	11	3	31
44. Supreme Court	20	9	6	1	36
45. Surveyor General	3	4	5	2	14
46. Treasurer, State	2	6	3	3	14
48. Veterans' Home of California	8	9	29	69	115
48. Veterans' Welfare Board	17	-------	3	1	21
49. Woman's Relief Corps Home of California	11	-------	-------	8	19
Totals	562	756	3,403	3,038	7,759
					562
Under civil service jurisdiction	-------	-------	-------	-------	7,197

APPENDIX IV.

Tabular Statement of Examinations Held and Results Obtained During Period From July 1, 1920, to July 1, 1921.

Kind of examination	Date	Number of applicants		Number examined		Per cent examined, men and women	Number passed		Per cent passed		Total per cent passed, men and women	Number failed		Per cent failed		Total per cent failed, men and women
		Men	Women	Men	Women		Men	Women	Men	Women		Men	Women	Men	Women	
1. Adding machine operator, Motor Vehicle Department	Nov. 8, 1920		1		1	100.0		1		100.0	100.0					
2. Agent, Children's Board of Control	Nov. 27, 1920		25		24	96.0		13		54.1	54.1		11		45.9	45.9
3. Agent, Special, Compensation Insurance Fund	Oct., 1920	9		8		88.9	4		50.0		50.0	4		50.0		50.0
4. Agent, Special, Industrial Welfare Commission	April 9, 1921		18		17	94.4		9		53.1	53.1		8		46.9	46.9
5. Asbestos worker	Dec., 1920	5		5		100.0	4		80.0		80.0	1		20.0		20.0
6. Attendant, Agnews State Hospital	Nov., 1920	22	28	15	21	72.0	15	21	100.0	100.0	100.0					
7. Attendant, Mendocino State Hospital	Nov., 1920	16	13	12	9	72.4	12	9	100.0	100.0	100.0					
8. Attendant, Napa State Hospital	Nov., 1920	28	30	26	28	93.1	24	26	92.3	92.8	92.6	2	2	7.7	7.2	7.4
9. Attendant, Norwalk State Hospital	July 1, 1920	11	16	11	16	100.0	10	16	100.0	100.0	100.0					
10. Attendant, Norwalk State Hospital	Nov., 1920	20	18	7	10	53.7	7	10	100.0	100.0	100.0					
11. Attendant, Pacific Colony	June, 1921	2	1	2	1	100.0	1	1	50.0	100.0	66.7	1		50.0		33.3
12. Attendant, Sonoma State Home	Nov., 1920	13	18	12	16	90.3	12	15	100.0	93.7	96.4		1		6.3	3.6
13. Attendant, Southern California	July 1, 1920	12	28	12	28	100.0	12	28	100.0	100.0	100.0					
14. Attendant, Southern California	Nov., 1920	28	22	19	17	72.9	19	17	100.0	100.0	100.0					
15. Attendant, Stockton State Hospital	Nov., 1920	32	15	29	13	89.3	29	13	100.0	100.0	100.0					
16. Attendant, Stockton State Hospital	June, 1921	26	12	26	10	91.7	22	9	84.6	90.0	86.1	4	1	15.4	10.0	13.9
17. Attendant, Veterans' Home	Nov., 1920	4	5	4	5	100.0	1	2	25.0	40.0	33.3	3	3	75.0	60.0	66.7
18. Auditor	Nov., 1920	3		2		66.7						2		100.0		100.0
19. Baker	Nov., 1920	8		6		75.0	6		100.0		100.0					
20. Baker, head	June, 1921	1		1		100.0	1		100.0		100.0					
21. Baker, assistant	June, 1921	1		1		100.0	1		100.0		100.0					
22. Bindery worker	Dec., 1920		4		4	100.0		4		100.0	100.0					
23. Bindery worker apprentice	Dec., 1920		4		4	100.0		3		75.0	75.0		1		25.0	25.0
24. Bindery worker	April, 1921		4		4	100.0		3		75.0	75.0		1		25.0	25.0
25. Blacksmith, general	Dec., 1920	4		4		100.0	2		50.0		50.0	2		50.0		50.0
26. Blacksmith, machine	Dec., 1920	1		1		100.0	1		100.0		100.0					
27. Blacksmith (tool sharpener)	Dec., 1920	1		1		100.0	1		100.0		100.0					
28. Blacksmith	April, 1921	5		2		90.0	1		50.0		50.0	1		50.0		50.0
29. Blacksmith's helper	Dec., 1920	2		2		100.0	2		100.0		100.0					
30. Bookbinder (forwarder)	Dec., 1920	12		11		87.5	5		45.4		45.4	6		54.6		54.6
31. Bookbinder (machine)	Dec., 1920	4		4		100.0	2		50.0		50.0	2		50.0		50.0
32. Bookbinder	April, 1921	1		1		100.0						1		100.0		100.0
33. Bookkeeper	Oct. 2, 1920	4	7	4	6	90.9	1	2	25.0	33.3	30.0	3	4	75.0	66.7	70.0
34. Bookkeeper	Feb. 5, 1921	16	4	13	4	85.0	4	1	30.7	25.0	29.4	9	3	69.3	75.0	70.6
35. Bookkeeper	May 21, 1921	14	9	11	5	69.6	2		18.1		12.5	9	5	81.9	100.0	87.5

36.	Bookkeeper, California School for Girls	Feb. 19, 1921		3		2	66.7		2	100.0	100.0							
37.	Bricklayer	April, 1921	3		2		66.7	2		100.0	100.0							
38.	Butcher	Nov., 1920	1		1		100.0	1		100.0	100.0							
39.	Cable splicer	Dec., 1920	1		1		100.0	1		100.0	100.0							
40.	Calculating machine operator, Motor Vehicle Department	Nov. 8, 1920		8		6	75.0		6	100.0	100.0							
41.	Carpenter foreman	Dec., 1920	1		1		100.0					1	100.0		100.0			
42.	Carpenter	Dec., 1920	21		14		66.7	7		50.0	50.0	7	50.0		50.0			
43.	Carpenter	April, 1921	33		30		90.9	22		73.3	73.3	8	26.7		26.7			
44.	Carpenter, helper	Dec., 1920	1		1		100.0	1		100.0	100.0							
45.	Carpenter, California School for Girls	Feb. 19, 1921	4		4		100.0	3		75.0	75.0	1	25.0		25.0			
46.	Cement finisher	Dec., 1920	2		1		50.0	1		50.0	50.0	1	50.0		50.0			
47.	Cement finisher	April, 1921	2		2		100.0	2		100.0	100.0							
48.	Chauffeur	Nov., 1920	3		3		100.0	1		33.3	33.3	2	66.7		66.7			
49.	Chauffeur	Dec., 1920	1		1		100.0					1	100.0		100.0			
50.	Chauffeur	June, 1921	4		3		75.0	2		66.7	66.7	1	33.3		33.3			
51.	Chemist, Purchasing Department	Jan. 22, 1921	5		3		60.0	2		66.7	66.7	1	33.3		33.3			
52.	Clerk, junior	Nov. 6, 1920	9	56	8	55	96.9	5	24	62.5	43.6	46.0	3	31	37.5	56.4	54.0	
53.	Clerk, junior	May 14, 1921	24	96	22	89	92.5	3	25	13.6	28.1	25.2	19	64	86.4	71.9	74.8	
54.	Clerk, junior (promotional), Fish and Game Commission	Feb. 19, 1921	1		1		100.0	1		100.0	100.0							
55.	Clerk, senior	Aug. 28, 1920	25	34	25	28	89.8	4	8	14.2	28.5	22.6	21	20	85.8	71.5	77.4	
56.	Clerk, senior	May 7, 1921	70	68	62	60	88.3	9	17	14.5	28.2	21.3	53	43	85.5	71.8	78.7	
57.	Clerk, senior (promotional), Sonoma State Home	Nov. 25, 1920	1		1		100.0	1		100.0	100.0							
58.	Clerk, chief, California School for Girls	Feb. 19, 1921		3		3	100.0		3		100.0	100.0						
59.	Clerk, Motor Vehicle Department	Nov. 8, 1920	2	43	2	42	97.7	2	42	100.0	100.0	100.0						
60.	Clerk, Compensation Insurance	Oct., 1920	11	43	7	35	77.7	4	24	57.1	68.5	65.7	3	11	42.9	31.5	33.3	
61.	Clerk, Assistant, California School for Girls	Feb. 19, 1921		1		1	100.0		1		100.0	100.0						
62.	Clerk, Commissary, California School for Girls	Feb. 19, 1921		3		3	100.0		1		33.3	33.3		2		66.7	66.7	
63.	Clerk, railroad	July 3, 1920	1		1		100.0	1		100.0		100.0						
64.	Clerk, Motor Vehicle Department	Dec. 6, 1920	4	38	4	35	92.8	4	32	100.0	91.4	92.3		3		8.6	7.7	
65.	Clerk, chief (renewals), Compensation Insurance Fund	Aug. 14, 1920		1		1	100.0		1		100.0	100.0						
66.	Clerk, credential	Aug. 14, 1920	1	9		9	90.0		7		77.8	77.8		2		22.2	22.2	
67.	Clerk, finger print	Aug. 21, 1920		3		3	100.0		3		100.0	100.0						
68.	Compositor	Dec., 1920	34		30		88.2	16		53.3		53.3	14		46.7		46.7	
69.	Compositor (promotional)	Feb. 19, 1921	1		1		100.0	1		100.0		100.0						
70.	Compositor	April, 1921	1															
71.	Cook	Nov., 1920	13	7	12	6	90.0	9	5	75.0	83.3	61.1	3	1	25.0	16.7	38.9	
72.	Cook	June, 1921	7	1	6	1	87.5	3	1	50.0	100.0	55.7	3		50.0		44.3	
73.	Copyholder	Dec., 1920		5		4	80.0		2		50.0	50.0		2		50.0	50.0	
74.	Copyholder	April, 1921		4		3	75.0		2		66.7	66.7		1		33.3	33.3	
75.	Copyholder, apprentice	Dec., 1920	1	7	1	6	87.5		4		66.7	57.1	1	2	100.0	33.3	42.9	
76.	Dairyman	Nov., 1920	2		2		100.0	2		100.0		100.0						
77.	Dairyman	June, 1921	1															
78.	Delineator	Mar. 1, 1921	7		4		57.1	1		25.0		25.0	3		75.0		75.0	
79.	Dentist	Feb. 19, 1921	3	1	2	1	75.0	2	1	100.0	100.0	100.0						
80.	Deputy, Real Estate Commission	Sept. 18, 1920	13	4	13	4	100.0	9	4	69.2	100.0	76.4	4		30.8		23.6	

APPENDIX IV—Continued.

Tabular Statement of Examinations Held and Results Obtained During Period From July 1, 1920, to July 1, 1921.

	Kind of examination	Date	Number of applicants		Number examined		Per cent examined, men and women	Number passed		Per cent passed		Total per cent passed, men and women	Number failed		Per cent failed		Total per cent failed, men and women
			Men	Women	Men	Women		Men	Women	Men	Women		Men	Women	Men	Women	
81.	Director of Education, California School for Girls	Feb. 19, 1921		1			100.0		1		100.0	100.0					
82.	Director of Discipline, California School for Girls	Feb. 19, 1921		3		2	66.7		2		100.0	100.0					
83.	Dormitory nightwatch, California School for Girls	Feb. 19, 1921		6		5	83.3		5		100.0	100.0					
84.	Draftsman, civil engineering, grade I	Mar. 1, 1921	8	1	8	1	100.0	5		62.5		55.6	3	1	37.5	100.0	44.4
85.	Draftsman, civil engineering, grade II	Mar. 1, 1921	12	1	11	1	92.3	6	1	54.5	100.0	58.3	5		45.5		41.7
86.	Draftsman, civil engineering, grade III	Mar. 1, 1921	21		15		71.4	5		33.3		33.3	10		66.7		66.7
87.	Draftsman, civil engineering, grade IV	Mar. 1, 1921	22		21		95.4	2		9.5		9.5	19		90.5		90.5
88.	Electrician	Nov., 1920	8		8		100.0	3		37.5		37.5	5		62.5		62.5
89.	Electrician	April, 1921	11		9		81.8	5		55.5		55.5	4		44.4		44.4
90.	Electrician, institutional	June, 1921	1		1		100.0						1		100.0		100.0
91.	Elevator operator	Dec. 24, 1920	8		7		87.5	4		57.1		57.1	3		42.9		42.9
92.	Engineering aid, junior, grade I	Mar. 1, 1921	54		43		79.6	41		95.3		95.3	2		4.7		4.7
93.	Engineering aid, civil, grade II	Mar. 1, 1921	82		67		81.7	41		61.2		61.2	26		38.8		38.8
94.	Engineer, junior civil, grade III	Mar. 1, 1921	88		84		95.6	25		29.7		29.7	59		70.3		70.3
95.	Engineer, assistant civil, grade IV	Mar. 1, 1921	153		137		89.5	31		22.6		22.6	106		77.4		77.4
96.	Engineer, chief, Bureau of Architecture	Nov. 27, 1920	2		2		100.0						2		100.0		100.0
97.	Engineer, chief, Bureau of Architecture	Mar. 5, 1921	3		3		100.0						3		100.0		100.0
98.	Engineer, chief, Bureau of Architecure	June 25, 1921	15		15		100.0						15		100.0		100.0
99.	Engineer, hoisting	Nov. 20, 1921	3		3		66.7	1		50.0		50.0	1		50.0		50.0
100.	Engineer, associate mechanical	June 25, 1921	11		10		90.0	1		10.0		10.0	9		90.0		90.0
101.	Engineer, piledriver	Dec., 1920	1		1		100.0	1		100.0		100.0					
102.	Engineer, safety (lumber, mechanical)	Oct. 16, 1920	13		11		84.6	1		9.1		9.1	10		90.9		90.9
103.	Engineer, safety (mines)	Nov. 16, 1920	5		5		100.0	1		20.0		20.0	4		80.0		80.0
104.	Engineer, stationary	Nov., 1920	13		12		92.3	7		58.3		58.3	5		41.7		41.7
105.	Engineer, stationary	June, 1921	8		2		25.0	2		100.0		100.0					
106.	Engineer, chief, California School for Girls	Feb. 19, 1921	7		6		85.7	2		33.3		33.3	4		66.7		66.7
107.	Examiner, claim, Compensation Insurance Fund	Aug. 14, 1920		2		2	100.0		2		100.0	100.0					
108.	Farmer	Nov., 1920	6		6		100.0	4		66.7		66.7	2		33.3		33.3
109.	Farmer, head	June, 1921	2		2		100.0	2		100.0		100.0					
110.	Farmer, California School for Girls	Feb. 19, 1921	8		7		87.5	2		28.5		28.5	5		71.5		71.5
111.	Farm hand	Nov., 1920	5		4		80.0	4		100.0		100.0					
112.	Farm hand	June, 1921	9		8		88.8	8		100.0		100.0					
113.	Farm hand, California School for Girls	Feb. 19, 1921	4		4		100.0	3		75.0		75.0	1		25.0		25.0
114.	Field assistant, Rodent Control Section, Department of Agriculture	July 1, 1920	9		8		88.8	8		100.0		100.0					
115.	Fireman, locomotive	Dec., 1920	9		8		88.8	2		25.0		25.0	6		75.0		75.0

116.	Fireman, stationary	Nov.,	1920	10		10		100.0	5		50.0		50.0	5		50.0		50.0
117.	Fireman, stationary	April,	1921	2		2		100.0						2		100.0		100.0
118.	Fireman, stationary	June,	1921	2		1		50.0	1		100.0		100.0					
119.	Fireman-chauffeur, California School for Girls	Feb. 19,	1921	8		5		62.5	1		20.0		20.0	4		80.0		80.0
120.	Fire ranger, district	April 1,	1921	44		35		79.5	18		51.4		51.4	17		48.2		48.2
121.	Forelady of the bindery	Dec.,	1920		1		1	100.0							1		100.0	100.0
122.	Foreman of bindery, assistant	July 24,	1920	3		3		100.0	2		66.7		66.7	1		33.3		33.3
123.	Foreman of pressroom, assistant	July 24,	1920	1														
124.	Foreman of pressroom, assistant	Dec.,	1920	2		2		100.0						2		100.0		100.0
125.	Foreman of proofroom, assistant	July 25,	1920	4		4		100.0	3		75.0		75.0	1		25.0		25.0
126.	Forester, assistant state	June 25,	1921	4		4		100.0	3		75.0		75.0	1		25.0		25.0
127.	Gardener, landscape	Nov.,	1920	5		4		80.0	2		50.0		50.0	2		50.0		50.0
128.	Gardener, vegetable	Nov.,	1920	4		4		100.0	4		100.0		100.0					
129.	Gardener, vegetable	June,	1921	1		1		100.0	1		100.0		100.0					
130.	Garden laborer	Aug. 28,	1920	6		4		66.7	3		75.0		75.0	1		25.0		25.0
131.	Handwriting expert	Aug. 21,	1920	1		1		100.0	1		100.0		100.0					
132.	Handyman	Nov.,	1920	15		15		100.0	12		80.0		80.0	3		20.0		20.0
133.	Handyman	June,	1921	1		1		100.0	1		100.0		100.0					
134.	Hod carrier	Dec.,	1920	1														
135.	Hod carrier	April,	1921	2		2		100.0	2		100.0		100.0					
136.	Housekeeper	Nov.,	1920		3		3	100.0		2	66.7		66.7		1		33.3	33.3
137.	Hydrotherapist	Nov.,	1920	1	2		1	33.3		1		100.0	100.0					
138.	Hydrotherapist, California School for Girls	Feb. 19,	1921		1													
139.	Identification expert	Aug. 21,	1920	2		2		100.0	1		50.0		50.0	1		50.0		50.0
140.	Inspector, apple	July 28,	1920	24		22		91.7	8		36.3		36.3	14		63.7		63.7
141.	Inspector, boiler	Oct. 15,	1920	4		4		100.0						4		100.0		100.0
142.	Inspector, electrical	Mar. 5,	1921	18		17		94.4	4		23.5		23.5	13		76.5		76.5
143.	Inspector, quarantine	July 10,	1920	2		1		50.0	1		100.0		100.0					
144.	Inspector, veterinary	July 10,	1920	79		61		78.4	6		9.8		9.8	55		90.2		90.2
145.	Janitor	Dec.,	1920	14		12		85.7	11		91.6		91.6	1		8.4		8.4
146.	Janitor	April,	1921	19		16		84.2	10		62.5		62.5	6		37.5		37.5
147.	Janitress	Dec.,	1920		1		1	100.0		1	100.0		100.0					
148.	Job foreman, assistant, composing room	Dec.,	1920	1		1		100.0	1		100.0		100.0					
149.	Kitchen help	Nov.,	1920	4		3		75.0	3		100.0		100.0					
150.	Kitchen help	Aug. 1,	1920	1		1		100.0	1		100.0		100.0					
151.	Kitchen help	June,	1921	1		1		100.0						1		100.0		100.0
152.	Laundress	Nov.,	1920		4		2	50.0		2		100.0	100.0					
153.	Laundress, assistant	Aug. 1,	1920		1		1	100.0		1		100.0	100.0					
154.	Laundry help	Aug. 1,	1920	1		1		100.0	1		100.0		100.0					
155.	Laundry help	Nov.,	1920	2	4		4	66.7		1		25.0	25.0		3		75.0	75.0
156.	Laundry help	June,	1921	1		1		100.0	1		100.0		100.0					
157.	Laundryman, assistant	Aug. 1,	1920	1		1		100.0	1		100.0		100.0					
158.	Laundryman	Nov.,	1920	5		4		80.0	3		75.0		75.0	1		25.0		25.0
159.	Laundryman	June,	1921	1		1		100.0						1		100.0		100.0
160.	Lineman's helper	Dec.,	1920	7		4		57.1	1		25.0		25.0	3		75.0		75.0
161.	Linotype operator	Dec.,	1920	20	2	18	2	90.9	13	2	72.2	100.0	75.0	5		27.8		25.0
162.	Machinist, foreman	Dec.,	1920	1		1		100.0	1		100.0		100.0					
163.	Machinist	Dec.,	1920	19		11		57.9	7		63.7		63.7	4		36.3		36.3

APPENDIX IV—Continued.

Tabular Statement of Examinations Held and Results Obtained During Period From July 1, 1920, to July 1, 1921.

	Kind of examination	Date	Number of applicants		Number examined		Per cent examined, men and women	Number passed		Per cent passed		Total per cent passed, men and women	Number failed		Per cent failed		Total per cent failed, men and women
			Men	Women	Men	Women		Men	Women	Men	Women		Men	Women	Men	Women	
164.	Machinist	April, 1921	17		15		88.2	12		80.0		80.0	3		20.0		20.0
165.	Machinist, helper	Dec., 1920	1		1		100.0	1		100.0		100.0					
166.	Manager, business, California School for Girls	Feb. 19, 1921		2		2	100.0		1		50.0	50.0		1		50.0	50.0
167.	Matron	Nov., 1920		6		4	66.7		4		100.0	100.0					
168.	Matron	June, 1921		3		3	100.0		2		66.7	66.7		1		33.3	33.3
169.	Matron, California School for Girls	Feb. 19, 1921		23		19	82.6		17		89.4	89.4		2		10.6	10.6
170.	Mechanic	Dec., 1920	6		6		100.0	6		100.0		100.0					
171.	Mechanic	April, 1921	8		6		75.0	3		50.0		50.0	3		50.0		50.0
172.	Mechanic, helper	Dec., 1920	3		3		100.0	3		100.0		100.0					
173.	Messenger	July, 1920	1	3	1	3	100.0	1	3	100.0	100.0	100.0					
174.	Messenger	Aug., 1920	3	2	3	2	100.0	3	2	100.0	100.0	100.0					
175.	Messenger	Sept., 1920		1		1	100.0		1		100.0	100.0					
176.	Messenger	Oct., 1920	1	1	1	1	100.0	1	1	100.0	100.0	100.0					
177.	Messenger	Nov., 1920	2	2	2	2	100.0	2	2	100.0	100.0	100.0					
178.	Messenger	Dec., 1920		1		1	100.0		1		100.0	100.0					
179.	Messenger	Jan., 1921	6	3	6	3	100.0	6	3	100.0	100.0	100.0					
180.	Messenger	Jan. 11, 1921	3	3	2	3	83.3	2	3	100.0	100.0	100.0					
181.	Messenger	Mar. 5, 1921	4	1	3	1	80.0	3	1	100.0	100.0	100.0					
182.	Messenger	April 2, 1921	1		1		100.0	1		100.0		100.0					
183.	Messenger	May 7, 1921	3		2		66.7	2		100.0		100.0					
184.	Messenger	June 4 1921		3		3	100.0		3		100.0	100.0					
185.	Milker	Nov., 1920	3		3		100.0	2		66.7		66.7	1		33.3		33.3
186.	Milker	June, 1921	1		1		100.0	1		100.0		100.0					
187.	Nurse	July 1, 1920		1		1	100.0							1		100.0	100.0
188.	Nurse	Nov., 1920		5		4	80.0		4		100.0	100.0					
189.	Nurse, California School for Girls	Feb. 19, 1921		2		2	100.0		2		100.0	100.0					
190.	Nurse	June, 1921		1		1	100.0		1		100.0	100.0					
191.	Painter	Dec., 1920	6		4		66.7	4		100.0		100.0					
192.	Painter	April, 1921	12		8		66.7	5		62.5		62.5	3		37.5		37.5
193.	Physical director, California School for Girls	Feb. 19, 1921		1		1	100.0		1		100.0	100.0					
194.	Physician, assistant	April 16, 1921	17	2	11	2	68.4	4	2	36.3	100.0	46.1	7		63.7		53.9
195.	Pilman	Dec., 1920	5		3		60.0	1		33.3		33.3	2		66.7		66.7
196.	Pileman	April, 1921	1		1		100.0	1		100.0		100.0					
197.	Plasterer	April, 1921	6		5		83.3	5		100.0		100.0					
198.	Plumber, foreman	Dec., 1920	1		1		100.0	1		100.0		100.0					

199.	Plumber, journeyman	Dec.,	1920	4		4		100.0	4		100.0		100.0				
200.	Plumber	April,	1921	9		9		100.0	9		100.0		100.0				
201.	Plumber, helper	Dec.,	1920	1		1		100.0	1		100.0		100.0				
202.	Porter, State Printing Office	Dec.,	1920	10		9		90.0	7		77.8		77.8	2		22.2	22.2
203.	Porter, State Printing Office	April,	1921	1		1		100.0	1		100.0		100.0				
204.	Poultryman	Nov.,	1920	2		2		100.0	1		50.0		50.0	1		50.0	50.0
205.	Pressman, cylinder	Dec.,	1920	3		3		100.0						3		100.0	100.0
206.	Pressman, cylinder	April,	1921	2		2		100.0	2		100.0		100.0				
207.	Pressman, platen	Dec.,	1920	14		11		78.5	6		54.5		54.5	5		45.5	45.5
208.	Principal, school, California School for Girls	Feb. 19,	1921		1		1	100.0		1		100.0	100.0				
209.	Printer, apprentice	Dec.,	1920	1		1		100.0	1		100.0		100.0				
210.	Proofreader	Dec.,	1920	8	1	8	1	100.0	5	1	62.5	100.0	66.7	3		37.5	33.3
211.	Proofreader, Motor Vehicle Department	Nov. 8,	1920		6		6	100.0		6		100.0	100.0				
212.	Proofreader, Motor Vehicle Department	Dec. 6,	1920		7		7	100.0		7		100.0	100.0				
213.	Seamstress, assistant	Nov.,	1920		6		5	83.3		2		40.0	40.0		3	60.0	60.0
214.	Seamstress	June,	1921		3		1	33.3		1		100.0	100.0				
215.	Secretary, assistant, in charge of credentials, State Board of Education	Aug. 14,	1920	2	8	1	7	80.0	1	5	100.0	71.4	75.0		2	28.6	25.0
216.	Section hand	Dec.,	1920	7		5		71.4	5		100.0		100.0				
217.	Sheet metal worker	Dec.,	1920	4		2		50.0	2		100.0		100.0				
218.	Sheet metal worker	April,	1921	2		1		50.0	1		100.0		100.0				
219.	Statistician, State Controller (promotional)	July 10,	1920	1		1		100.0	1		100.0		100.0				
220.	Steamfitter	Dec.,	1920	4		3		75.0	3		100.0		100.0				
221.	Steamfitter	April,	1921	7		7		100.0	7		100.0		100.0				
222.	Stenographer and typist	Aug. 7,	1920	2	33	2	31	94.2		9		29.0	27.2	2	22	100.0	71.0	72.0
223.	Stenographer and typist	Oct. 2,	1920	1	45		40	86.9		10		33.3	33.3		30		66.7	66.7
224.	Stenographer and typist	Dec. 4,	1920		67		64	95.5		34		53.1	53.1		30		46.9	46.9
225.	Stenographer and typist	Feb. 5,	1921	5	108	5	98	91.1	4	64	80.0	65.3	66.0	1	34	20.0	34.7	34.0
226.	Stenographer and typist	April 2,	1921	4	93	3	74	79.3		23		31.1	29.8	3	51	100.0	38.9	70.2
227.	Stenographer and typist	June 4,	1921	2	82	1	68	82.2	1	30	100.0	44.1	44.9		38		55.9	55.1
228.	Stenographer, Compensation Insurance Fund	Oct.,	1920		7		6	85.7		5		83.3	83.3		1		16.7	16.7
229.	Stenographer, grade 2 (promotional), Corporation Department	Mar. 1,	1921		1		1	100.0		1		100.0	100.0					
230.	Stenographer, grade 2 (promotional), Fish and Game Commission	Oct. 16,	1920		3		3	100.0		2		66.7	66.7		1		33.3	33.3
231.	Stenographer-secretary, California School for Girls	Feb. 19,	1921		2		2	100.0		2		100.0	100.0					
232.	Superintendent Underwriting Department, Compensation Insurance Fund (promotional)	Aug. 14,	1920	1		1		100.0	1		100.0		100.0					
233.	Supervisors	Nov.,	1920	2		2		100.0	2		100.0		100.0					
234.	Switchman	Dec.,	1920	29		29		100.0	22		75.8		75.8	7		24.2	24.2
235.	Switchman	April,	1921	9		4		44.4	2		50.0		50.0		2	50.0	50.0
236.	Teacher (grade), California School for Girls	Feb. 19,	1921		1												
237.	Teacher (high school), California School for Girls	Feb. 19,	1921		1												
238.	Teacher of domestic science, California School for Girls	Feb. 19,	1921		2		2	100.0							2	100.0	100.0
239.	Teacher (grade), Sonoma State Home	June 11,	1921		2		2	100.0		1		50.0	50.0		1	50.0	50.0

APPENDIX IV—Continued.

Tabular Statement of Examinations Held and Results Obtained During Period From July 1, 1920, to July 1, 1921.

	Kind of examination	Date	Number of applicants		Number examined		Per cent examined, men and women	Number passed		Per cent passed		Total per cent passed, men and women	Number failed		Per cent failed		Total per cent failed, men and women
			Men	Women	Men	Women		Men	Women	Men	Women		Men	Women	Men	Women	
240.	Teacher of arts and crafts, Sonoma State Home	June 11, 1921		2		1	50.0		1		100.0	100.0					
241.	Teacher of recreation and gymnastics, Sonoma State Home	June 11, 1921		2		1	50.0		1		100.0	100.0					
242.	Teacher, kindergarten and sense training, Sonoma State Home	June 11, 1921		1		1	100.0		1		100.0	100.0					
243.	Teacher of orchestra and band, Sonoma State Home	June 11, 1921		1			100.0	1		100.0		100.0					
244.	Teacher of vocal and instrumental music, Sonoma State Home	June 11, 1921		1		1	100.0		1		100.0	100.0					
245.	Teacher of household arts, Sonoma State Home	June 11, 1921		1		1	100.0		1		100.0	100.0					
246.	Teamster	April, 1921	3		2		66.7						2		100.0		100.0
247.	Telephone operator	Oct. 30, 1921		10		3	80.0		4		50.9	50.0		4		50.0	50.0
248.	Tractor operator	Nov., 1920	4		3		75.0	3		100.0		100.0					
249.	Tractor operator	June, 1921	1														
250.	Truckdriver (heavy)	Dec., 1920	31		29		93.5	17		58.6		58.6	12		41.4		41.4
251.	Truckdriver (light)	Dec., 1920	2		2		100.0	2		100.0		100.0					
252.	Truckdriver	April, 1921	185		167		89.2	111		67.2		67.2	54		32.8		32.8
253.	Tugboat captain (promotional)	Oct. 18, 1920	1		1		100.0	1		100.0		100.0					
254.	Typist, Compensation Insurance Fund	Oct., 1920		5		4	80.0		4		100.0	100.0					
255.	Typist, Motor Vehicle Department	Nov. 8, 1920		19		18	94.7		18		100.0	100.0					
256.	Typist, Motor Vehicle Department	Dec. 6, 1920		22		21	95.4		20		95.2	95.2		1		4.8	4.8
257.	Waiter	Nov., 1920	1		1		100.0						1		100.0		100.0
258.	Waiter	June, 1921	1														
259.	Waitress	Aug. 1, 1920		5		5	100.0		5		100.0	100.0					
260.	Waitress	Nov., 1920		19		14	73.7		11		78.5	78.5		3		21.5	21.5
261.	Waitress	June, 1921		2													
262.	Watchman	Dec., 1920	22		18		81.7	16		88.9		88.9	2		11.1		11.1
263.	Watchman	April, 1921	10		7		70.0	5		71.4		71.4	2		28.6		28.6
264.	Watchman, California School for Girls	Feb. 19, 1921	5		4		80.0	2		50.0		50.0	2		50.0		50.0
265.	Wireman, inside	Dec., 1920	3		3		100.0	3		100.0		100.0					
266.	Wireman, inside (helper)	Dec., 1920	2		2		100.0	2		100.0		100.0					
	Totals		2088	1387	1776	1220		995	764				781	456			
	Percentages						86.2			56.0	62.6	58.7			44.0	37.4	41.3

APPENDIX IV—Continued.

Tabular Statement of Examinations Held and Results Obtained During Period From July 1, 1921, to July 1, 1922.

Kind of examination	Date	Number of applicants		Number examined		Per cent examined men and women	Number passed		Per cent passed		Total per cent passed men and women	Number failed		Per cent failed		Total per cent failed men and women
		Men.	Women.	Men.	Women.		Men.	Women.	Men.	Women.		Men.	Women.	Men.	Women.	
1. Accountant	Nov. 12, 1921	61		51		83.6	28		54.9		54.9	23		45.1		45.1
2. Agent, Bureau of Labor Statistics	Mar. 3, 1922	24	8	19	7	81.2	7	2	36.8	28.5	34.6	12	5	63.2	71.5	65.4
3. Agent, special, Compensation Insurance Fund	Sept. —, 1921	3		2		66.7	2		100.0		100.0					
4. Assistant to the Surveyor General	Dec. 3, 1921	13		12		92.3	10		83.3		83.3	2		16.7		16.7
5. Attendant, Agnews State Hospital	Nov. —, 1921	33	28	31	27	95.0	27	23	87.1	85.2	86.2	4	4	12.9	14.8	13.8
6. Attendant, Industrial Home for the Adult Blind	Nov. —, 1921	2	2	1	2	75.0		1		50.0	33.3	1	1	100.0	50.0	66.7
7. Attendant, Mendocino State Hospital	Nov. —, 1921	23	18	23	18	100.0	19	18	82.6	100.0	90.2	4		17.4		9.8
8. Attendant, Napa State Hospital	Nov. —, 1921	52	33	51	32	97.6	45	30	88.2	93.7	90.3	6	2	11.8	6.3	9.7
9. Attendant, Norwalk State Hospital	Nov. —, 1921	21	17	18	17	92.1	17	16	94.4	94.1	94.2	1	1	5.6	5.9	5.8
10. Attendant, Sonoma State Home	Nov. —, 1921	11	14	10	13	92.0	10	11	100.0	84.6	91.3		2		15.4	8.7
11. Attendant, Southern California State Hospital	Nov. —, 1921	40	31	39	31	98.6	33	26	84.6	83.9	82.8	6	5	15.4	16.1	17.2
12. Attendant, Stockton State Hospital	Nov. —, 1921	24	12	22	11	91.4	22	8	100.0	72.7	90.0		3		27.3	10.0
13. Attendant, Veterans' Home	Nov. —, 1921	5		5		100.0	4		80.0		80.0	1		20.0		20.0
14. Baker	Nov. —, 1921	4		4		100.0	2		50.0		50.0	2		50.0		50.0
15. Bindery worker	Mar. 25, 1922		6		4	66.7		4		100.0	100.0					
16. Bindery worker (apprentice)	Mar. 25, 1922		5		2	40.0		2		100.0	100.0					
17. Blacksmith	Mar. 25, 1922	18		12		66.7	10		83.3		83.3	2		16.7		16.7
18. Blacksmith (railroad)	Mar. 25, 1922	5		3		60.0	1		33.3		33.3	2		66.7		66.7
19. Boilermaker	Mar. 25, 1922	7		5		71.4	4		80.0		80.0	1		20.0		20.0
20. Bookbinder (forwarder)	Mar. 25, 1922	4		3		75.0	3		100.0		100.0					
21. Bookbinder (apprentice)	Mar. 25, 1922	3		3		100.0	3		100.0		100.0					
22. Book repairer	Mar. 25, 1922		4		3	75.0		3		100.0	100.0					
23. Bookkeeper	Aug. 6, 1921	4	3	3	3	85.7	2		66.7		33.3	1	3	33.3	100.0	66.7
24. Bookkeeper	Nov. 5, 1921	17	17	13	15	82.3	2	2	15.4	13.3	14.3	11	13	84.6	86.7	84.7
25. Bookkeeper	Feb. 4, 1922	66	20	43	17	69.8	4	2	9.3	11.8	10.0	39	15	90.7	88.2	90.0
26. Bookkeeper	May 6, 1922	32	42	23	33	75.6	4	1	17.4	3.0	9.1	19	32	82.6	97.0	30.9
27. Bricklayer	Mar. 25, 1922	5		5		100.0	4		80.0		80.0	1		20.0		20.0
28. Bridgetender	Mar. 25, 1922	12		12		100.0	8		66.7		66.7	4		33.3		33.3
29. Butcher	Nov. —, 1921	2		2		100.0	1		50.0		50.0	1		50.0		50.0
30. Buyer, fabric	Oct. 29, 1921	7		7		100.0	3		42.8		42.8	4		57.2		57.2
31. Captain of tugs and dredgers	Mar. 25, 1922	5		5		100.0	3		60.0		60.0	2		40.0		40.0
32. Carpenter	Mar. 25, 1922	71		52		73.2	35		67.3		67.3	17		32.7		32.7
33. Carpenter foreman, Harbor Commission	July 30, 1921	4		4		100.0	3		75.0		75.0	1		25.0		25.0
34. Cement finisher	Mar. 25, 1922	9		7		77.8	5		71.4		71.4	2		28.6		28.6
35. Chauffeur	Nov. —, 1921	26		23		88.5	9		39.1		39.1	14		60.9		60.9
36. Chauffeur and mechanic	Mar. 25, 1922	11		7		63.6	5		71.4		71.4	2		28.6		28.6

APPENDIX IV—Continued.

Tabular Statement of Examinations Held and Results Obtained During Period From July 1, 1921, to July 1, 1922.

Kind of examination	Date	Number of applicants		Number examined		Per cent examined, men and women	Number passed		Per cent passed		Total per cent passed, men and women	Number failed		Per cent failed		Total per cent failed, men and women
		Men	Women	Men	Women		Men	Women	Men	Women		Men	Women	Men	Women	
37. Clerk, junior	Nov. 12, 1921	92	329	77	267	88.9	19	76	24.6	27.6	25.4	58	221	75.4	74.4	74.6
38. Clerk, junior	April 4, 1922	124	329	102	298	85.6	32	117	31.3	39.2	30.7	70	181	68.7	60.8	69.3
39. Clerk, junior (promotional)	April 22, 1922	1	8	1	8	100.0		4		50.0	44.4	1	4	100.0	50.0	55.6
40. Clerk, senior	Nov. 19, 1921	155	140	137	117	86.1	35	30	25.5	25.6	29.1	102	78	74.5	66.7	70.9
41. Clerk, senior	April 29, 1922	228	229	202	202	88.4	77	88	38.1	43.5	40.5	125	114	61.9	56.5	59.5
42. Clerk, Compensation Insurance Fund	Sept. —, 1921	5	2	5	1	57.1	2	1	66.7	100.0	75.0	1		33.3		25.0
43. Clerk, placement	Mar. 3, 1922	41	35	36	31	88.2	18	13	50.0	41.9	46.3	18	18	50.0	58.1	53.7
44. Complaint officer, Grade II, Immigration and Housing Commission	July 1, 1921	5	1	3	1	66.7	1		33.3		25.0	2	1	66.7	100.0	75.0
45. Complaint officer, Grade II, Immigration and Housing Commission	July 1, 1921	5		5		100.0	4		80.0		80.0	1		20.0		20.0
46. Complaint officer, Grade I, Immigration and Housing Commission	Nov. 26, 1921	4		4		100.0	2		50.0		50.0	2		50.0		50.0
47. Compositor	Mar. 25, 1922	10		8		80.0	4		50.0		50.0	4		50.0		50.0
48. Cook	Nov. —, 1921	27	13	23	10	80.2	17	9	73.9	90.0	78.8	6	1	26.1	10.0	21.2
49. Copyholder	Mar. 25, 1922		5		4	80.0		2		50.0	50.0		2		50.0	50.0
50. Copyholder (apprentice)	Mar. 25, 1922		4		4	100.0		3		75.0	75.0		1		25.0	25.0
51. Dairyman	Nov. —, 1921	4		4		100.0	3		75.0		75.0	1		25.0		25.0
52. Deckhand	Mar. 25, 1922	15		14		93.3	11		78.5		78.5	3		21.5		21.5
53. Defeator, Grade III	May 13, 1922	10		9		90.5	5		55.5		55.5	4		44.5		44.5
54. Deputy, Corporation Department	July 9, 1921	31		26		83.9	10		38.4		38.4	16		61.6		61.6
55. Deputy, Real Estate Commission	Nov. 12, 1921	30	5	26	4	85.7	9		34.6		30.0	17	4	65.4	100.0	70.0
56. Deputy, Real Estate Commission (promotional)	Nov. 12, 1921	1		1		100.0						1		100.0		100.0
57. Deputy, Chief, Real Estate Commission	Jan. 14, 1922	2		2		100.0	2		100.0		100.0					
58. Designer, architectural, Grade IV	June 24, 1922	1		1		100.0						1		100.0		100.0
59. Designer, architectural, Grade V	June 24, 1922	2		2		100.0	1		50.0		50.0	1		50.0		50.0
60. Director, Free Employment Bureaus	April 22, 1922	14	1	12		80.0	2		16.7		16.7	10		83.3		83.3
61. Draftsman, architectural, Grade III	Feb. 11, 1922	11		8		71.7	5		62.5		62.5	3		37.5		37.5
62. Draftsman, architectural, Grade IV	June 24, 1922	7		7		100.0	4		57.1		57.1	3		42.9		42.9
63. Draftsman, civil engineer, Grade I	May 13, 1922	17	5	12	4	72.7	3		25.0		17.7	9	4	75.0	100.0	82.3
64. Draftsman, civil engineer, Grade II	May 13, 1922	23	1	21	1	91.7	10		47.6		45.4	11	1	52.4	100.0	54.6
65. Draftsman, civil engineer, Grade III	May 13, 1922	33	2	28	2	85.7	10	1	35.7	50.0	36.7	18	1	64.3	50.0	63.3
66. Draftsman, civil engineer, Grade III (promot'al)	May 13, 1922	3		3		100.0						3		100.0		100.0
67. Draftsman, civil engineer, Grade IV	May 13, 1922	19		19		100.0	5		26.3		26.3	14		73.7		73.7
68. Draftsman, civil engineer, Grade IV (promot'al)	May 13, 1922	9		9		100.0	1		11.1		11.1	8		88.9		88.9
69. Draftsman, electrical engineer, Grade II	Aug. 13, 1921	5		5		100.0	2		40.0		40.0	3		60.0		60.0
70. Draftsman, electrical engineer, Grade III	Aug. 13, 1921	6		5		83.3	2		40.0		40.0	3		60.0		60.0

71.	Draftsman, electrical engineer, Grade III	May 20, 1922	4	3	75.0	1	33.3	33.3	2	66.7	66.7
72.	Draftsman, mechanical engineer, Grade II	Aug. 13, 1921	2	1	50.0	1	100.0	100.0			
73.	Draftsman, mechanical engineer, Grade II	May 13, 1922	3	3	100.0	2	66.7	66.7	1	33.3	33.3
74.	Draftsman, mechanical engineer, Grade III	Aug. 13, 1921	8	5	62.5	2	40.0	40.0	3	60.0	60.0
75.	Draftsman, mechanical engineer, Grade III	May 27, 1922	13	11	84.6				11	100.0	100.0
76.	Druggist	May 27, 1922	4	3	75.0	1	33.3	33.3	2	66.7	66.7
77.	Electrician, institutional	Nov. —, 1921	4	4	100.0	1	25.0	25.0	3	75.0	75.0
78.	Elevator operator	Mar. 24, 1922	7	6	85.7	2	33.3	33.3	4	66.7	66.7
79.	Engineering aid, junior, Grade I	May 6, 1922	70	58	82.8	56	96.5	2	96.5	2	3.5	3.5
80.	Engineering aid, civil, Grade II	May 6, 1922	119	104	87.4	83	79.8	79.8	21	20.2	20.2
81.	Engineering aid, civil (promotional)	May 6, 1922	2	2	100.0				2	100.0	100.0
82.	Engineer, junior civil, Grade III	May 6, 1922	97	86	88.6	53	61.6	61.6	33	38.4	38.4
83.	Engineer, junior civil (promotional)	May 6, 1922	3	3	100.0				3	100.0	100.0
84.	Engineer, assistant civil, Grade IV	May 6, 1922	87	78	89.6	16	20.5	20.5	62	79.5	79.5
85.	Engineer, assistant civil (promotional)	May 6, 1922	13	13	100.0				13	100.0	100.0
86.	Engineer, assistant civil, Grade IV (asphalt concrete)	May 13, 1922	18	16	88.9	10	62.5	62.5	6	37.5	37.5
87.	Engineer, assistant civil, Grade IV (asphalt macadam)	May 13, 1922	5	4	80.0	1	25.0	25.0	3	75.0	75.0
88.	Engineer, assistant civil, Grade IV (locating)	May 13, 1922	15	14	93.3	3	21.5	21.5	11	78.5	78.5
89.	Engineer, associate highway, Grade V	Sept. 17, 1921	82	72	87.8	25	34.7	34.7	47	65.3	65.3
90.	Engineer, associate highway, Grade V	May 6, 1922	24	21	87.5	7	33.3	33.3	14	66.7	66.7
91.	Engineer, highway, Grade VI	Sept. 17, 1921	43	41	95.3	7	17.0	17.0	34	83.0	83.0
92.	Engineer, junior hydraulic, Grade III	Aug. 6, 1921	28	27	96.4	14	51.8	51.8	13	48.2	48.2
93.	Engineer, junior hydraulic, Grade III	May 13, 1922	42	38	90.5	34	89.4	4	10.6	10.6
94.	Engineer, assistant hydraulic, Grade IV	Aug. 6, 1921	39	36	92.3	20	55.5	55.5	16	44.5	44.5
95.	Engineer, assistant hydraulic, Grade IV	May 13, 1922	17	13	76.4	12	92.3	92.3	1	7.7	7.7
96.	Engineer, assistant hydraulic (promotional)	June 17, 1922	6	6	100.0	3	50.0	50.0	3	50.0	50.0
97.	Engineer, associate hydraulic, Grade V	Oct. 15, 1921	48	42	87.5	27	64.3	64.3	15	35.7	35.7
98.	Engineer, associate hydraulic, Grade V	May 13, 1922	8	6	75.0	3	50.0	50.0	3	50.0	50.0
99.	Engineer, associate hydraulic (promotional)	May 13, 1922	4	4	100.0	2	50.0	50.0	2	50.0	50.0
100.	Engineer, hydraulic, Grade VI (promotional)	Oct. 15, 1921	4	4	100.0	2	50.0	50.0	2	50.0	50.0
101.	Engineer, assistant electrical, Grade IV	June 24, 1922	5	5	100.0	4	80.0	80.0	1	20.0	20.0
102.	Engineer, assistant mechanical, Grade IV	June 24, 1922	8	7	87.5	3	42.8	42.8	4	57.2	57.2
103.	Engineer, assistant mechanical, Grade IV (promotional)	June 24, 1922	6	6	100.0				6	100.0	100.0
104.	Engineer, associate mechanical, Grade V	Mar. 18, 1922	13	12	92.3	3	25.0	25.0	9	75.0	75.0
105.	Engineer, junior mining, Grade III	May 27, 1922	5	4	80.0	4	100.0	100.0			
106.	Engineer, assistant mining, Grade IV	May 27, 1922	9	8	88.9	5	62.5	62.5	3	37.5	37.5
107.	Engineer, associate mining, Grade V	May 27, 1922	7	4	57.2	3	75.0	75.0	1	25.0	25.0
108.	Engineer, petroleum	Sept. 17, 1921	30	28	93.3	17	60.7	60.7	11	39.3	39.3
109.	Engineer, petroleum	May 20, 1922	15	14	93.3	4	28.5	28.5	10	71.5	71.5
110.	Engineer, stationary	Nov. —, 1921	8	7	87.5	2	28.5	28.5	5	71.5	71.5
111.	Engineer, stationary hoist	Mar. 25, 1922	7	6	85.7	2	33.3	33.3	4	66.7	66.7
112.	Engineer, junior structural, Grade III	Aug. 6, 1921	20	18	90.0	14	77.8	77.8	4	22.2	22.2
113.	Engineer, junior structural, Grade III	May 27, 1922	7	5	71.4	1	20.0	20.0	4	80.0	80.0
114.	Engineer, assistant structural, Grade IV	May 20, 1922	17	14	82.3	6	41.8	41.8	8	58.2	58.2
115.	Engineer of estimates and costs, buildings	Feb. 4, 1922	3	3	100.0	1	33.3	33.3	2	66.7	66.7

APPENDIX IV—Continued.

Tabular Statement of Examinations Held and Results Obtained During Period From July 1, 1921, to July 1, 1922.

	Kind of examination	Date	Number of applicants		Number examined		Per cent exam. [incl. men and women]	Number passed		Per cent passed		Total per cent passed, men and women	Number failed		Per cent failed		Total per cent failed, men and women
			Men	Women	Men	Women		Men	Women	Men	Women		Men	Women	Men	Women	
116.	Engineman, locomotive hoist	Mar. 25, 1922	2		1		50.0						1		100.0		100.0
117.	Engineman, marine	Mar. 25, 1922	18		10		55.5	6		60.0		60.0	4		40.0		40.0
118.	Engineman, piledriver	Mar. 25, 1922	3		2		66.7	1		50.0		50.0	1		50.0		50.0
119.	Engineman and pilot, motor boat	Mar. 25, 1922	1		1		100.0	1		100.0		100.0					
120.	Estimator, junior	Feb. 18, 1922	7		7		100.0	3		41.8		41.8	4		58.2		58.2
121.	Estimator, assistant	Feb. 4, 1922	16		13		81.2	3	2	23.1		23.1	10		76.9		76.9
122.	Executive officer, assistant	July 1, 1921	11		7		63.6	1		14.2		14.2	6		85.8		85.8
123.	Farmer, head	Nov. —, 1921	2		2		100.0	2		100.0		100.0					
124.	Farmer	Nov —, 1921	35		28		80.0	23		82.1		82.1	5		17.9		17.9
125.	Fireman, locomotive	Mar. 25, 1922	14		7		50.0	2		28.4		28.4	5		71.6		71.6
126.	Fireman, marine	Mar. 25, 1922	18		12		66.7	10		83.3		83.3	2		16.7		16.7
127.	Fireman, stationary	Nov. —, 1921	18		14		88.9	7		50.0		50.0	7		50.0		50.0
128.	Fire ranger, district	Aug. 6, 1921	49		34		69.4	29		58.8		58.8	14		41.2		41.2
129.	Foreman of construction, general	Aug. 6, 1921	12		12		100.0	5		41.7		41.7	7		58.3		58.3
130.	Foreman of maintenance and repairs, bridges	Nov. 26, 1921	64		54		84.3	5		9.2		9.2	49		90.8		90.8
131.	Gardener, landscape	Nov. —, 1921	3		2		66.7						2		100.0		100.0
132.	Garden laborer	Nov. —, 1921	6		6		100.0	5		83.3		83.3	1		16.7		16.7
133.	Gardener, vegetable	Nov. —, 1921	3		3		100.0	2		66.7		66.7	1		33.3		33.3
134.	Handyman	Nov. —, 1921	4		4		100.0	1		25.0		25.0	3		75.0		75.0
135.	Housekeeper	Nov. —, 1921		2		1	50.0							1		100.0	100.0
136.	Hydrotherapist	Nov. —, 1921	10	5	8	4	70.5	5	4	62.5	100.0	75.0	3		37.5		25.0
137.	Inspector, apple packing	July 2, 1921	14		14		100.0	7		50.0		50.0	7		50.0		50.0
138.	Inspector, camp	Nov. 26, 1921	22		21		95.4	11		52.3		52.3	10		47.7		47.7
139.	Inspector, chief housing, Commission of Immigration and Housing	July 1, 1921	8		7		87.5	2		28.4		28.4	5		71.6		71.6
140.	Inspector, housing, Commission of Immigration and Housing	July 1, 1921	22		19		86.3	4		21.0		21.0	15		79.0		79.0
141.	Inspector, motor vehicle	Jan. 21, 1922	138	1	114	1	82.7	28		24.5		24.3	86	1	75.5	100.0	75.7
142.	Inspector, office, Department of Petroleum and Gas	Feb. 25, 1922	4		4		100.0	2		50.0		50.0	2		50.0		50.0
143.	Interne	Oct. 15, 1921	1														
144.	Janitor	Mar. 25, 1922	57		41		71.9	27		65.8		65.8	14		34.2		34.2
145.	Janitress	Mar. 25, 1922		3		1	33.3		1		100.0						
146.	Kitchen help	Nov. —, 1921	4		4		100.0	3		75.0		75.0	1		25.0		25.0
147.	Labor Commission, deputy	Mar. 4, 1922	15	3	9	3	66.7	5	3	55.5	100.0	66.7	4		44.5		33.3
148.	Laundress	Nov. —, 1921		2		2	100.0		1		50.0	50.0		1		50.0	50.0

149.	Laundry help	Nov. —, 1921	4	4	3	4	87.5	3	4	100.0	100.0	100.0					
150.	Laundryman	Nov. —, 1921	6		5		83.3	2		40.0		40.0	3		60.0		60.0
151.	Leverman	Mar. 25, 1922	6		6		100.0	4		66.7		66.7	2		33.3		33.3
152.	Linotype machinist	Mar. 25, 1922	5		2		40.0	2		100.0		100.0					
153.	Linotype operator	Mar. 25, 1922	13		6		46.1	3		50.0		50.0	3		50.0		50.0
154.	Machinist	Mar. 25, 1922	39		26		66.7	16		61.5		61.5	10		38.5		38.5
155.	Machinist, automobile	Mar. 25, 1922	6		5		83.3	2		40.0		40.0	3		60.0		60.0
156.	Machinist, locomotive	Mar. 25, 1922	7		4		57.1	3		75.0		75.0	1		25.0		25.0
157.	Manager, business, State hospitals	Oct. 15, 1921	23		23		100.0	5		21.7		21.7	18		78.3		78.3
158.	Manager, business, State hospitals	Mar. 11, 1922	12		11		91.7	4		36.3		36.3	7		63.7		63.7
159.	Manager Free Employment Bureau	Mar. 4, 1922	28	18	24	15	84.8	10	5	43.3	33.3	38.5	14	10	46.7	66.7	61.5
160.	Matron	Nov. —, 1921		8		7	87.5		3		41.8	41.8		4		58.2	58.2
161.	Matron, assistant	Feb. 7, 1922		24		19	79.1		4		21.0	21.0		15		79.0	79.0
162.	Mechanic	Mar. 25, 1922	18		9		50.0	7		77.8		77.8	2		22.2		22.2
163.	Mechanic, automobile	Mar. 25, 1922	84		70		83.3	42		60.0		60.0	28		40.0		40.0
164.	Messenger	July 2, 1921	1	5	1	5	100.0	1	5	100.0	100.0	100.0					
165.	Messenger	Aug. 6, 1921	1		1		100.0	1		100.0		100.0					
166.	Messenger	Sept. 3, 1921	3		3		100.0	3		100.0		100.0					
167.	Messenger	Oct. 1, 1921	2	3	2	3	100.0	2	3	100.0	100.0	100.0					
168.	Messenger	Nov. 5, 1921	1	1	1	1	100.0	1	1	100.0	100.0	100.0					
169.	Messenger	Dec. 5, 1921	1	1	1	1	100.0	1		100.0		50.0		1		100.0	50.0
170.	Messenger	Jan. 7, 1922		1		1	100.0		1		100.0	100.0					
171.	Messenger	Feb. 4, 1922	1	10	1	8	81.8	1	8	100.0	100.0	100.0					
172.	Messenger	Mar. 4, 1922	3	1	3	1	100.0	3	1	100.0	100.0	100.0					
173.	Messenger	April 8, 1922	12	5	9	3	70.6	7	3	77.8	100.0	83.3	2		22.2		16.7
174.	Milker	Nov. —, 1921	4		4		100.0	4		100.0		100.0					
175.	Monotype casting machine operator	Mar. 25, 1922	1		1		100.0	1		100.0		100.0					
176.	Monotype keyboard operator	Mar. 25, 1922	2		2		100.0	1		50.0		50.0	1		50.0		50.0
177.	Nurse (graduate, general)	Nov. —, 1921		3		3	100.0		3		100.0	100.0					
178.	Nurse (graduate, surgical)	Nov. —, 1921		1		1	100.0		1		100.0	100.0					
179.	Painter	Mar. 25, 1922	21		18		85.7	7		38.9		38.9	11		61.1		61.1
180.	Petrographer	May 13, 1922	2		2		100.0	2		100.0		100.0					
181.	Physician, assistant	Oct. 15, 1921	3	2	3	1	80.0	3		100.0		75.0		1		100.0	25.0
182.	Physician, assistant	May 8, 1922	9	7	9	5	85.7	3	3	33.3	60.0	45.7	6	2	66.7	40.0	54.3
183.	Pileman	Mar. 25, 1922	21		13		61.9	9		69.2		69.2	4		30.8		30.8
184.	Plasterer	Mar. 25, 1922	3		2		66.7	2		100.0		100.0					
185.	Plumber	Mar. 25, 1922	21		19		90.5	16		84.2		84.2	3		15.8		15.8
186.	Porter, State Printing Office	Mar. 25, 1922	7		5		71.4	4		80.0		80.0	1		20.0		20.0
187.	Poultryman	Nov. —, 1921	1		1		100.0	1		100.0		100.0					
188.	Pressman, cylinder	Mar. 25, 1922	7		5		71.4	5		100.0		100.0					
189.	Pressman, platen	Mar. 25, 1922	4		3		75.0	3		100.0		100.0					
190.	Pressman, two-color, No. 6-0 Meihle	Mar. 25, 1922	1		1		100.0	1		100.0		100.0					
191.	Pressman (apprentice)	Mar. 25, 1922	1		1		100.0	1		100.0		100.0					
192.	Printer, floor (apprentice)	Mar. 25, 1922	2		2		100.0	1		50.0		50.0	1		50.0		50.0
193.	Proofreader	Mar. 25, 1922		1													
194.	Proofreader (apprentice)	Mar. 25, 1922		1													
195.	Purchasing agent, Grade III	Nov. 12, 1921	21	1	15	1	72.7	12	1	80.0	100.0	86.7	3		20.0		13.3
196.	Purchasing agent, Grade IV	Nov. —, 1921	30		29		96.7	3		10.3		10.3	26		89.7		89.7
197.	Purchasing agent, Grade V	Nov. 5, 1921	21		16		76.2	2		12.5		12.5	14		87.5		87.5

APPENDIX IV—Concluded.

	Kind of examination	Date	Number of applicants		Number examined		Per cent examined, men and women	Number passed		Per cent passed		Total per cent passed, men and women	Number failed		Per cent failed		Total per cent failed, men and women
			Men	Women	Men	Women		Men	Women	Men	Women		Men	Women	Men	Women	
198.	Seamstress	Nov. —, 1921		5		5	100.0		4	80.0	80.0	80.0		1		20.0	20.0
199.	Section hand	Mar. 25, 1922	29		21		72.4	19		90.5		90.5	2		9.5		9.5
200.	Sheet metal worker	Mar. 25, 1922	4		4		100.0	4		100.0		100.0					
201.	Statistician, Bureau of Labor Statistics	April 22, 1922	7		3		70.0	1		20.0		14.2	4	2	80.0	100.0	85.8
202.	Steamfitter	Mar. 25, 1922	12		10		83.3	6		60.0		60.0	4		40.0		40.0
203.	Stenographer and typist	Aug. 6, 1921	2	76	1	43	56.4	1	32	100.0	74.4	75.0		11		25.6	25.0
204.	Stenographer and typist	Oct. 1, 1921	4	120	3	105	87.1		45	42.8	41.7	41.7	3	60	100.0	57.2	58.3
205.	Stenographer and typist	Dec. 3, 1921	1	185	1	160	86.5	1	62	100.0	38.8	39.1		98		61.2	60.9
206.	Stenographer and typist	Jan. 7, 1922	2	26	2	25	96.4		11		44.0	40.7	2	14	100.0	56.0	59.3
207.	Stenographer and typist	Feb. 4, 1922	6	83	3	60	70.8	1	23	33.3	38.7	38.1	2	37	66.7	61.3	61.9
208.	Stenographer and typist	Mar. 4, 1922	4	87	4	75	89.8	2	41	50.0	54.6	54.4	2	34	50.0	45.4	45.6
209.	Stenographer, Grade III (promotional), Attorney General	Mar. 4, 1922		2		2	100.0		1		100.0	100.0					
210.	Stenographer and typist	April 1, 1922	3	114	2	96	83.7	1	37	50.0	38.5	38.9	1	59	50.0	61.5	61.1
211.	Stenographer and typist	May 6, 1922	6	138	6	122	88.9	2	32	33.3	26.2	26.5	4	90	66.7	73.8	73.5
212.	Stenographer, Grade III (promotional), Attorney General	May 6, 1922		1		1	100.0							1		100.0	100.0
213.	Stenographer and typist	June 3, 1922	3	71	2	62	86.4		17		25.8	26.5	2	45	100.0	74.2	73.5
214.	Stenographer, Compensation Insurance Fund	Sept. —, 1921		1													
215.	Stenographer-interpreter, Commission of Immigration and Housing	July 1, 1921	1	3	1	3	100.0	1	3	100.0	100.0	100.0					
216.	Superintendent of construction, buildings	Aug. 6, 1921	17		17		100.0	7		41.2		41.2	10		58.8		58.8
217.	Superintendent of operation and maintenance, buildings	Dec. 10, 1921	24		20		83.3	9		45.0		45.0	11		55.0		55.0
218.	Supervisor	Nov. —, 1921	2		2		100.0	1		50.0		50.0	1		50.0		50.0
219.	Supervisor, assistant, in physical education	Sept. 24, 1921	6		6		100.0	1		16.7		16.7	5		83.3		83.3
220.	Switchman	Mar. 25, 1922	35		20		57.1	12		60.0		60.0	8		40.0		40.0
221.	Telephone operator and office attendant	Dec. 17, 1921	1	26	1	19	74.1	1	11	100.0	52.6	60.0		8		47.4	40.0
222.	Therapist, occupational	April 29, 1922	1	2		2	66.7		1		50.0	50.0		1		50.0	50.0
223.	Tractor operator	Nov. —, 1921	2		2		100.0						2		100.0		100.0
224.	Truck driver	Mar. 25, 1922	303		224		73.9	136		60.7		60.7	88		39.3		39.3
225.	Typist, Department Public Works (promotional)	Oct. 24, 1921		1		1	100.0							1	100.0	100.0	100.0
226.	Typist, Real Estate Commission	Jan. 7, 1922		34		34	100.0		10		29.4	29.4		24		70.6	70.6
227.	Typewriter repairman	Dec. 10, 1921	19		12		63.2	5		41.7		41.7	7		58.3		58.3

228. Waiter	Nov. —, 1921	3		2		66.7	2		100.0		100.0								
229. Waitress	Nov. —, 1921		37		34	91.6		29		85.2	85.2		5		14.8	14.8			
230. Watchman	Mar. 25, 1922	42		31		73.8	20		64.5		64.5	11		35.5		35.5			
231. Wireman, inside	Mar. 25, 1922	22		14		63.6	9		64.3		64.3	5		35.7		35.7			
232. Zoologist	Feb. 16, 1922	12		10		83.3	5		50.0		50.0	5		50.0		50.0			
Totals		4152	2494	3453	2161		1627	916				1826	1245						
Average percentages						84.4			47.1	42.2	45.3			52.9	57.6	54.7			

APPENDIX V.

FINANCIAL STATEMENT.
Seventy-second and Seventy-third Fiscal Years.

	Seventy-second fiscal year, 1920-1921	Seventy-second fiscal year, 1921-1922
Appropriation	$35,000 00	$43,690 00
Balance forward from seventy-first fiscal year	744 87	
Totals	$35,744 87	$43,690 00
Expenditures	35,711 00	43,008 90
Balances	$33 87	$681 10

Distribution of Expenditures.

	Seventy-third fiscal year, 1920-1921	Seventy-third fiscal year, 1921-1922
Office salaries	$18,270 04	$26,467 98
Commissioners' salaries	9,000 00	3,798 16
Traveling (administrative and examination)	3,428 92	3,448 06
Telephone and telegraph	478 80	691 80
Sacramento office incidental expense	796 33	1,173 08
Los Angeles office and rental	600 00	600 00
Postage	856 76	1,543 83
Printing	1,446 51	2,382 32
Furniture and equipment	250 86	2,110 51
Examination and classification expense	582 78	793 36
Totals	$35,711 00	$43,008 90

Distribution of Expenditures, Showing the Relative Amount Spent for Salaries and Other Expenses.

	Seventy-second fiscal year, 1920-1921			Seventy-third fiscal year, 1921-1922		
	Employees	Annual salary	Other expenses	Employees	Annual salary	Other expenses
(a) Examination division	5	$7,838 39	$1,586 65	8	$16,649 12	$2,310 21
(b) Certification division	1	1,393 25		1	1,573 56	
(c) Payroll division	1	1,335 72		1	1,465 33	
(d) Administrative division	8	16,702 68	6,854 31	8	10,578 13	10,432 45
Totals	15	$27,270 04	$8,440 96	18	$30,266 14	$12,742 76

APPENDIX VI.

RULES AND REGULATIONS OF THE STATE CIVIL SERVICE COMMISSION.

RULE 1.

SECTION 1. *'Qualifications.'* Applicants must be citizens of the United States and they must be between the ages of 21 and 60 years unless otherwise specified by the Commission at the time of the announcement of the examination.

SEC. 2. *Character and Fitness.* Every applicant must be of good moral character, of temperate habits, and in all respects physically competent to perform the duties of the position applied for.

RULE 2.

Applications.

SECTION 1. All applications must be made upon official blanks furnished by the Commission and filled out as therein directed.

Applicants taking more than one examination must file a new and complete application for each such examination.

SEC. 2. *Applicants to Present Credentials.* Wherever written examinations are required, each applicant whose application has been approved shall be notified through the post office of the time and place of the examination, and such notice shall be the credential of the applicant to take the examination.

SEC. 3. *Applicants for Positions as Laborers.* Applicants for laborers' positions must not be over sixty years of age. Laborers shall be appointed according to priority of application, but all such applicants shall be examined as to age, residence, physical condition and experience, and must be found to be in good physical condition and with the capacity to perform hard manual labor.

Separate lists of applicants shall be made for laborers for Sacramento, San Francisco, and Los Angeles. The names of those laborers on the list for Sacramento shall be drafted for positions nearest Sacramento; names of those laborers on the list for San Francisco shall be drafted for positions nearest San Francisco; and the names of those laborers on the list for Los Angeles shall be drafted for positions nearest Los Angeles. When any of these lists become exhausted, names may be certified from the other lists.

All applications for laborers' positions must be on forms furnished by the Commission, and shall take precedence according to their receipt in the office of the Commission at Sacramento, each application being given a serial number in the order of its receipt by the Commission.

RULE 3.

Applications not to be returned.

Applications and accompanying vouchers not returned for correction shall remain on file in the office of the Commission, and in no circumstance will be returned to applicants.

RULE 4.

Examinations.

SECTION 1. *Examinations to be Free.* All examinations shall be conducted under the supervision of the Executive Member of the Commission without any cost or expense to any applicant, except for a medical or physical examination when required.

SEC. 2. *Questions Placed Under Seal After Approval.* All examination questions shall be first approved by the Executive Member of the Commission. The examination questions after approval shall be securely sealed with the official seal of the Civil Service Commission. The seal shall not be broken until the beginning

of the examination and then only in the presence of all the candidates at the examination and the authorized agent of the Civil Service Commission.

SEC. 3. *Explanations.* All necessary explanations will be made to the whole class. No question will be explained to any individual candidate. Examiners are forbidden to explain the meaning of, or to make remarks relating to, any question that may assist in its solution.

SEC. 4. *Conversation During Examinations.* Communication between candidates during examination is strictly forbidden.

SEC. 5. *Leaving the Examination Room.* During an examination no candidate will be permitted to leave the room, except in case of extreme necessity, and then only with a representative of the Commission. A luncheon recess may be allowed, however, at the direction of the Commission.

SEC. 6. *Limit of Time.* The limit of time prescribed for such examination will be stated before the examination and shall begin to run when announcement is made by the examiner in charge.

SEC. 7. *Helps.* Candidates are forbidden to receive aid from a fellow candidate or to use helps in any form. Before the commencement of an examination candidates will be required to hand to the examiner any printed or written matter in their possession that might serve to aid them in the examination. Evidence of copying or collusion may result in the cancellation of examination papers and the debarment of the candidate from future examinations. Copies of the questions in the examination may not be made or taken from the examination room.

SEC. 8. *Rating of Examinations.* All examinations shall be rated on a scale of 100, and the relative weights of the different subjects, including experience, shall be determined by the Executive Member of the Commission at the time of the announcement of the examination.

SEC. 9. *Rating of Examination Papers.* Where written examinations are required they shall be so managed that no examination papers will disclose the name or identity of any applicant until all the examination papers shall have been marked.

Each candidate must write his name and address upon a declaration sheet, which must have printed upon it a serial number, to be known as his examination number. The candidate shall mark upon each examination sheet his examination number. When the examination papers have been rated the declaration sheet shall be unsealed and the examination papers assigned to the name of the person who wrote them.

So far as practicable, questions on different subjects of examination shall be answered on separate sheets and all the answers on a given subject shall be rated by the same examiner. Where the number of examiners will permit, the answers shall be redistributed by subjects for review by other examiners after being rated in the first instance.

SEC. 10. *Identification Marks.* Any candidate in any examination who places an identification mark upon his examination papers, other than his serial number, may be deprived of all benefits under such examination.

The following are marks of identification within the meaning of this rule: name or address of the candidate; any assumed or fictitious name or address; any initials, lines or other characters that might indicate the identity of the candidate.

SEC. 11. *Marking and Grading of Papers. Relative Weights, and Method of Determining Average Percentage.* The relative weight of each subject shall be fixed and announced by the Executive Member of the Commission, and all examination papers shall be marked and graded under the regulations of said Executive Member. When, during the marking and grading of the papers, it becomes apparent that a candidate, whose papers have been partially marked, would receive a general average percentage less than the minimum percentage for eligibility fixed by said Executive Member, or if the candidate receives less than the minimum percentage required on a given subject, then such candidate shall be considered as having failed and the marking of his papers need not be completed.

The different subjects in each examination are given relative weights according to their importance. These weights represent the value of each subject in the whole examination. The method of obtaining the average percentage of the examination is as follows: Multiply the rating obtained in each subject by the relative weight of that subject, add the products, and divide the sum of the products by the sum of the relative weights. The quotient thus obtained will be the average percentage for that examination.

When an examination is being held for any given position, it shall be within the province of the examiner to pass an applicant for a position in a lower grade of the same class, if in the opinion of the examiner the applicant is qualified to fill the lower grade position, but not qualified to fill the higher grade position.

SEC. 12. *Minimum Standing.* Candidates shall be required to obtain a general average of not less than 70 per cent in order to pass an examination.

SEC. 13. *Notice of Result of Examinations.* As soon as the marking and grading of the papers shall have been completed and the eligible registers established, each candidate shall be notified through the post office of his general average percentage and relative standing obtained upon examination.

Where the marking of the examination papers has not been completed because the candidate has failed in any given subject, he shall be notified of that fact.

SEC. 14. *Appeal for Review.* Any applicant may appeal to the Executive Member of the Commission to have his examination papers reviewed on the ground of errors committed therein, if said appeal is made in writing within thirty days after receiving announcement of the result of the examination. Upon a review of the examination papers of the applicant, his rating may be changed in accordance with such review. If, in the judgment of said Executive Member, such review discloses errors on the part of the examiner affecting the examination papers of all the applicants, then all the examination papers may be reviewed.

SEC. 15. *Veteran Preference.* To be entitled to veteran preference as provided for in section 27 of the Civil Service Act, applicants must file with the Civil Service Commission the original or certified copy or photograph copy of honorable discharge papers or of certificate of honorable active military service. Such papers must be filed with the application for examination in the office of the Civil Service Commission prior to the date of the examination.

RULE 5.

Eligible registers.

SECTION 1. Successful candidates shall be enrolled upon the register of eligibles in the order of their general average percentage upon examination without regard to priority of application or examination, except that two or more candidates receiving the same percentage shall be enrolled according to the percentage attained in the chief essential of the examination, and with the further exception that if one of the candidates so rated be a veteran he shall be given the preference.

SEC. 2. Successful candidates may be enrolled upon two or more eligible registers at the same time.

RULE 6.

Certifications.

SECTION 1. *Vacancies.* Whenever a vacancy is to be filled the appointing power shall notify the Executive Member of the Commission of that fact, stating the duties of the position.

SEC. 2. *Three Names to be Certified.* The said Executive Member shall then certify to the appointing power the names and addresses of three persons who stand highest on the eligible list for the sub-class or grade to which the position belongs. In case there are less than three upon such eligible list there shall be certified the number thereon and the appointing power shall fill the position by the appointment of one of the persons so certified. Where the employment is for a period of sixty days or less, only those names of eligibles who live in the vicinity of the employment may be certified.

If an appointing power have at the same time more than one vacancy in the same sub-class and grade to be filled, as many names as there are vacancies, and two names in addition to the total number of such vacancies if there be that number of names on the register, shall be certified in the manner previously set forth.

The appointing power shall fill the first vacancy by the selection of one of the highest three eligibles so certified. The second, and any succeeding vacancy, shall be filled in like manner by selection in turn from the highest three remaining names.

If, in any case indicated, there be no additional name or names on the register, or if the number of names which can be certified or which are finally available for appointment be less than the number specified in this rule but at least equal to the

number of vacancies to be filled, then the required selection shall be made from the names certified and available.

SEC. 3. *Next in Rank After Waiver.* Whenever an eligible has been certified to the appointing power, and such eligible waives appointment, the secretary shall forthwith notify the appointing power of such waiver and certify the next highest eligible, whereupon said next highest eligible shall have the same standing as though originally certified.

SEC. 4. *New Positions.* Whenever a new position is created, the appointing power who may fill such position shall immediately make requisition upon the Executive Member of the Civil Service Commission for an eligible to fill the position, and shall at the same time furnish said Executive Member with a detailed statement of the duties attached to said position. It shall then be the duty of the Executive Member to classify said position and certify eligibles in accordance with the provisions of section 2 of this rule.

SEC. 5. *Examination Papers to be Forwarded With Certification.* Upon the certification of eligibles to any appointing power to fill a vacancy, the examination papers of the eligibles shall be transmitted with the notice of certification if required by the appointing power. Within ten days thereafter all examination papers must be returned to the office of the Commission by the appointing power.

RULE 7.

Failure to respond.

SECTION 1. Any eligible who fails to respond within a reasonable time after notice has been sent to him to report for duty will be stricken from the eligible register, unless, within thirty days from the date of the notice sent him, he presents reasons satisfactory to the Executive Member of the Commission for his failure to report.

When the eligible resides in the city from which the notice has been sent three days shall be deemed a reasonable time in which to respond. When the eligible resides in some other city or county the time consumed in transmission of the letter to his place of residence and return shall be added to the three days.

SEC. 2. Any eligible who fails to respond within a reasonable time after any notice sent him by the Executive Member of the Commission requiring an answer will be stricken from the eligible register, but may be restored if at any time during the period of his eligibility he presents reasons satisfactory to the said Executive Member for his failure to respond.

RULE 8.

Declination and waiver of certification.

SECTION 1. An eligible may at any time have his name temporarily withdrawn from the eligible register upon giving reasons in writing satisfactory to the Executive Member of the Commission, and his name may be restored thereto at the discretion of the said Executive Member upon written application of the eligible during the period of his eligibility.

SEC. 2. An eligible may, when his name is reached for appointment to a temporary position, waive certification without losing his position upon the eligible register. A temporary position is one that will last for less than six months.

SEC. 3. Whenever an eligible has indicated the locality or institution in which he will accept employment, he may decline certification to positions in other localities or institutions, without losing his position upon the eligible register.

An eligible may decline appointment after certification without losing his position upon the eligible register for any reason satisfactory to the said Executive Member.

In the event of an absolute refusal of a permanent position by an eligible for reasons that are not satisfactory his place upon the eligible register shall be declared vacant and his name shall be removed therefrom. The said Executive Member may in his discretion, however, restore his name to the eligible register for the remaining period of his eligibility upon his written application therefor.

RULE 9.

Appointments.

SECTION 1. *Probationer.* A probationer is one who having been certified and appointed after examination has been employed less than six months.

The probationary period for any appointment is hereby fixed at six months.

SEC. 2. *Permanent Appointments.* A permanent appointee is one who having been a probationer, has served more than the required probationary period of six months.

SEC. 3. *Temporary Appointments.* A temporary appointee is one who has been appointed to a position without examination, and with the previous consent of the Executive Member of the Commission.

Whenever a position is to be filled, the appointing power must make application in writing to the said Executive Member to fill the same by the certification of eligibles in accordance with section 9 of the Civil Service Act.

When there are no eligibles from which to fill the position, the Executive Member of the Commission may authorize the appointing power to fill such position by temporary appointment, such temporary appointment to continue until such time as there are eligibles but not to exceed ninety days from date of appointment. Until such permission has been given no authority exists in the appointing power to make a temporary appointment.

Upon making the appointment it will be incumbent upon the appointing power to notify the said Executive Member, naming the appointee, the title and character of the position, the date of commencement of service, and salary or compensation thereof, as required by section 16 of the Civil Service Act.

SEC. 4. *Emergency Appointments.* Emergency appointments are those made notwithstanding there may be an eligible list, for the reason that eligibles are not immediately available. In certain departments of the state men are employed and discharged almost daily, but they are at such great distance from the heads of their departments that in some cases word can not be either sent to or received from them for several days. In order to prevent the stoppage of public business when the necessity of making short-time appointments exists, permission is hereby granted to the appointing power in any department of the State Civil Service to make emergency appointments for not more than fifteen working days. The name of the appointee, the duties of the position, the nature of the emergency, and the further data required by section 16 of the Civil Service Act must be mailed to the office of the State Civil Service Commission.

Where the appointing power is sufficiently near Sacramento to make application for a temporary appointment with the previous consent of the said Executive Member, a resort to emergency appointments will be deemed an abuse of the privilege of this rule.

Emergency appointments may not be continuous.

RULE 10.

Report of appointment.

Whenever the names of three eligibles have been certified to the appointing power to fill a vacancy, it shall be the duty of the appointing power to make the appointment forthwith. It shall also be the duty of the appointing power to make immediate report to the office of the Commission of the fact of appointment.

RULE 11.

Efficiency records.

In all offices and places of employment subject to the Civil Service Act, the appointing power shall make records of the individual efficiency of holders of positions in performing their duties and shall file such records monthly with the office of the Civil Service Commission on or before the fifth day of the month succeeding that in which the records were made.

The efficiency records shall be rated upon:

First. Quality—Meaning the ability of an employee to perform the task to which he or she is assigned, and the degree of excellence attained in its performance. Cognizance should be taken of such qualities as neatness of work, originality, resourcefulness, initiative, sense of order, system, judgment, tact, special knowledge, technical ability, mechanical skill and ability to direct work and to manage men.

When "temperamental qualities" determine the usefulness of employees, as in the case of teachers in a reform school, or nurses in an institution, "temperamental aptitude" shall be rated under quality.

Second. Quantity—Meaning the amount of work done. In cases where the work is not measurable, ratings should be on alertness, or promptness, speed, industry, perseverance, energy, diligence and willingness to work.

Third. Discipline—Including treatment of the public, treatment of fellow employees, sobriety, obedience to rules, and personal neatness.

Fourth. Attendance—Including absence and punctuality. Quality and quantity of work shall be rated on a percentage basis. The grading shall be as follows:

For excellent or exceptional work	90-100
For good or thoroughly satisfactory work	80- 90
For fair or not wholly satisfactory work	70- 80
For poor or unsatisfactory work	70 and below

Eighty-five per cent is arbitrarily taken by the Civil Service Commission as the marking for an average employee doing thoroughly satisfactory work.

Where markings above 90 per cent or below 70 per cent are reported, an explanation should accompany, stating briefly the reason therefor. The Civil Service Commission retains the right to investigate such ratings before entering them upon its records.

Attendance shall be recorded by demerits:

Tardiness—1 demerit for 5 minutes or less; 3 demerits for more than 5 minutes and not exceeding one hour; 5 demerits for more than one hour.

Absence without leave—5 demerits for each day, same to be noted by an accompanying star (*). (Absence without leave for one or more days in any one month shall be cause for investigation by the Civil Service Commission.)

Absence with leave not exceeding 15 days, half a demerit for each day of said period; 1 demerit for each day in excess thereof. A period so penalized shall not be for more than one month. Absence on sick leave not exceeding 30 days, half a demerit for each day.

An employee is considered present when detailed on special work and during his vacation.

No efficiency credit shall be allowed for overtime work.

Discipline shall be recorded in demerits:

Penalties to be given for laxity in observance of or violation of established rules and regulations, failure to report, incivility, deportment, manner, inebriety, indolence, personal neatness, and habits. If suspension is imposed for disciplinary purposes, the demerits under "discipline" shall be as follows:

For a suspension of 1 day	10 demerits
For suspension of more than 1 day and less than 7 working days	15 demerits
For more than 6 and less than 13 working days	25 demerits
For more than 12 and less than 28 working days	40 demerits

When demerits are so made, there shall not be any penalty under "attendance" for the suspension period.

The total demerits reported with any individual record shall be added, the sum divided by 5 and the result subtracted from the average marking for quantity and quality of work. The remainder shall be entered on the report as the net efficiency.

If the net efficiency of any employee falls below 70 for any one month, the secretary of the Commission may file a charge of inefficiency against such employee with the Civil Service Commission. If such charge is filed, it shall be the duty of the Civil Service Commission to try the said employee for inefficiency. If, after such trial, it shall find the ratings to be just, the Civil Service Commission shall enter judgment, removing the said employee from the civil service of the State of California, and his name shall be stricken from the list of eligibles.

In case the net efficiency of an employee shall fall below 80 continuously for three months, the Executive Member of the Commission may reduce the salary or grade of such employee.

The efficiency records of any office or department shall be made upon a letter-size form, at the left of which shall be a column for the names of the employees in the said office or department arranged alphabetically. In the first column to the right of the name shall be written the name of the position; in the second column the salary paid; in the third column shall be rated the attendance; and it shall be in a double subcolumn in the first of which shall be recorded demerits for tardiness,

and in the second shall be recorded the demerits for absence; in the fourth column shall be recorded discipline demerits; in the fifth column shall be rated quality of work; in the sixth column shall be rated the quantity of work; and three columns shall be left at the extreme right for noting the average positive per cent rating, the total number of demerits and the net efficiency.

The appointing power shall require the immediate supervisor of the persons whose efficiency records are being made up to certify to the appointing power, the record for the quantity and quality work, discipline and attendance. From the record thus transmitted to the appointing power or its authorized agent by the said immediate supervisor, the appointing power or its authorized agent shall cause to be made the entries in the efficiency records to be submitted to the office of the Civil Service Commission. A copy of said record shall be kept in the office of the appointing power.

RULE 12.

Leaves of absence.

SECTION 1. *Vacation.* (*a*) To be entitled to a vacation with pay, an employee must have been employed continuously at least six months. He is then entitled to a vacation of fifteen full working days during the first year of service.

(*b*) The vacation period must be during his period of service—that is to say, he must not have resigned to take effect during his year of service, or been dismissed from the service of the state. The time of the vacation is in the discretion of the appointing power unless the appointing power fails or neglects to give the employee a vacation until the last fifteen working days of the year's service, in which case the employee shall be entitled, as of right, to a vacation during said last fifteen working days of the year's service.

(*c*) An employee may resign, to take effect at the end of his year of service, and would be entitled to his vacation during the last fifteen days of his year of service notwithstanding.

(*d*) If an employee resigns to take effect before the end of his year of service or is dismissed, before he has enjoyed his vacation, he is not entitled to a vacation.

(*e*) In computing working days, Sundays and holidays should not be included. Saturday is a working day.

(*f*) Such vacation shall not be cumulative; that is, if not taken one year, the employee will not be entitled to thirty days the next year.

SEC. 2. *Sick Leave.* (*a*) When a state employee is prevented by sickness from reporting for duty, or when some member of his family is afflicted with contagious disease, as a result of which his presence in the service would jeopardize the health of fellow employees, he must immediately send notice thereof to his superior, and thereafter he shall be granted sick leave.

(*b*) Employees claiming sick leave must furnish the Executive Member of the State Civil Service Commission with a medical certificate showing that they have been actually disabled from performing work, and from and to what dates. Where the person claiming sick leave is working at an institution where the state has physicians employed, the certificate may be made by any such physician. Those working in a department where a physician is not employed must furnish a certificate from some responsible physician. Certificate forms may be secured from the office of the Civil Service Commission and must be approved by the appointing power before forwarding to the office of the Civil Service Commission. Where the leave is for five days or less the certificate may be signed by only the appointing power, if he so elects.

(*c*) If an employee has held a position in the state service continuously for six months immediately preceding sick leave, he may upon the recommendation of the appointing power, be granted full pay until recovery, provided the same shall not exceed seven days.

(*d*) If an employee has held a permanent position in the state service continuously for one year immediately preceding sick leave, he may upon recommendation of the appointing power, be granted full pay until recovery, providing the same shall not exceed fifteen days, upon proper showing made to the Civil Service Commission.

(*e*) In exceptional cases, upon proper showing to the Civil Service Commission the leave may be extended for a total of thirty days at full pay and thereafter sixty days at half pay; no leave, however, shall exceed ninety days in any year of service.

(*f*) Where an employee of the state is incapacitated by an accident and claims compensation under the act of the legislature approved May 23, 1917, he shall not be entitled to the benefit of sick leave with pay.

(*g*) Sick leave shall be reckoned upon calendar days for monthly employees, and upon working days for per diem employees.

SEC. 3. *Special Leave.* Leave without pay, if requested in writing by a state employee, may be granted for a period of not to exceed one year, if recommended by the appointing power and approved by the Executive Member of the Civil Service Commission; provided, that leave of absence for less than thirty days may be granted by the appointing power without the approval of said Executive Member.

SEC. 4. *Reemployment after Leave.* A position shall be held open for an employee when on sick leave for ninety days or when on a special leave for not exceeding thirty days. When an employee is absent on special leave exceeding thirty days he shall not be entitled as of right to be restored to the position he formerly occupied, except on the request of the appointing power and approval of the Executive Member of the Civil Service Commission. He shall, with the approval of the said Executive Member, be entitled, unless restored to the position he formerly occupied, to have his name placed on the general lay-off list, or on the eligible register of his sub-class and grade in accordance with his original percentage, provided he shall not be considered for appointment until at least ninety days from the time at which he entered upon leave have expired.

RULE 13.

Absence without leave.

SECTION 1. Absence from duty without leave for any time will be considered good cause for dismissal.

SEC. 2. Absence from duty without leave for ten consecutive days shall be deemed a resignation from the service by the absentee, and upon the report of such absence by the appointing power to the Civil Service Commission, the absentee shall be removed from the service of the state, and the fact of removal shall be entered in the official roster; *provided*, that if at any time within thirty days the person so absenting himself shall make satisfactory explanation to the Executive Member of the Civil Service Commission of the cause of his absence he shall be restored to his position.

RULE 14.

Reduction in force.

SECTION 1. Whenever it becomes necessary to reduce the number of employees in a given sub-class they shall be laid off by the appointing power according to their relative efficiency, the least efficient being laid off first, and their names shall be entered upon the departmental lay-off list, which list shall be immediately filed with the Civil Service Commission. Employees laid off shall be reemployed in the order of their relative efficiency. The Executive Member may make separate provision for the reemployment of persons having special qualifications.

SEC. 2. Employees desiring reemployment in other departments may request that their names be placed upon the general lay-off list for their sub-class and grade. Their names shall be entered upon such list in accordance with their records of service and efficiency, as may be determined by the Executive Member of the Commission. If the record of service of an employee does not justify the placing of his name upon the general lay-off list, his request may be denied; or, in the discretion of the Executive Member, his name may be restored to the eligible list with his original percentage. Certification from the general lay-off list will be made in advance of and in the same manner as from the eligible register. Where, however, there are less than three names upon any general lay-off list, a sufficient number of names to make three shall be added from the eligible register for the same sub-class and grade. Any name on any lay-off list may be removed therefrom at any time after one year by the Executive Member of the Civil Service Commission.

SEC. 3. Whenever a probationer shall be laid off for lack of work he may be assigned to work suitable to his sub-class and grade in any other department of the state service. The probationer shall have credit for the time he may have served until he shall have served six months in all. No distinction shall be made between a probationer and a permanent employee when making lay-offs, but in all cases the appointing power shall be guided by the relative efficiency of the persons laid off. The names of those laid off during their probationary period shall be restored to the eligible list in accordance with their original percentage, unless the

Executive Member elects to place the names of such persons upon either the departmental or general lay-off lists.

RULE 15.

Transfer.

Transfers, as provided by section 13 of the Civil Service Act, may be made by the appointing power only with the previous consent of the Executive Member of the Commission.

Eligibles appointed after examination to fill a position in a given class may not be transferred to positions in another class.

NOTE.—The Civil Service Commission does not take the initiative in arranging transfers. Employees desiring transfers should take the matter up with the head of their department, and with the head of the department of which they wish to be transferred.

RULE 16.

Resignation or relinquishment of position.

SECTION 1. When a civil service appointee desires to resign his position he shall present his resignation, in writing, to the power that appointed him, and a copy of such resignation shall immediately be filed by the appointing power with the Civil Service Commission, together with a statement from the appointing power of the action taken thereon. An appointee so resigning from the service may within one year, with the recommendation of appointing power, be reinstated to the position from which he was separated or a similar position in the same department if there be need for his services, upon petition to and favorable action by the Executive Member of the Civil Service Commission.

SEC. 2. The Executive Member of the Commission may, when in his judgment there appear good and sufficient reasons, permit a civil service appointee to relinquish his position and place his name upon the general lay-off list, provided such appointee shall make application for such action in person or in writing; *and provided, further*, that if such an appointee be permitted to relinquish his position under this section he shall not again be considered for any appointment in the class he vacated until at least 90 days thereafter have expired, nor shall he ever again be considered for reappointment to the same department to the kind of position he relinquished except with the consent of the appointing power.

SEC. 3. An appointee to a temporary position as defined by rule 8 of section 2, may, with the consent of the appointing power, and the Executive Member of the Civil Service Commission, be permitted to relinquish such position and such relinquishment shall be deemed to be a waiver of all other temporary employments until a withdrawal of waiver is filed with and acted upon by the said Executive Member.

RULE 17.

Promotion.

SECTION 1. *Method of Promotion.* Vacancies in positions, unless filled by reinstatement or transfer, shall be filled so far as practicable by promotion from among persons holding positions in the next lower grade of the department, office, or institution in which the vacancy exists. An increase of salary beyond the grade of the position occupied shall be deemed a promotion.

Promotion shall be based upon merit determined by competitive examinations and by the superior qualifications of the persons promoted, as shown by his record of efficiency. Applicants for promotional examinations shall register in the office of the Commission at least three days before the date fixed for the examination.

The recommendation of the appointing power, with reasons for the recommendation, shall be a factor in all promotional examinations, and shall be given a rating to be determined by the Executive Member of the Commission upon the announcement of the examination.

Whenever a vacancy is to be filled by promotion, and the number of applicants in the next lower grade who present themselves for examination are so few that in the judgment of the said Executive Member the good of the public service requires that such promotion shall be open to all employees in the lower grades of that class, he shall so declare and notify all employees in such lower grades that such examination will be held and of their eligibility, and shall proceed to hold an original competitive examination to fill such positions.

RULE 18.

Trials and dismissals.

SECTION 1. Charges under section 14 of the Civil Service Act may be made by the appointing power or its representative, the Civil Service Commission or its representatives, or any citizen.

Such charges shall be tried either by the appointing power or the Civil Service Commission, and shall be instituted by serving upon the defendant a written complaint setting forth the grounds for removal with such particularity as shall enable the defendant to understand clearly the charges made against him and filing with the Civil Service Commission a copy thereof.

Within ten days after service upon him of the complaint, the defendant shall file with the Commission and furnish to the prosecutor a written answer thereto.

The appointing power, in case the charges are to be heard by it, shall then notify the defendant and the Civil Service Commission of the time and place of hearing of said charges, and in case the Civil Service Commission shall hear said charges it shall notify the defendant and the prosecutor of the time and place of hearing said charges.

The time of hearing shall not be less than five nor more than ten days from the service upon the prosecutor of the answer of the defendant.

The defendant at such hearing shall have opportunity to present whatever competent evidence he may desire in his own defense and shall have the right to be represented by counsel. Failure to file an answer within the time allowed shall be construed as an admission of the truth of the charges by the defendant, and judgment of removal shall be entered forthwith and filed with or by the Commission.

Either the appointing power or the Commission may transfer charges to the other for action or investigation.

SEC. 2. The hearing of charges may be by the Commission, any commissioner, the chief examiner or any other agent of the Commission as it may direct, or the appointing power.

SEC. 3. Any civil service appointee dismissed from employment after trial shall be removed forthwith from all eligible lists and shall not be eligible for examination thereafter without the consent of the Commission. Any eligible or appointee convicted of a felony shall be dismissed from the service of the state and shall have his name stricken from all eligible registers.

RULE 19.

Where any position involves the handling of cash an eligible certified to such position and appointed by the appointing power may be required to furnish a bond in the sum nominated by the appointing power and approved by the Executive Member of the State Civil Service Commission.

RULE 20.

Regular and special meetings.

Regular meetings of the Civil Service Commission shall be held on the second Tuesday of every month in the office of the Commission in Sacramento, at 1.30 o'clock p.m.

Special meetings may be called at any time by the president or by a majority of the commissioners, provided forty-eight hours' notice of such special meeting be given to all members of the Commission. A notice of each special meeting shall state the business for which said meeting is called, but any other business may be transacted at such meeting. Ordinary parliamentary rules shall govern the deliberations of the Civil Service Commission.

RULE 21.

Public inspection.

All the books, records, answers and papers pertaining to examinations or other proceeding shall be open to the inspection of any citizen.

RULE 22.

Amendments to rules.

The rules of the Civil Service Commission may be amended at any meeting.

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FIFTH BIENNIAL REPORT

OF THE

STATE BOARD OF EDUCATION

STATE OF CALIFORNIA

1920-1922



CALIFORNIA STATE PRINTING OFFICE
FRANK J. SMITH, Superintendent
SACRAMENTO, 1923

23180

EDUCATIONAL DIRECTORY.

SUPERINTENDENT OF PUBLIC INSTRUCTION.

(Elected November 5, 1918.)

Name.	Term expires.	Address.
WILL C. WOOD	January, 1923	Alameda

Staff of the Superintendent of Public Instruction.

JOB WOOD, JR., Deputy	Sacramento
EDNA M. STANGLAND, Secretary	Sacramento
SAM H. COHN, Assistant Superintendent of Public Instruction	Alameda
GEORGIANA CARDEN, State Supervisor of Attendance	Sacramento
ETHEL M. RICHARDSON, Assistant Superintendent in charge of Americanization	Pasadena
W. S. DYAS, Bookkeeper Textbook Department	Sacramento

STATE BOARD OF EDUCATION.

(Appointed by the Governor.)

Name.	Term expires.	Address.
E. P. CLARKE	December, 1922	Riverside
MRS. O. SHEPARD BARNUM	August, 1925	312 South Fifth street, Alhambra
MRS. ELIZABETH B. PHILLIPS	August, 1924	1006 Putnam avenue, Porterville
MRS. AGNES RAY	August, 1923	460 Staten avenue, Oakland
GEORGE W. STONE	August, 1924	143 High Street, Santa Cruz
STANLEY B. WILSON	August, 1923	538 South San Pedro street, Los Angeles

NOTE.—Will C. Wood, Superintendent of Public Instruction, is Secretary of the Board, according to law. One vacancy exists.

Commissioners of Education.

(Assistant Superintendents of Public Instruction appointed by State Board of of Education.)

MARGARET S. MCNAUGHT, Commissioner of Elementary Schools	Sacramento
ALBERT C. OLNEY, Commissioner of Secondary Schools	Sacramento
EDWIN R. SNYDER, Commissioner of Vocational Education	Sacramento

State Supervisors.

J. C. BESWICK, Trade and Industrial Instruction	Sacramento
WM. M. COMAN, Rehabilitation	Sacramento
J. B. LILLARD, Agricultural Instruction	Sacramento
MAUDE I. MURCHIE, Teacher Training in Home Economics	Sacramento
HERBERT R. STOLZ, Physical Education	Sacramento

Assistant Supervisors.

ARTHUR J. SCHUETTNER, Physical Education	Sacramento
WINIFRED VAN HAGEN, Physical Education	Oakland

Assistant Secretaries.

FLORENCE B. ARGALL	Sacramento
HELEN DIMMICK, Credentials	Sacramento
MARION H. KETCHAM, Retirement Salary	Sacramento

COUNTY SUPERINTENDENTS OF SCHOOLS.

County.	Name.	Address.
Alameda	D. E. Martin	Oakland
Alpine	Mrs. Eugenia M. Bruns	Gardnerville, Nevada
Amador	Mrs. Sabra R. Greenhalgh	Jackson
Butte	Irvin Passmore	Oroville
Calaveras	Teresa Rivara	San Andreas
Colusa	Perle Sanderson	Colusa
Contra Costa	Wm. H. Hanlon	Martinez
Del Norte	E. A. Moore	Crescent City
El Dorado	E. J. Fitzgerald	Placerville
Fresno	Clarence W. Edwards	Fresno
Glenn	S. M. Chaney	Willows
Humboldt	Robert A. Bugbee	Eureka
Imperial	H. C. Coe	El Centro
Inyo	Mrs. M. A. Clarke	Bishop
Kern	L. E. Chenoweth	Bakersfield
Kings	Miss M. L. Richmond	Hanford
Lake	Minerva Ferguson	Lakeport
Lassen	Mrs. Julia A. Norwood	Susanville
Los Angeles	Mark Keppel	Los Angeles
Madera	Craig Cunningham	Madera
Marin	Jas. B. Davidson	San Rafael
Mariposa	John L. Dexter	Mariposa
Mendocino	Roy Good	Ukiah
Merced	Mrs. Belle S. Gribi	Merced
Modoc	Mrs. Nettie B. Harris	Alturas
Mono	Mildred Gregory	Bridgeport
Monterey	Jas. G. Force	Salinas
Napa	Lena A. Jackson	Napa
Nevada	Miss Elizabeth M. Richards	Nevada City
Orange	R. P. Mitchell	Santa Ana
Placer	Irene Burns	Auburn
Plumas	Mrs. Kate L. Donnelley	Quincy
Riverside	Ira C. Landis	Riverside
Sacramento	Carolyne M. Webb	Sacramento
San Benito	Mrs. Dorothy B. Slaven	Hollister
San Bernardino	Ida M. Collins	San Bernardino
San Diego	Ada York	San Diego
San Francisco	Alfred Roncovieri	San Francisco
San Joaquin	Mrs. Effie S. Anderson	Stockton
San Luis Obispo	Robert L. Bird	San Luis Obispo
San Mateo	Roy W. Cloud	Redwood City
Santa Barbara	A. S. Pope	Santa Barbara
Santa Clara	Miss Agnes Howe	San Jose
Santa Cruz	Miss Cecil M. Davis	Santa Cruz
Shasta	Mrs. Charlotte Cunningham	Redding
Sierra	Belle Alexander	Downieville
Siskiyou	J. W. Miller	Yreka
Solano	Dan H. White	Fairfield
Sonoma	Ben Ballard	Santa Rosa
Stanislaus	A. G. Elmore	Modesto
Sutter	Lizzie Vagades	Yuba City
Tehama	Mamie B. Lang	Red Bluff
Trinity	Miss Lucy Young	Weaverville
Tulare	J. E. Buckman	Visalia
Tuolumne	G. P. Morgan	Sonora
Ventura	Mrs. Blanche T. Reynolds	Ventura
Yolo	Harriett S. Lee	Woodland
Yuba	Jennie Malaley	Marysville

CITY SUPERINTENDENTS OF SCHOOLS.

City	County	Name of Superintendent.
Alameda	Alameda	C. J. Du Four
Alhambra	Los Angeles	Charles E. Barber
Bakersfield	Kern	Charles E. Teach
Berkeley	Alameda	H. B. Wilson
Chico	Butte	Chas. H. Camper
Eureka	Humboldt	Geo. B. Albee
Fresno	Fresno	Wm. John Cooper
Grass Valley	Nevada	J .S. Hennessey
Long Beach	Los Angeles	W. L. Stephans
Los Angeles	Los Angeles	Mrs. Susan Dorsey
Modesto	Stanislaus	W. E. Faught
Oakland	Alameda	Fred M. Hunter
Oroville	Butte	L. M. Trempe
Palo Alto	Santa Clara	A. C. Barker
Pasadena	Los Angeles	J. F. West
Petaluma	Sonoma	Bruce H. Painter
Pomona	Los Angeles	G. V. Whaley
Richmond	Contra Costa	W. T. Helms
Riverside	Riverside	A. N. Wheelock
Sacramento	Sacramento	Chas. C. Hughes
Salinas	Monterey	Arthur Walter
San Bernardino	San Bernardino	Perry R. Davis
San Diego	San Diego	Henry C. Johnson
San Jose	Santa Clara	Walter L. Bachrodt
San Luis Obispo	San Luis Obispo	Arthur H. Mabley
San Rafael	Marin	Oliver R. Hartzell
Santa Ana	Orange	John A. Cranston
Santa Barbara	Santa Barbara	Paul E. Stewart
Santa Cruz	Santa Cruz	John W. Linscott
Santa Monica	Los Angeles	Horace M. Rebok
Santa Rosa	Sonoma	Jerome O. Cross
Stockton	San Joaquin	Ansel S. Williams
Tulare	Tulare	A. W. Ray
Vallejo	Solano	E. L. Cave
Ventura	Ventura	Arthur L. Vincent
Visalia	Tulare	De Witt Montgomery

DISTRICT SUPERINTENDENTS OF SCHOOLS.

County.	Name.	City.
Alameda	Harry W. Jones	Piedmont
	M. L. Benson	Hayward
	W. O. Davies	San Leandro
Contra Costa	R. R. Huffman	Antioch
	Geo. A. Johnson	Crockett
	E. A. Palmer	Concord
	Alice E. Kelly	Martinez
	F. S. Ramsdell	Pittsburg
Fresno	R. A. Catlin	Kingsburg
	George Edgecomb	Selma
	C. L. Geer	Coalinga
	Cree T. Work	Reedley
Imperial	H. F. Willebrandt	Brawley
	F. F. Fanning	Calexico
	C. R. Prince	Calipatria
	A. P. Shibley	El Centro
	B. M. Gruwell	Holtville
	C. B. Collins	Imperial
Kern	J. R. Cookman	Maricopa
	J. A. Joyce	Taft
Kings	Clyde E. Denham	Hanford
	T. C. Allen	Lemoore
Lassen	Elmo C. Eby	Westwood
Los Angeles	Wm. R. Andrews	Azusa
	Leonard F. Collins	Burbank
	W. H. Hughes	Claremont
	Otto J. Harvey	Compton
	Ben S. Millikan	Covina
	Joseph C. Templeton	Downey
	Ernest E. Harwood	Eagle Rock
	Chas. N. Mills	El Segundo
	Wirt C. Williams	Glendora
	Chas. G. Schweitzer	Graham
	Pearl M. Hall	Hawthorne
	Francis E. Rice	Hermosa Beach
	B. L. Easton	Puente
	Willison L. Stuckey	Huntington Park
	G. W. Crozier	Inglewood
	A. R. Clifton	Monrovia
	Mark R. Jacobs	Montebello
	C. A. Langworthy	Redondo Beach
	Mrs. Carrie May	San Dimas
	John A. Bevington	San Gabriel
	Geo. A. Bush	South Pasadena
	Lewis F. Ferrish	Venice
	James A. Davis	Watts
	S. H. Thompson	Whittier
Marin	Wade F. Thomas	San Anselmo
	Herbert H. Matthews	Mill Valley
Mendocino	C. O. Sharpe	Sausalito
Monterey	P. W. Smith	Fort Bragg
Napa	J. H. Graves	Monterey
Nevada	Osman R. Hull	Napa
Orange	J. S. Hennessy	Grass Valley
	C. C. Smith	Anaheim
	C. A. Marcy	Fullerton
	G. A. Riddlebarger	Placentia
	J. A. Baker	La Habra
	W. E. Fanning	Brea
	Geo. C. Sherwood	Orange
	S. R. Fitz	Garden Grove
	W. B. Violette	Huntington Beach
	E. F. Beswick	Tustin
Riverside	F. W. Whitney	Beaumont
	Glen D. Wight	Corona
	Paul G. Ward	Hemet
	George W. Scott	Blythe
	D. A. Hanks	San Jacinto

DISTRICT SUPERINTENDENTS OF SCHOOLS—Continued.

County.	Name.	City.
San Bernardino	H. G. Clement	Redlands
San Diego	J. D. Simkins	East San Diego
	Guy Hudgins	National City
San Joaquin	R. J. Custer	Lodi
	F. A. Lattin	Tracy
San Luis Obispo	H. F. Clarke	Paso Robles
	E. B. Dykes	Atascadero
San Mateo	W. J. Savage	Colma
	E. M. Knight	San Bruno
	L. E. Adams	South San Francisco
	H. E. H. Ruggles	Burlingame
	Geo. W. Hall	San Mateo
	A. E. Monteith	Redwood City
Santa Barbara	W. C. Conrad	Santa Maria
Siskiyou	E. W. Hauck	Yreka
	Geo. E. Townes	Weed
	H. A. Burch	Dunsmuir
Sonoma	Melrowe Martin	Sebastopol
Stanislaus	J. J. Berry	Oakdale
Tehama	J. D. Sweeney	Red Bluff
Tulare	C. E. Bigham	Porterville
	W. N. Davis	Dinuba
	A. W. Ray	Tulare
Ventura	J. M. Horton	Fillmore
	Charles D. Jones	Santa Paula
	R. B. Haydock	Oxnard
Yolo	C. E. Dingle	Woodland

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PART I.

Letter of Transmittal and Report of the President.

LETTER OF TRANSMITTAL.

SACRAMENTO, September 15, 1922.

HON. WILLIAM D. STEPHENS,

Governor of California.

DEAR SIR: I have the honor to submit herewith the report of the State Board of Education, including the reports of the Superintendent of Public Instruction, the reports of the commissioners, and the report of the Public School Teachers' Retirement Salary Fund Board.

Respectfully submitted,

STATE BOARD OF EDUCATION.

By WILL C. WOOD, *Secretary.*

REPORT OF THE PRESIDENT.

To His Excellency,

GOVERNOR WILLIAM D. STEPHENS:

In transmitting herewith the reports of the Commissioners of Education and in reviewing briefly the work of the State Board of Education for the biennial period 1920 to 1922, we desire to make acknowledgment of your sympathetic and discriminating interest in public education and your cordial and effective support of a liberal and progessive educational program for the state. This has been evidenced by your cooperation with the work of this board and other educational agencies, by your public addresses on education, and by your approval of educational measures enacted by the legislature at the request of the educational leaders of the state.

LEGISLATION AT LAST SESSION.

The program of educational legislation passed by the legislature of 1921 and approved by you as Governor was the most extensive and in many ways the most advanced and important of any that has been approved at any legislative session in the history of the state. Among the outstanding educational laws enacted was that providing for the advancement of the normal schools of the state to the status of teachers colleges, the new junior college law, the legislation necessary for carrying out the provisions of Amendment No. 16, the teachers' tenure law, the law for the vocational rehabilitation of men and women injured in industry, the law providing schools for the children of migratory workers, and the law making permanent the plan for the annual registration of minors.

While these laws and others passed at the last session of legislature have been in effect only a short time, their far-reaching effect in stimulating greater interest, higher standards and more effective work in education is already apparent. There has been a gratifying response on the part of the teacher-training institutions of the state to the enlarged opportunity and greater dignity given them by the teachers college law. The presidents and faculties of these institutions have cooperated with the State Board of Education, the State Director of Education and the Commissioners of Education in the development of plans for an enriched curriculum and higher standards of work in these institutions such as should be demanded in view of their advancement into the college class. It will, however, be the policy of this board to proceed conservatively in the matter of authorizing the granting of the bachelor's degree by the teachers colleges. Somewhat definite standards of equipment, qualifications of faculty members and other facilities are being worked out; and the plan will be to check these carefully with the present situation at these various institutions. While we are in hearty sympathy with the policy of enabling the teachers colleges as fast as they reach the standards of collegiate rank to grant degrees, we feel that the dignity and high standard of the degree should be carefully maintained. There may be disappointment in some localities and on the part of some of the teachers colleges because of

delay in acting on their applications for the degree granting power; but we feel in the long run that the interests of higher education will be served by proceeding carefully in this matter and giving time for such increase in facilities and strengthening of faculties as may in some instances be necessary to give the institutions recognized positions of college rank.

The following junior colleges have been approved under the new state law: Modesto, Riverside, Santa Ana, Fullerton, Chaffey Union (Ontario), Sacramento and San Mateo. In addition to these junior colleges authorized as part of the public school system of the cities named, the junior college work in Fresno, San Diego and Santa Barbara was taken over at the beginning of the past school year by the teachers colleges located in those cities. This arrangement was made possible by the provisions of the law and has proved economically and educationally advantageous. Junior college work has also been inaugurated in the teachers colleges at San Jose, Chico and Arcata. Plans are under consideration for the organization of junior colleges under the new law at El Centro, San Bernardino, Long Beach and two or three other centers where junior college work had been maintained in connection with the high school under the old law.

The junior colleges already authorized and those now under consideration will cover the state quite adequately and provide two years of standard college work for several thousand young people who would otherwise be deprived of the opportunities of higher education, owing to the crowded conditions of the colleges. At Riverside, bonds have been voted for a junior college building which will be the first in the state; and plans are under consideration in other cities for separate buildings for the junior college work as soon as it reaches the stage of development to warrant this action. There has been gratifying response on the part of those interested in junior college work in the acceptance of such standards as will guarantee the recognition of their work by the State University and other universities and colleges of the state, with full credit.

The schools for the children of migratory workers has been a unique experiment, but the law has certainly already demonstrated its value to such a degree that it is hoped provision will be made for the continuance of the plan with a larger degree of support. The development of work under the vocational rehabilitation law has been on such an extensive scale as to surprise those who were interested in urging this unique piece of educational work. The number of applicants, the success in training them for some form of industry and the opportunities found for placing them in industry after such training have been such as to amply justify the law. This is what might be called an experiment in making the unfit, fit and the effect will be to render self-supporting and independent a large number of victims of our industrial life who otherwise, to a considerable degree, would be public charges; and to give these people themselves a new outlook on life because of the fact that they are able again to take their position in the ranks of those who are self-supporting and efficient.

The legislation made necessary by the adoption of Amendment No. 16 has resulted in greatly improved facilities for school supervision in most of the counties of the state; better salaries for teachers; and in general improved facilities for school work.

LEGISLATION FOR COMING SESSION.

In view of the large program of educational legislation carried out by the last session of the legislature, our impression at this time is that there will be little occasion to urge many measures of a constructive character at the coming session of the legislature. It may be well for us to develop the new phases of work under way, before undertaking other experiments. The state, of course, should not stand still educationally, but it would seem that the legislation of recent years has provided facilities for progressive developments for several years to come.

There is, however, one important change in the legislation that we desire to present to you and which we trust will receive your approval. It is the policy of the state to provide free textbooks for the children of the elementary schools and the law places this obligation definitely upon the state. No provision is made by law and no funds are made available whereby these books can be purchased by the city or district school authorities. The State Board of Education during the present biennial period has been greatly embarrassed and has suffered considerable criticism because we are unable to supply elementary school texts that were really urgently needed by the schools. This condition was due to the fact that the textbook appropriation was cut down by the legislature. We have, for instance, been unable to supply geography texts for the lower grades and to adopt new texts in civics and hygiene that are urgently needed. It has also been necessary to restrict the supply of books sent out to the schools in a way that has caused inconvenience to some rapidly growing communities.

The suggestion we have to make is that the state adopt a policy of creating a textbook fund which shall follow the plan of the apportionment of school funds instead of making a biennial textbook appropriation. For the past year the average cost per child for all textbooks distributed to elementary schools was 80 cents. This is remarkable evidence of the economy and efficiency of the plan of production and distribution of textbooks in operation in the state. Owing to the need of new textbook adoptions to meet progressive developments in education, it is quite possible that the annual cost for some years would run somewhat higher than 80 cents per child. We feel confident, however, that if provision were made for a textbook fund apportioned upon the basis of $1 per child of school enrollment, this would be ample, and in the administration of the fund, care of course would be taken to hold the expense down to less than the maximum amount available if possible. Some plan, however, should be put in operation as a permanent policy that would make the funds available for school textbooks responsive to the growing needs of the schools, as shown by their enrollment. The State Director of Education, Mr. Will C. Wood, is working out the details of the law embodying this plan and we trust the same will commend itself to the legislature.

TEACHERS' RETIREMENT SALARY LAW.

The amended teachers' retirement salary law, which was passed at the last session of the legislature, failed to meet with your approval. Our conviction is that your action in the premises was wise. There will undoubtedly be proposals made the coming session of the legis-

lature for a general revision of the law and we desire at this time to go on record to the effect that we do not believe there has been sufficient experience with the present law to warrant revision at this time. It is claimed by some that the law is not sound from an actual standpoint, but its machinery is simple to administer and the general plan is one approved by the teachers of the state at the time the law was adopted. The following figures regarding the annuitants, disbursements and investments during the last biennial period will be of interest.

There has been 1030 retirement salaries granted up to March 31, 1922. Of these 760 were thirty-year salaries and 270 were disability salaries. On the pay roll sent out March 31, 1922, there were 796 names. Of these 580 were thirty-year annuitants and 218 were disabled annuitants. This indicated that 232 names had been removed from the pay roll by death, resumption of teaching, or for other causes. Of these, 180 were those of thirty-year annuitants and 52 those of disabled annuitants. The net gain in the number of annuitants for the biennial period ending June 30, 1922, was 57 retired for thirty years and 39 retired for disability.

Payments to Retired Teachers.

	1920-1921	1921-1922
First quarter	$82,846 75	$86,916 26
Second quarter	84,410 99	87,960 28
Third quarter	84,391 72	89,551 05
Fourth quarter	83,574 40	89,745 71
	$335,223 86	$354,173 30
Investments June 30, 1920		934,300 00
Investments June 30, 1922		1,312,111 50

It will be noted that the total invested surplus has reached an amount close to $1,500,000 and that during the past two years there has been no very large increase in the number of annuitants or the total amount of the quarterly pay roll. This condition influences us in the opinion that we could very safely continue to operate for two years or more under the law as it stands and that the problem of the revision of the law had much better be deferred until its provisions have been more thoroughly tested in the light of experience. The only changes we shall suggest are certain ones relating to details of administration, but which will not in any way involve a revision of the general plan.

TEXTBOOK ADOPTIONS.

The only change made in textbooks during the past biennial period has been the adoption of a new text in advanced geography—the McMurry and Parkins Advanced Geography published by The Macmillan Company. The board decided on the policy of the use of geography readers for the lower grades in preference to a primary geography, thus avoiding the twice over system of the use of geography material. Lack of funds, however, prevented the board from providing any of these geography readers, but to tide over the situation a Book of Maps, with a limited amount of text material, has been provided for use in the lower grades. This material was compiled by Miss Myrta L.

McClellan and we believe the book, while not expensive, will prove of such value to the schools that it will be retained as a permanent part of the work in geography regardless of what plans may develop in the future for the organization of courses in this subject. We desire to acknowledge the cooperation given by the Railroad Commission, Highway Commission, State Forester, Mining Bureau and other departments in providing maps and other material to make this little book up to date in all details.

The board has continued the procedure in textbook adoptions that has been in force ever since the organization of the present board. That involves the following plan: An independent study of the texts submitted by a competent and representative group of educational experts who are not subjected to any arguments or importunities by book publishers, and who report their findings confidentially to the Commissioners and the Board of Education. These reports are carefully reviewed by the State Superintendent and the Commissioners of Education, who also make their own independent investigation of the texts. They hold a public hearing at which the representatives of the book companies and the authors present their arguments and a second hearing is held by the State Board of Education. Following the investigation and hearing, the Commissioners and the State Superintendent make a recommendation for adoption to the State Board of Education and their report is made the basis of action by this board. The matter of price is also carefully considered, but educational merit as determined by the investigation is the most important determining factor in any adoption. We believe that this method of procedure is eminently safe and fair and that it has resulted in giving the State textbooks of such recognized merit as to command the approval and confidence of the school people of the state and the respect of educational authorities generally. The state may well be proud of the mechanical excellence of the state textbooks turned out by the State Printing Office and the moderate cost should meet the approval of the most exacting economist. The adaptation of the books to the needs of California children is another element in favor of the state series; and this has been brought about by careful revision to meet the conditions of this state.

SPECIAL EXPERT WORK.

During the past biennial period we secured the services of Mrs. Helen Keller of the southern branch of the State University for a few months for a valuable piece of field work in connection with the introduction of the new texts in arithmetic and spelling. Mrs. Keller covered the greater part of the state and her services in explaining to teachers the plan of work in these textbooks, and in demonstrating methods of instruction, proved of the highest value in facilitating those school adjustments that always follow the introduction of new textbooks.

Glenn H. Woods, supervisor of music in the Oakland schools, was secured for a limited period to make a survey of conditions in the teaching of music throughout the state both in the teacher-training institutions and in public schools. Mr. Woods is one of the recognized authorities of the state in this field and his advice and suggestions have proved most helpful to the communities which he visited and to this

board in making future plans for the teaching of music both in the public schools and in the teachers colleges.

By arrangement with the Commission of Immigration and Housing, plans are being made for the employment for the coming school year of Mrs. Grace C. Stanley—at the present time county superintendent of schools of San Bernardino County—to make a study of the problem of teaching the foreign-speaking children, especially Mexican children, who constitute quite a large element of the school population in many counties of the state. We feel confident that Mrs. Stanley's investigations and experimental work will be of great value in strengthening the important work of Americanization of the foreign child in the schools of the state.

SUGGESTIVE COURSE OF STUDY.

At the last annual meeting of city and county superintendents, a resolution was adopted requesting the State Board of Education to take steps to prepare a suggestive course of study for the elementary schools of the state. Acting on this request, the State Board of Education secured the services of Miss Katherine McLaughlin of the southern branch of the State University, who has made a special study of the kindergarten-primary course; and of Miss Myrta L. McClellan of the southern branch of the State University, recognized specialist in the teaching of geography. Important suggestions on the teaching of music have also been supplied by Glenn H. Woods, whose field work in the schools has already been referred to.

Under the general direction of the Commissioner of Elementary Schools the preparation of a suggestive course of study has been in progress for several months. Commissioner McNaught, Miss McLaughlin and Miss McClellan have visited a large number of typical schools, have held group conferences with teachers and superintendents and members of the teachers college faculties in various parts of the state and have had the advice of recognized experts in the teaching of special subjects. A tentative outline of the kindergarten-primary course and a complete outline of the geography course have been sent out to city and county superintendents of the state and boards of education and these should be of considerable value to them in shaping their course of study for the coming year. Suggestions from them will be considered in further work on these courses. Plans are being developed as rapidly as possible within the limitation of our funds for the completion of this highly important and greatly desired piece of work.

It will of course be understood that the State Board of Education has no power to prescribe a uniform course of study for the elementary schools, but it is hoped that the expert work which has been done and will be done in the preparation of this suggestive course will result in placing in the hands of the school administrators and teachers of the state material which will be serviceable in an important degree in planning more efficient and up to date courses of study for the various cities and counties.

GROWTH IN PUBLIC SCHOOLS.

The following figures on the school enrollment for the past year are submitted for your information:

Kindergarten	40,141
Elementary Schools	570,606
Secondary Schools (including Junior College)	227,081
Total	837,828

The gain over the previous year in the kindergarten was 9 per cent, in the elementary schools 5 per cent, and in the secondary schools 16 per cent. The total gain was 61,753 pupils. These statistics will be given in much more complete form in the report of the State Superintendent of Public Instruction and will no doubt be discussed by him. We desire, however, to call your attention to the fact that in the near future the enrollment in the public schools of the state from kindergarten to junior college will reach an even million. It is certainly a tremendous responsibility which the state faces to provide for the adequate education of this vast and rapidly increasing army of young people.

TEACHERS' SALARIES.

Following the world war, there was a general recognition throughout the nation of the fact that teachers were being inadequately paid and a nation-wide movement was inaugurated which resulted in an increase in salaries in nearly every state. California led in this movement and the adoption of Amendment No. 16 by the people of the state guaranteed school revenues sufficient to make adequate salaries possible.

In view of somewhat changed conditions in the matter of the cost of living that have developed within the last two years, there has been, we regret to say, something of a reaction against this movement for a just compensation of teachers. We are glad, however, to report that there have been few evidences of this reaction in California. So far as we are able to judge public sentiment in this state, it is to the effect that in the past teachers have been inadequately paid and that the present standards of salaries in the various cities and counties of the state should be maintained. The public, however, has the right to demand efficiency commensurate with the scale of salaries paid; and it is the policy of this board gradually to raise the standards of certification and the requirements for graduation in the various teacher-training institutions to the end that the teachers of the state may be so well trained that they can justly claim a scale of salaries based on fine preparation and demonstrated success. It is an interesting evidence of the ambition of the teachers of California to improve their professional preparation that over 4000 were enrolled in summer school sessions in the state this year.

Taking into account the expenditures of the cities and counties as well as the state and including the State University and the teachers colleges of the state, California is now expending between fifty and sixty million dollars annually on public education. This may seem to some taxpayers a vast sum to be voted to this purpose, but we may

well bear in mind the fact that this sum, large though it seems, is only practically the same as the United States spends on a single battleship. This, moreover, is true. The cost per child is only about $70 per year and that is equivalent to the cost of two ten-cent cigars daily or a little more than one ice cream soda daily. When we consider the cost reduced to that basis, certainly there seems no sound ground for any charge of extravagance in state expenditures for public education.

We do well to remember that the young people in our public schools and other institutions of public education are the most priceless heritage of the state. Under the conditions of our Democracy, these young people will be the future rulers of California; and we are justified in expenditures on such a liberal scale as will train them to be efficient, responsible and patriotic citizens, who will guarantee that in the years to come California will continue to hold its place of recognized leadership as one of the most progressive commonwealths in the nation.

STATE BOARD OF EDUCATION.

By E. P. Clarke, *President.*

PART II.

Report of the Secretary.

LETTER OF TRANSMITTAL.

In accordance with provision of section one thousand five hundred thirty-two of the Political Code, I herewith submit to the Honorable William D. Stephens, Governor of California, the report of the Superintendent of Public Instruction for the biennial period ending June 30, 1922.

Respectfully submitted.

WILL C. WOOD,
Superintendent of Public Instruction.

Sacramento, California,
September 15, 1922.

REPORT OF THE SUPERINTENDENT OF PUBLIC INSTRUCTION AND EX OFFICIO SECRETARY OF THE STATE BOARD OF EDUCATION.

To the Honorable State Board of Education,
Sacramento, California.

Ladies and Gentlemen:

I have the honor to submit herewith a review of the activities of the office of the Superintendent of Public Instruction during the last two years, together with a statement of the conditions of the public elementary and secondary schools, state teachers colleges and other state institutions supported in whole or in part by the state; also, recommendations having for their purpose the improvement of the school system of California.

Will C. Wood,
Superintendent of Public Instruction
and ex officio Secretary of the State
Board of Education.

ORGANIZATION OF THE STATE DEPARTMENT OF EDUCATION.

THE STATE BOARD OF EDUCATION.

Membership.

The Board is appointed by the Governor and the members serve for four years. The law provides for a board of seven members.

Officers.

The officers of the State Board of Education are the president and vice president elected by the board, the secretary (Superintendent of Public Instruction) elected by the people, and three assistant superintendents, designated the Commissioner of Elementary Schools, the Commissioner of Secondary Schools, and the Commissioner of Industrial and Vocational Education. The commissioners are appointed by the board. The Superintendent of Public Instruction (secretary) and the commissioners take part in the deliberation of the board, but have no vote.

Meetings.

The regular meetings of the board are held quarterly. Special meetings are called by the president from time to time.

Powers and Duties.

The powers and duties of the State Board of Education, generally stated, as defined by law, are as follows:

1. To adopt rules and regulations, not inconsistent with law, for the government of the schools of the state.

2. To standardize the courses of instruction, requirements for entrance, requirements for graduation, and textbooks of the normal schools of the state.

3. To appoint:

(1) Three Commissioners of Education;
(2) A Supervisor of Physical Education and assistant supervisors;
(3) A Supervisor of Vocational Agriculture;
(4) A Supervisor of Teacher Training in Home Economics;
(5) A Supervisor of Trades and Industries;
(6) Such expert and clerical assistance as may be necessary, within the limits of the board's appropriations.

4. To study the educational needs of the state and make recommendations for the improvement of the administration of the public schools.

5. To grant
High school teachers credentials,
Junior high school credentials,
Elementary school credentials,

Special teachers credentials,
Elementary and secondary grade life diplomas,
Attendance officer credentials, and
Health and development credentials.

For the most part this work is handled by the Commission of Credentials, hereinafter discussed.

6. To accredit universities, colleges, normal schools, and other educational institutions for kindergarten, elementary, high school, junior high school, and special certification, and prescribe regulations governing such certification by county boards of education.

7. To adopt textbooks for the elementary schools, contract for the same, copyright the materials therein, and enforce the uniform use thereof.

8. To administer the funds appropriated for vocational education and vocational rehabilitation of men injured in industry, by the Federal Congress and the Legislature, and prescribe rules and regulations governing the organization of courses of study under the Federal Act relating to vocational education.

9. To adopt rules and regulations governing courses in physical education.

10. To prescribe a list of textbooks for use in the high schools of the state and contract for such textbooks in the name of the state.

11. To call a convention of high school principals annually.

12. To approve or disapprove of the courses of study of all high schools of the state.

Compensation.

The members of the board are paid $15 a day for actual service during sessions and $10 a day for committee work. Their actual and necessary traveling expenses are allowed.

THE TEACHERS' RETIREMENT SALARY FUND BOARD.

Membership and Officers.

Members of the State Board of Education constitute the Teachers' Retirement Salary Fund Board. The officers are the same as for the State Board of Education.

Powers and Duties.

1. To approve and allow retirement salaries of public school teachers entitled to the same.

2. To audit all claims and demands against the retirement salary fund.

3. To invest the moneys in the permanent fund in securities and collect the income thereon.

4. To conduct investigations into all matters relating to the retirement salary law.

Nature of Trusteeship.

The administration of this fund involves much careful and painstaking work. It involves the investment of a reserve fund of about $1,500,000. Every application for full retirement, when granted involves an annual expenditure of $500 per annum for the remainder of the life of the applicant, so all applications must be carefully investigated and considered.

THE STAFF OF THE DEPARTMENT OF EDUCATION.

I. Executive Office.

Superintendent of Public Instruction (Ex officio secretary and executive officer.)	1
Secretary	1
Assistant secretary State Board of Education	1
Assistant secretary Teachers' Retirement Salary Fund Board	1
Bookkeeper	1
Assistant bookkeeper (retirement salary)	1
Mailing clerk	1
Stenographer	1
Messenger	1

II. Elementary Schools Division.

Commissioner of Elementary Schools	1
Secretarial stenographer	1

III. Secondary Schools Division.

Commissioner of Secondary Schools	1
Secretarial stenographer	1

IV. Vocational Education Division.[1]

Commissioner of Vocational Education	1
Supervisor of Agricultural Education	1
Supervisor of Home Economics Training	1
Supervisor of Trades and Industry	1
Supervisor of Rehabilitation	1
Assistant in Rehabilitation	1
Secretarial stenographer	1
Stenographers	3

V. Physical Education Division.

Supervisor of Physical Education	1
Assistant supervisors	2
Secretarial stenographer	1

VI. Division of Normal and Special Schools.

Deputy Director of Education	1
Secretary	1
Stenographer	1

VII. Division of Immigrant Education.

Assistant superintendent	1
Stenographer (half-time)	1

[1]The Rehabilitation Work is a subdivision of the Vocational Education Division.

VIII. Legal Division.

Deputy superintendent	1
Stenographer	1

IX. Division of Statistics and Foreign Language Schools.

Assistant superintendent	1
Statistical clerk	1

X. Textbook Division.

Head of division	1
Assistant	1
Part-time clerk	1

XI. Credentials Division.

Assistant secretary in charge	1
Credentials clerks	4
Stenographers and clerks	6

XII. Attendance Division.

State supervisor of attendance	1

GENERAL PLAN OF DEPARTMENTAL ORGANIZATION.

I. Professional Agencies.

The professional agencies of the state office include the elementary school division, the secondary school division, the vocational education division, Americanization division, and the physical educational division.

II. Executive Agencies.

The executive agencies of the state office, not including the superintendent's office, include the three secretarial offices, the legal division, the statistical division, attendance division, division of normal and special schools, and the textbook division.

DEPARTMENTAL MEETINGS.

There are two departmental councils—the Cabinet and the Commission of Credentials, the former being a department organization, the latter a legal organization.

There is an annual joint meeting of the Cabinet, the members of the Department of Education at the University of California, the Dean of the School of Education at Stanford University, the Dean of the School of Education at the University of Southern California, and the Deans of the Schools of Education of Mills College, Pomona College and Occidental College and teachers college presidents for the purpose of organizing cooperative investigations of educational problems.

THE CABINET.

Composition.

The Cabinet consists of the Superintendent of Public Instruction, the Commissioner of Elementary Schools, the Commissioner of Secondary Schools, and the Commissioner of Vocational Education.

Functions and Duties.

Its functions shall be:

1. To discuss all plans of a professional nature, with a view to the development and working out of a unified policy.

2. To consider all suggestions for legislation bearing upon professional problems of general concern.
3. To coordinate the movements of the professional representatives of the department so as to prevent unnecessary duplication of activity and to effect a workable and economical plan for visiting state institutions and supervising the schools of the state.
4. To assign the investigation of all problems referred to the Cabinet by the State Board of Education and to consider reports thereon before presentation to the board.

Organization.

The Superintendent of Public Instruction shall be Chairman of the Cabinet and shall prepare a program for each meeting. Any member may bring up for discussion during the meeting any matter on which he desires to confer with the members.

Meetings.

A regular meeting shall be held at 10 o'clock a.m. on the first Monday of each month, and special meetings may be called by the Superintendent at any time. It shall be the duty of each member to attend all regular meetings unless excused by the Superintendent. The regular meeting shall have precedence over any other business.

Minutes.

The minutes of meetings shall be kept in a book provided for the purpose and shall be open to the inspection of the members of the Cabinet and members of the State Board of Education.

Limitation.

The Cabinet shall have no legal standing, and all correspondence concerning its business shall be conducted by the superintendent or department head concerned on his own stationery.

COMMISSION OF CREDENTIALS.

Composition.

The Commission of Credentials consists of the Superintendent of Public Instruction, Commissioner of Elementary Schools, the Commissioner of Secondary Schools, and the Commissioner of Vocational Education.

Functions and Duties.

1. To consider all applications for regular high school, junior high, elementary, kindergarten, and special credentials.

2. To consider reports of the commissioners on applications for accreditation and report thereon to the board.

3. To arrange for the examination of candidates for the regular high school credentials and special credentials.

Organization.

The commission shall elect a chairman. An assistant secretary is assigned by the board.

Meetings.

The commission shall arrange regular meetings to consider credential matters on which conference is necessary.

Minutes.

The minutes of the meetings, and a complete list of credentials granted, shall be kept by the secretary in a book provided for the purpose.

EXECUTIVE AGENCIES.

Superintendent of Public Instruction and ex officio Secretary in Charge.

Duties.

1. To act as chief executive officer of the board, carrying out in person, or through assistants, all educational policies determined by the board.

2. To supervise the different departments, divisions and offices of the state department and decide all conflicts of authority; to assume responsibility for the proper administration of the department and to see that all work assigned is properly performed and all reports are properly made.

3. To superintend the schools of the state and visit and investigate in person, and through assistants, the kindergartens, elementary schools, secondary schools, junior colleges, teachers colleges, the California Polytechnic School, and all other educational institutions supported in whole or in part by the state.

4. To visit all orphan asylums receiving state aid and look into the educational features thereof.

5. To call a convention of city and county superintendents annually and prepare a program therefor.

6. To require reports and prepare and publish blanks for reports and such other forms as may be required by law.

7. To compile biennially a report of the activities of his office and of educational advances during the biennium and to make recommendations for the improvement of schools.

8. To interpret in person, or through assistants, the laws relating to schools.

9. To cause all state school moneys appropriated or otherwise made available for school purposes to be apportioned according to law.

10. To pass upon all claims against the funds of the state set aside for the state departments of education and see that the accounts of the departments are properly kept.

11. To act as a regent of the State University.

12. As director of education, to perform duties heretofore performed by boards of trustees of the several state normal schools and of the California Polytechnic School and the California School for the Deaf and the Blind, subject to limitations of law.

13. To perform such other duties as may be prescribed by law.

SECRETARY TO THE SUPERINTENDENT.

Duties.

1. To receive and distribute all correspondence and open all mail directed to the superintendent, answering all correspondence of a routine nature.

2. To attend to all complaints concerning correspondence and have charge of the filing in the superintendent's office.

3. To attend to the details of publication of all bulletins of a professional nature.

4. To act as secretary of the Cabinet.

5. To have charge of the department library and publications received.

6. To investigate and pass upon all applications for the certificate of scholastic preparation for entrance to dental colleges, subject to approval of the superintendent.

ASSISTANT SECRETARY OF THE STATE BOARD OF EDUCATION.

Duties.

1. To keep the minutes of the State Board of Education, under the direction of the secretary and have same ready within ten days after the adjournment of each meeting.

2. To answer in the name of the secretary all board correspondence of a routine nature.

3. To be responsible for the safe keeping of all books, records and papers of the State Board of Education.

4. To make all purchases, check all bills and all claims for traveling expenses, and prepare all warrants in payment of claims for services, materials and traveling expenses.

5. To supervise the keeping of accounts of all appropriations and revenues and of all expenditures, segregating the items for convenience in budget making.

6. To exercise supervision over and direct the work of all non-professional employees of the board, except those assigned to work with the professional departments and the Commission of Credentials.

7. To prepare or have prepared, quarterly, an itemized report of receipts, expenditures and unexpended balances for presentation to the board at each regular meeting.

8. To prepare all contracts and bonds for the lease of plates or the purchase of manuscripts for elementary school textbooks and see that they are properly signed and filed within four months after any adoption.

9. To prepare all contracts and bonds required from publishers under the high school textbook law and see that they are properly signed and filed within four months after receipt of notification of the official listing of books from the Commissioner of Secondary Schools.

10. To perform such other duties as may be assigned by the secretary.

LEGAL DIVISION.

Deputy Superintendent of Public Instruction in charge.

Duties.

1. To edit and have printed the school law.

2. To annotate the school law from decisions of the courts and opinions of the superintendent.

3. To advise educational officers as to the interpretation of the school law and methods of procedure thereunder, all opinions to be subject to approval by the superintendent.

4. To investigate and report to the superintendent all appeals for salary withheld.

5. To keep on file and properly indexed, all opinions, interpretations and decisions of the superintendent.

6. To assist the superintendent in visiting the orphan asylums.

7. To assume responsibility for the offices of the Superintendent of Public Instruction during his absence.

DIVISION OF STATISTICS AND FOREIGN LANGUAGE SCHOOLS.

Assistant Superintendent in charge.

Duties.

1. Subject to the approval of the superintendent, to prescribe the blanks, forms, registers and regulations for making all statistical reports to county and state school officers.

2. To attend to the gathering, tabulation and editing of all statistical data.

3. To apportion school moneys.

4. To prepare the annual statistical tables for publication in the biennial report.

5. To bring about a study of retardation, its causes and the means of reducing the same.

6. To gather information concerning the progress of educational measurements and the development of educational standards, and to encourage local boards to introduce such work.

7. To supervise all foreign language schools.

TEXTBOOK DIVISION.

Bookkeeper in charge.

Duties.

1. To receive and fill all orders for textbooks.

2. To keep records and accounts showing all orders for the publication of textbooks, the number of textbooks printed, the number distributed to the several school districts and state institutions, the stock on hand, and expenditures from the textbook fund and from the orphans' textbook fund.

3. To prepare for each regular meeting a report showing stock of textbooks on hand, amounts expended for textbooks during the previous quarter, balances available for the publication of textbooks, and estimates of the number of textbooks needed during the next quarter.

4. To keep all books and accounts of the office of the Superintendent of Public Instruction, and prepare a monthly statement showing expenditures for the various purposes, and balances.

SUPERVISOR OF ATTENDANCE.

Duties.

1. To study the problem of school attendance and other problems of child welfare directly affecting the elementary schools.

2. To cooperate with local supervisors of attendance in the enforcement of the compulsory education law.

3. To prepare forms for the registration of minors and gather statistics of such registration.

4. To organize and supervise classes organized under law for children of migratory workers.

5. To assist the Superintendent of Public Instruction in visiting orphan asylums receiving state aid, and investigate educational conditions therein.

PROFESSIONAL AGENCIES.

Elementary School Division.

Commissioner of Elementary Schools in charge.

Duties.

1. To visit and investigate the elementary schools of the state.

2. To direct and supervise all investigations of textbooks for elementary schools and collect and approve all claims for expert reading, subject to approval by the secretary.

3. To visit and investigate the kindergarten classes of the state and make recommendations for their improvement and for better articulation of such classes with the elementary schools.

4. To supervise the investigation of applications for accreditation by institutions preparing teachers for regular elementary school work, the actual detail work to be done by the secretary of the Commission of Credentials, and while visiting outside the state, to look into the organization of teacher-training courses in accredited institutions whenever she can do so conveniently and at slight expense.

5. To suggest ways and means for improving elementary school teachers in the service. This will involve the preparation of a bulletin of suggestions on the organization of teachers' institutes, the organization of professional reading circles, and plans for official recognition of such work. It would also involve the working out of a plan of cooperation with the universities and teachers colleges in their extension work with elementary school teachers.

6. To visit and investigate special schools and classes of elementary grade established for the deaf, crippled and atypical children, and classes for children with speech defects, and to become acquainted with institutions for the care and education of such children with a view to close cooperation.

7. To visit and investigate the several state teachers colleges and the training schools thereof, and counsel with teachers college authorities concerning better preparation of teachers for kindergarten and elementary schools.

8. To make a special study of rural life and rural institutions related to the schools and devise ways and means for improving the rural elementary schools.

9. To investigate and supervise all post-graduate courses of elementary grade.

10. To make every reasonable effort to coordinate the work of all agencies that are seeking to cooperate with the elementary schools or influence their curricula and organization.

11. To perform such other duties as may be prescribed by law or assigned by the superintendent under the direction of the State Board of Education.

SECONDARY SCHOOL DIVISION.

Commissioner of Secondary Schools in charge.

Duties.

1. To visit and investigate the secondary schools of the state.

2. To advise local boards and school officials in the making of course of study.

3. To investigate the course of study of the several high schools and junior high schools, and recommend the approval or disapproval thereof to the State Board of Education not later than the third regular meeting of each year.

4. To cooperate with the Commissioner of Vocational Education in the supervision of evening high schools.

5. To counsel with university authorities concerning entrance requirements, with a view to better articulation of high schools and colleges.

6. To investigate and report on junior high school courses, post-graduate high school courses and junior colleges.

7. To supervise the preparation of the official list of high school textbooks, junior college textbooks and junior high school textbooks; to appoint expert readers of such textbooks; to turn over to the assistant secretary a statement of the amount due each expert reader for his services within one month after the listing of such books; to receive fees for the listing of textbooks and turn same over to the assistant secretary with a complete statement of the sources thereof before the publication of the official list, and to enforce the high school textbook law.

8. To arrange the program of each convention of high school principals.

9. To prepare and publish the high school directory annually.

10. To prepare and publish a manual of suggestions concerning the organization and conduct of high schools, suggested forms for keeping records, suggestions for the organization of libraries, suggested courses of study, the rules and regulations of the State Board of Education applicable to high schools and any other matter tending toward the improvement of the high school organization.

11. To perform such other duties as may be assigned by law or by the superintendent under the direction of the State Board of Education.

VOCATIONAL EDUCATION DIVISION.

Commissioner of Vocational Education in charge.

Duties.

1. To visit and investigate all vocational industrial and technical schools and classes of the state.

2. To direct and supervise the work of all assistants in his department and require reports thereon.

3. To cooperate with the Federal Board of Vocational Education in the administration of the Smith-Hughes law in so far as it relates to California, and of the law for the rehabilitation of persons injured in industry.

4. To cooperate with the State University and the state teachers colleges in organizing courses of teacher-training under the Smith-Hughes law.

5. To advise local boards and school officials in the making of courses of study in the vocational arts.

6. To supervise the organization and conduct of pre-vocational courses in elementary and junior high schools and vocational courses in junior colleges.

7. To cooperate with the Commissoner of Secondary Schools in the supervision of evening high schools.

8. Upon invitation, to cooperate with penal and reformatory institutions in the organization of suitable vocational courses therein.

9. To cooperate with federal and state agencies in the reeducation of maimed soldiers and civilians.

10. To study the problems of vocational opportunities, guidance and placement, and counsel with local boards concerning the organization of work therein.

11. To perform such other duties as may be assigned by law or by the superintendent under the direction of the State Board of Education.

PHYSICAL EDUCATION DIVISION.

Supervisor of Physical Education in charge.

Duties.

1. To supervise all courses of physical education offered in the elementary, high and teachers colleges of the state.

2. To prepare and publish a manual of physical education.

3. To cooperate with local authorities in efforts to control and overcome growth handicaps.

4. To advise school officials and teachers concerning the hygiene of instruction and school sanitation.

5. To cooperate with university and local agencies in the study of mental hygiene.

6. To disseminate proper ideas as to the care, nurture and physical training and instruction of the children of the state.

7. To counsel and cooperate with the universities and teachers colleges in the preparation of teachers of physical education.

8. To devise ways and means of training teachers in the service in the proper aims and methods of physical education.

9. To give an opinion on each application for a special credential to teach physical education.

10. To investigate and make a recommendation upon each application for a health and development certificate, the actual detail work to be done by the secretary of the Commission of Credentials.

11. To direct and supervise the work of all assistants in his department.

12. Upon invitation, to cooperate with penal and reformatory institutions and all other institutions maintained by the state in the organization of suitable courses of physical education therein.

13. To perform such other duties as may be assigned by law or by the superintendent under the direction of the State Board of Education.

DIVISION OF IMMIGRANT EDUCATION.

Assistant Superintendent in charge.

Duties.

1. To visit, investigate and supervise elementary and secondary classes in Americanization and home teachers.

2. To investigate and recommend courses of study for Americanization classes.

3. To investigate and recommend courses of study for the preparation of all students for the duties of citizenship.

4. To cooperate with teacher-training institutions in the preparation of teachers of citizenship and Americanization.

5. To cooperate with the Commission of Immigration and Housing and the Federal Bureau of Naturalization in Americanization work.

DIVISION OF NORMAL AND SPECIAL SCHOOLS.

Deputy Director of Education in charge.

Duties.

1. To receive and investigate all estimates sent in by the various normal and special schools and recommend approval or disapproval by the director.

2. To investigate all claims and recommend approval or disapproval thereof by the director.

3. To assist the director in determining policies such as proposed extensions of the course of study, proposed increase in the number of faculty members, the holding of summer sessions, the conduct of extension classes, etc.

4. To supervise generally the work of all custodians of buildings and grounds and to cooperate with the business managers of the several institutions.

5. To cooperate with the State Engineering Department in the preparation of plans for new buildings and other public works.

6. To assist in working out a scientific classification of teaching positions in the several institutions.

7. To assist in working out a scientific salary schedule which shall take into consideration the class of position, training and experience of the employee and the cost of living.

8. To visit the several institutions from time to time and keep in touch with them.

9. To study the organization in each institution with a view to the promotion of efficiency and economy and to make recommendations thereon from time to time.

REPORTS OF PROGRESS.

FOREIGN LANGUAGE SCHOOLS.

Section 1534 of the Political Code, approved June 3, 1921, placed in the hands of the Superintendent of Public Instruction the responsibility of control of private schools conducted wholly or in part in the language of a foreign nation. The legislature, however, failed to provide means, other than a fee of $2 charged each applicant for a permit to conduct or teach in such a school, for adequate supervision of these schools. In consequence, there has been practically no inspection of the schools.

Examination of applicants has been held from time to time in San Francisco, Los Angeles, Fresno, Stockton and Sacramento. This has been done at the expense of the applicants, however.

The following table gives an idea of the distribution of the applicants:

	Japanese	Chinese	German	Total
Granted	181	77	6	264
Failed	45	4	--	49
Pending	34	15	--	49
Total	260	96	6	362

Both Chinese and Japanese leaders have expressed complete satisfaction with the operation of the law, and have at all times given every evidence of their willingness to cooperate in carrying out its provisions. In the preparation of textbooks to meet the requirements of the law, both the Chinese and Japanese have called this office into consultation and have placed at the services of the deputy in charge of this work every aid needed. Translations of the texts have been submitted for his inspection, and suggestions have been well received and carried out. An entirely new set of texts for use in California is being prepared by the Japanese Educational Association of California. Through the courtesy of Mr. V. S. McClatchy translations have from time to time been made for this office without cost to the state.

An amendment to section 1534 of the Political Code, correcting certain errors in the law as it now stands, will be submitted to the coming legislature. One amendment necessary to the proper carrying out of this law will be an increase in the fee from $2 to $10, the fee now charged for other types of examinations, which will provide greater funds for the inspection of these schools.

REPORT OF ASSISTANT SUPERINTENDENT IN CHARGE OF IMMIGRANT EDUCATION.

At the opening of the school year on September 1, 1921, a brief outline of aims for the year in the field of immigrant education was submitted to the State Superintendent of Public Instruction. A copy of that outline follows here, and as far as possible in reporting on the year's work this outline will be adhered to. I am happy to report that we have not forgotten these aims at any time during the year and that our hopes for improvement over last year in both the quality and quantity of the work have been realized far beyond our modest expectations.

AIM FOR YEAR 1921-22.

A. IMMIGRANT EDUCATION OF ADULT FOREIGN BORN.

I. Teacher training.

1. Working toward ideal: "No teachers of adult immigrants who have not had special training for this work."
2. Short institutes held in every center where schools are conducting classes for adult foreigners on
   (*a*) Methods of teaching English,
   (*b*) Methods of citizenship training,
   (*c*) Methods of preparing applicants for second papers.

These institutes are held under auspices of local school authorities and all teachers are *strongly* urged to attend. For large cities a two weeks' course is held, meeting three days a week for one hour and a half.

II. Expansion of work.

This is going to be difficult in a period of great unemployment, for people are not interested in education when they can not get jobs.

1. Home teachers.
   (*a*) At least seven communities where home teachers have never been employed, or have been employed only on part time, should be urged to start the work. Richmond, Crockett, Santa Barbara, San Diego, Fillmore, Ontario have already been approached.
   (*b*) Increase number of home teachers employed in San Francisco, San Jose, Long Beach, Alameda and other places as opportunity offers.
2. Night school and other adult classes.
   (*a*) Increase number of factory classes.
   (*b*) Adult classes are now being held in twenty-two cities and thirty-four rural communities, with a total of 343 classes, and enrollment of 10,458.
   If unemployment is not serious, ten new rural communities should offer classes; total enrollment for state increase 20 per cent.
   (*c*) Opening of new classes in immigrant neighborhoods, as well as centrally located high school buildings.

B. EDUCATION OF NON-ENGLISH SPEAKING CHILDREN.

I. Teacher training.

1. Continuation of extension work started by San Francisco, San Jose, Chico, Fresno and Santa Barbara State Teachers Colleges, and starting such extension in San Diego, and Southern Branch of University.

II. Demonstration of methods of teaching by taking classes in rural schools and inviting inspection.

C. GENERAL ACTIVITY.

I. Conference on Industrial Americanization with employees of large numbers of foreign-born.
How can schools assist in stabilizing the labor question?

II. Urge city and county superintendents to employ supervisors of Americanization.

III. Gather data to show growth of and development in 1921-22 as compared with 1920-21.

IV. Work out satisfactory course of study for children in migratory schools.

A. IMMIGRANT EDUCATION OF ADULT FOREIGN BORN.

I. Teacher training.

The ideal set in this field is rapidly being realized. In another year, except as an emergency, there will be practically no teachers of adult immigrants who have not taken special preparation and training. Three things have made this possible: (1) greater facilities for obtaining training; (2) more stringent requirements for the secondary credential in citizenship, and (3) recognition of the importance of training by superintendents and others charged with the employment of teachers.

This year, California teachers have had many opportunities to obtain courses in methods of teaching foreign adults, and plans are all made for even greater opportunity next year. Last summer, courses were given at the University, both at Berkeley and Los Angeles, at the University of Southern California and at the Teachers Colleges in San Jose and San Francisco. All of these places are giving courses this summer, but this year the courses are specified exactly. Six units in all are required —two in the technique of modern language teaching, two in racial backgrounds and the last two in any related subject chosen by the student to fit his own needs as a worker in the field. In the past greater leniency in choice of subject has been shown. However, it seems obvious that if a man or woman is seeking a license to teach English to foreign adults he or she should know how to teach English and should also know foreign adults.

The University of California has been particularly generous in bringing Dr. H. R. Miller from Oberlin College to give two courses, one on the immigration question. In addition, the University is maintaining an excellent demonstration school in Oakland in connection with the course on Methods of Teaching. The assistant superintendent in charge of

immigrant education directed the courses at the Southern Branch of the University, in Los Angeles, during the summer of 1922.

San Francisco Teachers College has made a remarkable venture in teacher training by taking over a property in the Italian quarter at which a model school will be developed to set standards in all the work of immigrant education. This school is being used in the summer of 1921-22 to initiate the training school for home and Americanization teachers which will now become a permanent feature of the college curriculum.

San Jose Teachers College has engaged a specialist in recreation in addition to the regular staff for the summer course. In this way the play life, in their native villages, of most of the nationalities in California will be interpreted in terms of possibilities for better recreation in America. Both Chico and Santa Barbara Teachers Colleges are offering courses in Americanization, although not the full group required by those seeking the special secondary credential.

During the past winter the University of Southern California has been maintaining a course which was largely attended by Los Angeles city teachers. For the year 1922-23, the extension division has engaged the services of a teacher who will give methods courses in any part of the state. The places tentatively chosen, cooperating with the State Superintendent of Public Instruction, are Los Angeles, San Diego, Orange County, Long Beach, Ventura, Santa Barbara, Fresno, Kings and Stanislaus counties, San Francisco, Stockton, Oakland, Alameda and San Jose.

The employment of this one person is a step toward the consummation of a larger plan which is still in abeyance. During the winter a committee appointed by President Barrows to outline a program of citizenship training for the university has been meeting with the assistant state superintendent in charge of immigrant education. The appended plan was presented by the assistant superintendent and adopted unanimously by the whole committee: Dr. Van Nostrand, director of the extension division, Dean Hart, of the summer session, and a representative of the American Legion. No action has been taken by the president's office, but the extension division has already made its appointment.

Some Citizenship Needs of the Public Schools.

1. *Teachers* who can deal with non-English speaking children in the primary grades.
2. *Teachers* who can deal with older non-English speaking children who have been educated in their own country, but can not fit into their grade in an American school because of their language handicap.
3. *Teachers* who understand the social forces in America that are making for the assimilation of the immigrant and can make the public evening school take its place as an important element in the general scheme.
4. *Teachers* with executive ability who can organize and supervise the immigrant education program in a school system.
5. *Teachers* with training in civics and an understanding of modern questions—political, social, industrial—who can teach citizenship to adults.

How This Need Can Be Met By the State University.

I. Ultimate, complete program.

1. Division of immigrant education in school of education with
   (*a*) director who can give courses covering the background of the immigration question; anthropology as it deals with migrations of people, history of immigration in the old world and America, immigration and social institutions, industry, etc. Problems of immigration in America. This director should be free for *extension* work and intensive short courses in various parts of the state for at least one-half of his time.
   (*b*) Instructor in pedagogy of immigrant question.
      (1) Methods of teaching English to adults and children.
      (2) Methods of school administration in foreign communities.
      (3) Technique of home teaching.
      (4) Group and community organization.
   (*c*) Instructor in citizenship education.
   (*d*) Demonstration and practice schools in a foreign neighborhood.
2. Southern Branch.
   Special teachers' courses in subjects indicated under (*a*), (*b*), (*c*) above and a demonstration and practice school in a foreign neighborhood.
3. Extension division.
   (*a*) Special intensive courses in all parts of the state under the director of the division in the school of education.
   (*b*) An expert teacher of foreign-born children and adults employed on full time to assist in 3 (*a*) above, and when not engaged in formal courses to supervise and confer with teachers of foreign children and adults.

II. Immediate program.

1. Graduate class in Los Angeles, to study material suitable for use in classes of ungraded foreign children. Findings of this research group to be printed by University or State Board of Education.
2. Employment of full-time instructor for the extension division, as indicated in 3 (*a*) above.

In addition to these formal courses offered during the winter and summer sessions, carrying university credit and preparing for a state board credential, many short institutes have been held all over the state, these being open only to teachers then employed in teaching foreign adults or those especially designated by the local superintendents as substitutes. These institutes were all directed by the assistant superintendent in charge of immigrant education, and the classrooms of the teachers visited before the formal conferences, so that the suggestions made were in every case practical and specific. Such institutes were held in San Diego, Los Angeles, Kings County, Tulare, Fresno, Stock-

ton, Oakland and San Francisco. About 400 teachers attended and marked improvement in classroom methods was noticed.

As so many opportunities are afforded for teachers to receive adequate preparation for their work with foreign adults, the state board felt justified in making requirements more nearly commensurate with the importance of the work. These standards will be rigidly maintained in the future. They are as follows:

Applicants for the special secondary certificate in citizenship must have a bachelor's degree or an elementary certificate, based upon two years of training, or the equivalent, and four years' teaching experience plus at least six units of special work in an accredited course given by a college or university. This special course, which all applicants must take, shall include two units on modern language teaching, two units on the problems of immigration and two units on some allied subject elected by the applicant.

After another year it would be well to raise the standards still further and require two units in a study of American institutions and the responsibilities of citizenship.

As superintendents have had trained teachers on their staff, they have recognized their superiority and the consequent improvement of attendance. Therefore, untrained teachers are no longer acceptable.

Recommendations for Teacher Training.

For the future we feel that in teacher training, if a director could be employed in this department under the state superintendent who would give full time to coordinate the work done by all the teacher-training institutions and the Extension Division of the University, supervise classes and give courses where the extension division cannot afford to go, no further pioneering would be necessary and a completely adequate program would be under way.

II. Expansion of Work.

At the beginning of the year it was thought that all expansion might be difficult because of the business depression, which prevents school boards from undertaking new expenditures and makes the worker uninterested in education on account of his daily fear of unemployment. Business, however, proved to be more stable and an exceptional growth in the night schools can be reported. There were increases both in the number of classes and in attendance of from 50 to 150 per cent.

Home Teachers.

1. Many communities where home teachers have never been employed have had them this year or engaged them for next year. Still other districts have employed full-time teachers of adults who have done considerable work with home classes. Cities where home teachers were employed have increased the number of such teachers. These new fields include: Crockett, Santa Barbara, Fillmore, Ontario, Fowler, Tulare, Visalia, Hanford, San Jose, San Francisco, Long Beach and Los Angeles. Last year there were fifty-nine home teachers employed in California. This year there are sixty-eight. Last year there were seventy-five full-time teachers doing adult immigrant education work and this year there are more than one hundred.

2. The increase in classes and attendance has been even more striking. In 1920-21, twenty-two cities were carrying on adult work, with 269 classes and an enrollment of 9108. In 1921-22, there were twenty-eight cities doing the work, with 402 classes and an enrollment of 14,741. Outside the cities, in the union high school districts, there were thirty-five districts in 1920-21, where classes for adult foreigners were offered and there are fifty-two in 1921-22. Last year there were seventy-seven classes in these districts, with a total enrollment of 1360. This year there were 140 classes, with a total enrollment of 3554. Not only have these classes increased in number and in size, but the plan of organization has very decidedly improved. Whereas, last year, it was considered sufficient if the union high school offered classes in the high school building, this year the plan of carrying education to the people that need it has been very generally adopted, and classes now meet in the elementary schools in the high school union where the foreign population warrants it, regardless of the distance from the central building, and the high school pays the bill.

There are many other ways in which numbers alone do not represent the increase and expansion of the adult immigrant classes. During the past year, many changes have come about which tend to raise the standard of the work. The first is the recognition of the importance of supervision. In the past, especially in the union high school districts, classes were started and taught on an hourly basis by teachers who were already carrying a full-time day program. The responsibility for building up the class and creating a closer organization, was left with the superintendent or high school principal, who had too many other duties to give this any particular attention. Now both union high school districts and cities are appointing trained supervisors, who select the teachers and supervise them, and determine where classes are needed and the type of lessons that would be suitable. It is only when the work is undertaken thus as a regular department, that it is vital and permanent.

The second factor which gives permanence to the program is the law passed at the last session of the legislature apportioning state and county money for evening schools. The $2700 which accrues on the first thirty units of average attendance justifies any new district in starting adult classes, because this money will pay for a full-time supervisor for the first year.

The third, and an exceedingly important factor in bringing about a higher type of education, can be stated less concretely than the other two. This is the socialization of the adult work and the added dignity which has been given to it. The night school is ceasing to be a group of classes, academic in character, which bear little relation to the life of the individual attending them. Partly because the plan has been so generally adopted of having the night school in the immigrant community, it has come to serve as the important civic agency in meeting a large part of the needs of the foreign born. In many of the small towns all over California this year, there were night school commencements, which were attended by the foreigners and Americans alike and in every instance played an important part in breaking down the barriers of prejudice between these two groups in the communities.

In many places the night schools have been organized as clubs with much of the responsibility for the direction of the school resting upon the students themselves. In these cases, all the recreation program is taken care of by the student body and many things are undertaken which lead to important community activities.

With increasing socialization, there has been much greater leniency in the choice of meeting places. Under the rural high schools, there are classes for men and women on the ranches. Some of these mothers' classes have made the first American contact which the foreign women have had. In the citrus belt, many of the fruit packers' camps have a club room or other meeting place where trained teachers are organizing clubs and classes for the foreign adults. In the railroad lumber camps and in the camps where construction workers live there are many teachers working for the local school, but conducting their classes in a room or cabin provided by the industry. This makes for such close association between the immigrant and his teacher that the most practical and useful kind of lessons can be provided.

As Los Angeles has led in the past in the completeness of its program, it continues the steady development of all phases of the work with cumulative results. Many interesting stories of their unique ways of organizing and maintaining classes could be told, but they are scarcely suitable for a report of this sort.

Here, as in many other places, much effort is made to use the students' capacity for sharing responsibility and to develop a program of adult education which is sufficiently democratic to help immigrants to fit into the life of a democracy.

B. EDUCATION OF NON-ENGLISH SPEAKING CHILDREN.

The initiation of a state plan for education of non-English speaking children has been one of the most significant accomplishments of the past year. Although we have had foreign children in our schools for many years, little recognition of that fact has been made either by teacher training institutions or school boards and others responsible for curricula. The child who cannot speak English has been a laggard in our schools, always suffering from a handicap which no one helped him to overcome. Although he came with the wealth of the tradition of the whole world, because he was different and strange, the gifts with which he could enrich the life of America have been rejected.

It is therefore with great hopes for the future that we point out the progress made in this line. An important advance has been in the training of teachers. Many teachers colleges are now giving specific attention to the education of the foreign child. Fresno has a teacher on the faculty this year who has spent a year at Columbia studying this question. San Jose is giving particular attention to the foreign child in the rural school and has taken over a country school, which is largely Portuguese as a regular part of the observation and practice work.

San Diego has a member of its faculty who has had much experience with foreign children, who gave a course this summer on teaching Mexican children. Some instruction of this sort will now be a permanent part of the curriculum.

The splendid development of a training center in the Italian quarter of the San Francisco Teachers College has been mentioned. The work

is beginning with classes of primary kindergarten age. Here it will be possible to develop, not only correct methods of teaching English, but all the enriched curriculum which such an environment calls for. This will be a school which belongs to the community, which interprets America to the community and the community to America. Teachers going out into their own schools from this experience will do much for education in California.

The university in its southern branch has taken a decided step in demanding that every teacher who receives the diploma in the future shall have had at least nine weeks training in methods of teaching foreign children. During the summer session in the southern branch, this year, there was a demonstration class made up of non-English speaking children, and much was gained by the sixty or more teachers from all over the state who watched the progress of that group and joined in the discussion of the methods employed.

In addition to the work of the regular teacher training institutions, the state department has had the assistance of a supervisor in this field for the past year. Since there were no state funds available to finance such assistance, it was necessary to have each county pay for her services during the time she was working in that particular county. From December 1st to May 1st she worked for periods of from one week to two months in Monterey, Merced, Santa Barbara and San Diego counties, visiting in all 105 schools, with a total of 240 visits. In every case this supervisor, Miss Flora Philips, spent considerable time with the teachers and usually took classes for a demonstration lesson. No adequate estimate of the value of this service can be made. Everywhere teachers expressed their gratitude for the assistance given them. This next year, several counties will have full time supervisors who will be available for teachers who do not know how to meet the difficulty which arises when their children cannot understand them. San Bernardino and Fresno counties had such supervision last year. Ventura, Monterey and Santa Barbara have undertaken it for next year.

The attention given to this special subject is but one evidence of the importance it is assuming in educational progress. Cities now are beginning to see the necessity of administrative provision for the foreign child. Whereas, formerly he was put into the first grade work just as the English speaking child, the establishment of the pre-primer class now gives him a term in which to learn the spoken English before he is obliged to read and write it. Both Los Angeles and San Diego have this pre-primer class. Here the foreign child, with an opportunity to compete with his equals, begins his school life in a happy environment, with a chance to develop self confidence and the power of self expression. All over the United States, cities are planning to follow this grading for the elimination of retardation and the intelligent management of their children.

The more significant evidence of statewide progress has been the definite provision made for the non-English speaking child in the state course of study. During the year the Commissioner of Elementary Education has been writing a new course of study for the state beginning with the first three grades. This department was called into consultation and with the aid of Miss Philips, mentioned above

as supervisor, prepared amendments and additions to the course of study to adapt it to the needs of the foreign child. Three important facts were recognized.

First—A child who speaks no English should be given one year and a half to finish the first grade. Hence the establishment of a pre-primer class of one term in which most of the time is spent acquiring the oral English which the child needs.

Second—Recognition should be made of the fact that the foreign child has a home life, traditions and ideals which are different from those of the American child; all that is good and helpful in his inheritance should be developed and intensified. This will give dignity to his attitude toward his parents and make possible a greater contribution to America.

Third—The foreign child should be used to give the American child a better understanding and appreciation of the peoples of the rest of the world, so that through his contacts with the foreign child in the schoolroom, the American of the next generation will be more of a factor in bringing about a better understanding of the nations of the world.

It is a decidedly high water mark in educational progress, when such a point of view can be written into a state course of study.

For the future there should be someone employed jointly by the State Superintendent of Public Instruction and the Commissioner of Elementary Education to interpret this part of the course of study and bring about its adoption by the schools of California in spirit as well as in letter.

C. GENERAL ACTIVITY.

Certain activities have been undertaken by the department, which fall under none of the above heads. During the winter, the Assistant Superintendent in charge of Immigrant Education made a trip throughout the East and attended the national conference on immigrant education which occurred under the auspices of the National Education Association in Chicago.

Many valuable suggestions and much encouragement and stimulation was gained from this trip. It was particularly gratifying to see how the California home teacher plan was being adopted in other states and to know that our work here is considered very highly by Eastern experts. As a result of the contacts on this trip, California was asked to present a paper on this subject at the National Education Association in Boston in July.

Another important event of the year was the illiteracy conference called by the National Education Association, in San Francisco, under the leadership of Mrs. Cora Wilson Stuart.

An excellent program was planned by the State Superintendent of Public Instruction and remarkable stimulation was given to the work of adult immigrant education. Although the purpose of this conference was to emphasize the importance of education of the native-born illiterate, the meetings interpreted this purpose in the broadest possible way so as to include not only foreign-born illiterates but all adults whose education is not adequate to their needs.

An important activity of the department for the year has been the preparation of two pamphlets and the arranging for a third by Miss

Sarah Barrows of the San Francisco Teachers College for use of teachers who have either foreign children or adults. These pamphlets have already been called for in sufficient quantity to exhaust the supply, so that it has not been possible to fill the orders either within or outside the state.

Several projects which were contemplated for the year have not been carried out. One was the conference with employees of foreign labor, to work out closer cooperation between the schools and the industries. This has been deferred until a period of greater industrial stability.

Another important plan, which was not carried out, will probably be done better this year. This is the contemplated conferences in both the north and the south of all those officially concerned with the naturalization and citizenship of aliens. It is hoped in the early fall that meetings may be held of judges, naturalization examiners and citizenship teachers, in order to set the highest possible standards for the demands which should be made and the opportunities given, to those seeking to function as citizens in our American life.

With the law on our statute books requiring county superintendents to send notices of school opportunities to every applicant for first or second papers, it is important that the schools and the federal government work in close cooperation. It has been somewhat difficult to establish the necessary machinery in the county superintendents offices for carrying out this law. It is interesting to note that 4707 people have applied for first papers, 4279 for second and 5464 have received notices telling them where they can attend school and receive instruction which will fit them to become citizens. This law, which reaches every man, no matter where he lives, is a factor in carrying out the important part of the state program, which is the education of the foreign adult in the rural community. We have set for ourselves the ideal here, which no other state has, namely, that wherever a man may live he should have an equal opportunity for an education. Especially in California, where the cultivation of the fields and the carrying on of mighty engineering projects which stagger the imagination, are the real genius of our industrial life, do we insist that those who make us great shall not pay too dear a sacrifice of their personal development in leaving the congested city for the important work of the country.

REPORT OF STATE SUPERVISOR OF ATTENDANCE.

The work of the State Supervisor of School Attendance for the year 1921-22, in accordance with directions from the Superintendent of Public Instruction, has included:

I. The securing of appointments of qualified persons to act as supervisors of attendance in the various counties and cooperation with city and county superintendents of schools in the enforcement of compulsory school attendance.

II. The preparation of all forms for working permits and forms to be used in taking the annual registration of minors.

III. The establishment and maintenance of schools for the children of migratory laborers in rural districts.

IV. An investigation of the school attendance of Indian children in California.

Each project, while somewhat distinct in character, has been directly related to a common objective, namely the enrollment in and regular attendance at a public school of every child between the ages of eight and sixteen years or his exemption therefrom in accordance with law; and for every child exempted a continuance of responsibility and effort that seeks to secure for him educational facilities adjusted to his needs and his capabilities.

I. Appointment of Supervisors of Attendance.

The emphasis of effort was placed upon securing supervisors of attendance for the counties rather than for the cities or separate districts. The year's work has resulted in the appointment of thirty-one such officers, an increase of twenty over previous years. Of the thirty-one appointed, eighteen gave full time to the work with salaries ranging from $1,200 per year and expenses to $3,000 per year and expenses. The average salary paid was $1,913.34 per year and expenses. Only one county paid $1,200; two counties paid $3,000. One county had two full time supervisors. All were certificated for the work upon credentials granted by the State Board of Education.

Distribution by Counties.

ALAMEDA:
County—One, full time.
Cities—Alameda—One, part time.
Berkeley—One, full time.
Oakland—Director of Attendance also Director of Americanization, four assistants.
Districts—Two.

BUTTE:
County—One, part time, combined with office of public health nurse.
Cities—Chico—One, part time.
Oroville—One, part time.

CONTRA COSTA:
City—Richmond—One, full time and one part time assistant.

FRESNO:
County—Two, full time.
City—Fresno—One, full time.
Districts—Two.

GLENN:
County—One, office combined with that of probation, by County Government Act.

HUMBOLDT:
City—Eureka—One, full time.

IMPERIAL:
County—One, full time.

KERN:
County—One, part time, combined with work of supervisor of physical education
City—Bakersfield—One, full time.
Districts—Three.

KINGS:
County—One, full time.
District—One.

LOS ANGELES:
County—One, full time.
Cities—Alhambra—One, part time.
Glendale—One, full time.
Long Beach—One, full time.
Los Angeles—Director and seventeen full time assistants
Pasadena—One, full time.
Pomona—One, part time.
Santa Monica—One, part time.
Districts—Eleven.

MADERA:
County—One, full time.

MARIN:
City—San Rafael—One, part time.

MERCED:
County—One, part time.
District—One.

MODOC:
County—One, part time.

MONTEREY:
County—One, full time.
City—Salinas—One part time, combined with work of school nurse.
District—One.

NAPA:
District—One.

NEVADA:
County—One, part time, combined with office of public health nurse.
City—Grass Valley—One, part time.

ORANGE:
County—One, full time.
City—Santa Ana—One, part time.

RIVERSIDE:
City—Riverside—One, part time.
Districts—Two.

SACRAMENTO:
County—One, full time.
City—Sacramento—Director and two assistants, all full time.

SAN BERNANDINO:
County—One, full time.
City—San Bernardino—One, full time.
Districts—Six.

SAN DIEGO:
County—One, full time.
City—San Diego—One, full time.

SAN JOAQUIN:
County—One, part time.
City—Stockton—One, full time.

SAN FRANCISCO:
City and County—One director, two full time assistants, one policeman.

SAN LUIS OBISPO:
County—One, part time, combined with Fish and Game Warden.
City—San Luis Obispo—One, part time.

SAN MATEO:
Districts—Five.

SANTA BARBARA:
County—One, full time.
City—Santa Barbara—One, full time, with one unpaid deputy.
Districts—Two.

SANTA CRUZ:
City—Santa Cruz—One, part time.

SANTA CLARA:
County—One, full time.
Cities—Palo Alto—Not supplied.
San Jose—One, full time.

SHASTA:
County—One, part time, combined with work of rural supervisor.
District—One.

SISKIYOU:
County—One, part time, combined with probation.

SOLANO:
County—One, full time.
City—Vallejo—One, full time.
Districts—Two.

SONOMA:
County—One, full time.
City—Petaluma—One, part time.
District—One.

TEHAMA:
County—One, part time, combined with office of public health nurse.

SUTTER:
County—One, part time.

STANISLAUS:
City—Modesto—One, part time.
Districts—Two.

TULARE:
County—One, full time.
Cities—Tulare—One, part time.
Visalia—One, part time.
Districts—Three.

VENTURA:
County—One, full time.
City—Ventura—One, part time.
Districts—Four.

YUBA:
County—One, part time, combined with work of supervisor of music.

Summary.

County Supervisors of Attendance:	
Full time	18
Part time	13
Total	31
City Supervisors of Attendance:	
Full time	17
Part time	18
Assistant	27
Total	62
District Supervisors of Attendance:	
Total	138

Cooperation with superintendents of schools.

In order to assist in a uniform interpretation of the duties of a supervisor of attendance, particularly in territory outside cities, an outline of the activities to be expected of such an officer was sent to the superintendents early in October, 1921; this was followed by a form for monthly reports and later, by a bulletin (Superintendent of Public Instruction, Bulletin No. 9) which set forth the responsibilities, under the law, of all persons concerned in the enforcement of compulsory full-time school attendance. Other than this, no attempt was made to impose uniformity of procedure in the details of securing full enrollment and maintaining regularity of attendance. Rather was effort directed toward making clear the underlying principles of the work through actual demonstration of their application to the conditions peculiar to each county. These principles, briefly stated, are:

1. Education for every child is not only a privilege but an obligation under the laws of the state.

2. The privilege of an education is for every type of child, the school system being sufficiently flexible in operation and diversified in curriculum to permit of adaption to the needs and the capabilities of all.

3. The obligation involves the cooperation of every member of a community in the enforcement of the compulsory education laws.

4. The public schools are for all the children. A separate school for any group is admissible only when specialized instruction is necessary to facilitate the assimilation of such group by the community and is never to be established for the purpose of social segregation.

5. The most effective means for combating child labor is enforcement of school attendance.

6. Employment, intelligently selected and continuously directed, may be made a valuable part of a child educational program and should not be confused with child labor which views a child merely as a diminutive man or woman valued solely for immediate daily output.

7. Irregularity of attendance may be as detrimental to the educational development of a child as nonattendance.

8. Truancy is usually the result of a social maladjustment beyond the understanding or control of the truant and should be corrected at the source.

The application of these principles has not been a matter merely of enunciation and discussion but actual demonstrations in adjusting type cases in company with the local officers. Under the law, the State Supervisor of Attendance, even when acting as the duly authorized agent of the Superintendent of Public Instruction has no power of enforcement of school attendance beyond the right to revoke a working permit nor is it recommended that more power be sought. The enforcement of school attendance is a community's business and full responsibility should be centered therein. A representative from the state office is more effective as an interpreter of the law and as a messenger bringing first hand tidings of efforts and results elsewhere than as an officer until whose coming action may be delayed and to whom responsibility may be shifted.

The calling into play of community interest in the enforcement of school attendance is the best work a supervisor of attendance can do. The method employed in one county is this:

Quarterly reports to the county superintendent of schools are made by each school principal. These reports contain the name of each pupil, his age, grade, standing in each subject, total days of absence with each day or fractional day's absence classified by cause. The causes specified are: sickness, weather, work, parental indifference, truancy. The reports are analyzed by the supervisor of attendance and taken by him to the respective districts for discussion with the Social Committee—a committee previously appointed by the Superintendent of Schools. The total number of days of absence are translated into terms of financial loss to the district and the causes scrutinized. If sickness is largely responsible, the health authorities are called in to diagnose the district's case and to prescribe proper remedies. If weather has prevented attendance, transportation and roads are considered. If the children have been kept out to work the child labor law is evoked, or if there is an emergency need, not yet over, for help with a crop, an adjustment of the school day may be temporarily effected. If parental indifference is the trouble, public opinion will speak not only to the parents, but to the justice of the peace before whom a parent may be called. If there is a case which honestly can be classified as truancy, the child in question is dealt with personally. Other counties utilize a similar method, but with the Union High School District as the administrative unit and the committee made up of representatives from each included elementary school and the high school.

The following table was compiled from the annual reports of the superintendents of the counties to the Superintendent of Public Instruction on state enrollment and average daily attendance for the years 1920-21 and 1921-22.

Table Showing Per Cent of Gain or Loss in Enrollment and Average Daily Attendance in the Elementary Schools in 1921-22 over 1920-21, by Counties.

Counties	Enrollment		Average daily attendance		Rate of average daily attendance	
	Gain	Loss	Gain	Loss	1920-21	1921-22
Alameda	2.0		4.6		81.4	83.5
Alpine				7.0	77.7	72.2
Amador		1.0	2.0		87.1	90.2
Butte	1.3		3.3		83.2	86.0
Calaveras		3.5		2.4	88.0	88.8
Colusa	1.6		3.1		86.4	87.7
Contra Costa		6.8	1.5		86.6	93.9
Del Norte	0.7		7.4		75.5	80.5
El Dorado		8.7		1.3	82.3	88.3
Fresno	3.2		5.8		83.7	85.8
Glenn		6.3	1.6		85.8	92.7
Humboldt	2.9		3.9		84.9	85.7
Imperial		12.1		5.1	71.8	75.8
Inyo		0.1	2.8		83.1	85.7
Kern	7.7		7.7		84.1	84.1
Kings	4.0		6.3		83.0	84.9
Lake	0.3			3.0	88.3	85.5
Lassen	8.8		8.6		81.6	81.4
Los Angeles	9.5		12.1		72.1	73.8
Madera	2.4		4.5		82.6	84.3
Marin	5.4		9.2		80.1	83.0
Mariposa		0.6	2.3		75.6	77.9
Mendocino	1.1		3.9		83.9	86.2
Merced	9.4		11.3		85.8	87.3
Modoc	6.0			0.2	83.2	78.3
Mono	16.2		15.0		77.9	77.0
Monterey		3.8	0.3		82.8	86.2
Napa	0.8			0.3	86.8	85.8
Nevada		1.5			85.1	86.4
Orange	13.9		12.5		82.1	81.2
Placer	13.4		9.0		88.4	84.9
Plumas		7.8			71.3	76.8
Riverside	3.8		6.7		78.7	80.9
Sacramento	5.1		7.5		79.3	81.1
San Benito	5.0		4.3		85.0	84.4
San Bernardino	9.8		10.9		79.5	80.3
San Diego	3.8		6.7		78.5	80.7
San Francisco	1.2		2.4		77.2	78.1
San Joaquin	4.3		4.9		84.2	84.8
San Luis Obispo	1.9		4.4		84.4	86.5
San Mateo	4.0		4.9		85.0	86.3
Santa Barbara	4.9		5.6		79.7	80.3
Santa Clara	2.4		5.0		83.4	85.6
Santa Cruz	2.6		4.8		86.4	88.3
Shasta	0.1		3.7		80.0	82.9
Sierra	17.2		16.4		82.4	78.7
Siskiyou		1.9	3.1		81.0	85.2
Solano	4.4		5.5		83.7	84.5
Sonoma	5.8		5.2		85.8	85.3
Stanislaus	3.4		3.6		86.2	86.3
Sutter	4.9		8.5		85.7	88.6
Tehama	2.6		0.2		87.7	85.6
Trinity	12.2		11.4		79.4	78.8
Tulare	6.4		8.5		84.7	86.3
Tuolumne	10.9		10.0		87.6	86.9
Ventura	4.9		10.4		76.9	80.9
Yolo	2.6		4.0		87.6	88.8
Yuba	2.6		3.4		87.0	87.6
Totals	5.0		6.9		78.9	80.4

Table Showing Per Cent of Gain or Loss in Enrollment and Average Daily Attendance in the Elementary Schools in 1921-22 over 1920-21, by Cities.

Cities	Enrollment		Average daily attendance		Rate of average daily attendance	
	Gain	Loss	Gain	Loss	1920-21	1921-22
Alameda	0.6		1.4		84.7	85.9
Alhambra	11.4		7.0		85.9	81.1
Bakersfield	4.3		7.1		80.9	83.0
Berkeley	3.2		3.2		77.2	77.2
Chico		0.7			82.3	82.9
Eureka	3.4		6.4		86.5	88.8
Fresno		0.4	5.0		81.2	83.5
Glendale	25.2		24.4		84.9	84.3
Grass Valley	0.8		1.3		85.8	86.2
Long Beach	7.7		8.2		77.7	78.1
Los Angeles	9.3		13.2		67.0	69.4
Modesto	2.0		3.1		84.4	87.3
Oakland	0.6		2.1		81.8	83.1
Oroville	3.9		9.8		83.3	88.1
Palo Alto	1.3		4.0		83.0	85.2
Pasadena	6.8		7.6		79.6	80.2
Petaluma	22.4		2.7		87.8	74.3
Pomona	5.3		6.1		79.8	80.5
Richmond		0.9		0.9	84.0	84.0
Riverside	9.8		11.7		84.5	85.8
Sacramento	4.2		4.8		77.5	77.9
Salinas		17.9		3.8	82.0	93.2
San Bernardino	8.6		1.2		79.2	82.1
San Diego	0.5		5.1		76.8	80.4
San Jose	3.9		6.0		80.8	82.6
San Luis Obispo	3.2		4.9		84.1	85.5
San Rafael	6.9		7.4		74.7	85.1
Santa Ana	14.2		10.9		82.8	80.7
Santa Barbara	9.8		10.7		79.9	80.6
Santa Cruz	0.1		0.3		85.2	88.3
Santa Monica	6.6		5.9		75.0	74.6
Santa Rosa		5.3		2.1	80.3	82.8
Stockton	4.0		5.1		84.6	85.5
Tulare		0.6	3.5		85.3	88.9
Vallejo	4.6		2.4		81.2	79.4
Ventura	11.1		10.5		84.7	83.7
Visalia	8.3		11.1		82.5	84.6

The figures pertain to the elementary schools only. They were selected because the elementary school group corresponds more closely to the compulsory full-time attendance group than any other, and because the figures for the last two years on elementary school data are comparable. It should be borne in mind, however, in using this table as the basis of an estimate of the attendance work that the group includes children between six and eight years of age over whom no compulsion may be exercised and that it omits children under sixteen years of age who are attending high schools.

The table is chiefly valuable as indicating the progress in each city and in each county as a whole.

The best endorsement of the work being done by the supervisors of attendance lies in the fact that every county and district (with whom appointments are optional) having had the services of such an officer during the past year is continuing with the work for the coming year and one county (San Bernardino) has already perfected plans providing for two supervisors instead of one.

No direct amendment of "an act to enforce the Educational Rights of Children" is sought at this time. Desired amendments of related statutes will be noted in connection with the reports of the registration of minors and the education of Indian children. In addition it is recommended that the Teacher's Retirement Salary Act be amended to continue its burdens and benefits to persons transferring from teaching service to the attendance service. This recommendation is based upon two considerations: (1) the value of teaching experience in the training of a supervisor of attendance, and (2) the danger of relegating to the attendance service individuals eligible to the retirement salary.

II. Forms for the Working Permits and the Registration of Minors.

Working permits.

In view of the changes made in the compulsory education law in 1921, it was necessary to issue a complete new set of working permit forms. The new forms are an improvement over the old in that they are simple and because there is included a certificate of age and a prescribed health certificate.

This certificate of age had been found necessary to provide against false statements of age and to serve as protection for both child and employer.

The business of issuing working permits needs to be given more attention. When this responsibility was placed with the school authorities by the legislature of 1919, it was with the hope that the school through its greater number of officers and its more intimate knowledge of the individual child was in a better position to perform intelligently the details of the service than was the Bureau of Labor.

Results have justified the change to a considerable extent. Fewer children are exempted from school attendance in order to work but a greater knowledge of industrial conditions is needed by those invested with authority to issue working permits. An industrial survey of the work open to children between the ages of fourteen and sixteen years is needed without delay in Los Angeles, San Francisco, Oakland, Fresno, Sacramento and Stockton. Provision for the follow-up of the minors securing permits is also essential, particularly in reference to their condition of health.

Although a child under sixteen years is not allowed to enter industry without being physically fit, his age, the prolonged hours of effort within doors, and reduced periods of recreation together with the probability of poor home conditions lessen his chances of continued healthful development and present a plea for the continuation of health supervision over him. The fact that the employed child under sixteen years of age is now required to attend part-time classes opens the possibility of health supervision through this avenue.

The number of working permits issued between July 1, 1921, and June 30, 1922, is listed below by counties. A report of this number has been furnished, in accordance with law, to the Commissioner of the Bureau of Labor Statistics.

Working Permits Issued by Counties.

Alameda	142	Marin	0	San Luis Obispo	221
Alpine	0	Mariposa	3	San Mateo	4
Amador	0	Mendocino	42	Santa Barbara	30
Butte	122	Merced	0	Santa Clara	10
Calaveras	2	Modoc	0	Santa Cruz	16
Colusa	0	Mono	0	Shasta	4
Contra Costa	31	Monterey	0	Sierra	0
Del Norte	0	Napa	4	Siskiyou	3
El Dorado	4	Nevada	5	Solano	49
Fresno	137	Orange	2	Sonoma	4
Glenn	4	Placer	0	Stanislaus	6
Humboldt	7	Plumas	0	Sutter	0
Imperial	1	Riverside	5	Tehama	0
Inyo	6	Sacramento	151	Trinity	1
Kern	4	San Benito	0	Tulare	3
Kings	155	San Bernardino	11	Tuolumne	2
Lake	34	San Diego	4	Ventura	4
Lassen	0	San Francisco	448	Yolo	4
Los Angeles	795	San Joaquin	17	Yuba	0
Madera	0				
Total					2497

The Bureau of Labor has reported to the Superintendent of Public Instruction violations of child labor law as indicated below:

Employment without permit	27
Employment during prohibited hours	6
Employment in prohibited occupation	2
Employment in excess of 8 hours per day	7
Employment under minimum age	4
Total	46

The United States Immigration Service reports to the Superintendent of Public Instruction the names of all children under sixteen years of age entering by the various ports of the United States and manifested to California. The names of these children have in turn been reported to the school authorities of the places of their prospective residences. The following lists the number of such cases, segregated by nationalities:

Scotch	42
Italian	99
Irish	20
French	12
English	91
Hebrew	51
Magyar	1
Scandinavian	18
Dutch	17
Finnish	6
German	21
Dalmatian	16
Armenian	11

Welsh	5
Greek	5
Croatian	20
Russian	1
Spanish	16
Slovak	1
Swiss	4
Slovanian	2
Liberian	4
Syrian	8
Mexican	377
Japanese	3
South American	5
African Black	1
West Indian	1
Total	858

Registration of minors.

In the fall of 1921 the first registration of minors was taken in accordance with the amendment of Section 1662 of the Political Code effected in the 1921 Legislature. It was an unpopular measure with school superintendents, principals and teachers which was not offset by any enthusiasm on the part of parents who, under the law, are required to register their children each year. The work has been done, generally speaking, in a half-hearted way which is evident in the results, these being, in general, so far short of comprehensiveness as to be practically valueless from a statistical standpoint.

However, unpopular and poorly done as it was, and expensive as it was, in some unaccountable way the idea of an annual census of school children has gained in favor during the year. It is possible that the publication of the returns from the Federal census of 1920, available subsequent to the California registration of minors, showing that California ranked ninth in percentage of school attendance has awakened interest in the subject and disturbed a certain complacency. Without doubt, the conference on illiteracy held in San Francisco in February, 1921, under the leadership of Mrs. Cora Wilson Stewart, revealed the need of information on the numerical relation between California school enrollment and California school age population. At any rate, there now appears a willingness on the part of officials and a demand on part of supervisors of attendance to continue the effort but with certain conditions changed. The chief defects in the present law may be listed as follows:

1. Lack of penalty for failure to comply imposed upon any person responsible, whether parent, teacher or attendance officer.

2. Lack of provision for remuneration for teachers or other persons required to work extra hours in securing registrations in the homes.

3. An annual repetition of data appears an unnecessary burden both in effort and expense.

4. The lack of definite requirement in the utilization of the findings from registration.

It is recommended, therefore, that the registration law be amended to provide:

First—That a penalty be imposed for failure to comply with the provision of the law.

Second—That the supervisor of attendance be made the official registrar of minors of the territory under his jurisdiction and that the necessary temporary assistant registrars be appointed by the trustees of each district, such assistants to be approved by the City or County Superintendent of Schools and paid for their services from the funds of the districts.

Third—That the registration of minors be taken only in the odd-numbered years.

PART III.

Reports of Commissioners.

LETTER OF TRANSMITTAL.

The Honorable STATE BOARD OF EDUCATION,
Sacramento, California.

LADIES AND GENTLEMEN:

I have the honor to submit to you reports for the years beginning July 1, 1920, and ending June 30, 1922.

Very respectfully,

MARGARET S. MCNAUGHT,
Commissioner of Elementary Schools.

REPORT OF COMMISSIONER OF ELEMENTARY SCHOOLS.

INTRODUCTION.

The biennial period beginning July 1, 1918, and closing June 30, 1920, was for elementary public school education a period of unrest. The chief thought, the great struggle, was directed toward holding what had been attained.

The biennial period from July 1, 1920, to July 1, 1922, is a period of marked educational progress. This report will review briefly some features of this progress:

(1) Provision of more adequate salaries for elementary teachers, making possible their continuous education and training while in service. Poorly paid teachers had not been able to afford the luxury of institutional education.

(2) Much needed supervision in rural districts.

(3) Legislative enactment converting the state normal schools into state teachers colleges.

(4) The adoption of certain new textbooks.

(5) The establishment in the state teachers colleges of a kindergarten-primary course.

(6) Action toward solving problems of school adjustment.

(7) Preparation of a portion of a suggestive state course of study for the elementary schools.

(8) Music conference resulting in a rural school music outline.

(9) Furtherance of industrial art.

The report closes with recommendations for future procedure.

MORE ADEQUATE COMPENSATION FOR ELEMENTARY TEACHERS.

In November, 1920, the people voted affirmatively upon constitutional amendment number sixteen, providing a state school fund of $30 per pupil in average daily attendance, and county support of the same amount. This amendment has literally not only provided for elementary education, but has greatly improved its quality. Good teachers instead of leaving the field of education have been satisfied to remain in it and the previously depleted ranks, due to an insufficient living wage, have rapidly filled. This kind of expression too by the people of the state, their belief in the value of elementary education, has done much to give courage to teachers and administrators and stimulate them toward greater effort and more education for themselves. One illustration of this latter result is the fact that during the summer of 1922 approximately 2550 elementary teachers attended summer schools in the state teachers colleges and universities, while many others were able to add to their usefulness by means of private lessons and travel tours. Hundreds of elementary teachers too have taken advantage of extension courses offered by universities and state teachers colleges.

SUPERVISION OF RURAL SCHOOLS.

It is generally conceded by all educators dealing with the problem of rural education that the crying need for rural schools is supervision. The State Board of Education has always recognized this need and

various attempts in one form or another have been made to bring it about—but not until Amendment 16 was passed were the funds provided and not until legislation in 1921 were these funds distributed.

Rural supervision is now no longer a hope; it is a realization. At the last computation made there were 119 rural supervisors in the state, including general elementary, music, physical education, agriculture and a number of other activities. At the present writing this number will have been increased. The salaries paid are sufficient to obtain efficient service, so that among these rural supervisors are a number of able men and women, intelligent and well trained. In the continued improvement of this supervision lies one of the greatest benefits to the rural life of the state.

THE STATE TEACHERS COLLEGES.

In the last biennial report mention was made of the suggestion then rapidly gaining ground, and naturally endorsed by the Elementary Commissioner, that the normal schools of the state be changed to teachers colleges. The legislature of 1921 made the change, placing the colleges under the direction of the State Superintendent of Public Instruction (as Director of Education) and the State Board of Education.

The change is vital in all that relates to elementary education. Since elementary public school education is the foundation of democracy, elementary schools should be taught by high grade, noble men and women. These men and women should be made ready for their work in high grade, noble institutions, and the teachers colleges where men and women gather for professional study may aspire to be, in a sense, the greatest colleges in the state. Certainly they can render a service unique. Already the standards for elementary teachers have been raised with every indication of still higher standards in the near future. It no longer sounds utopian to say that elementary teachers should be as well trained as high school teachers, nor does it seem utopian to assert that with equal training will come equal salaries.

Elementary teachers themselves are seeing the signs of the times as never before and as never before are eagerly fitting themselves for their work. The Southern Branch University of California has already established a four-year course and has been granted the degree-granting privilege to its teachers college department, while several of the state teachers colleges are petitioning the State Board of Education for the same privilege. Facts like these indicate belief in the value of elementary education.

TEXTBOOKS.

During this biennium the Thorndike arithmetics adopted by the State Board of Education have been printed and distributed. They have, as was expected, "worn well"; the more they are used and understood, the better they are appreciated. The work of Mrs. Helen B. Keller, assistant in education, employed by the board from September 1, 1921, to January 19, 1922, largely for field work in arithmetic, was of much value in bridging the chasm caused by the change to a new series of textbooks carrying with them a new point of view and setting forth a psychology of learning rather than a method of teaching.

The Beard and Bagley history has also been in use during this period and has proved to be an excellent choice.

In 1922 the Parkins and McMurry advanced geography was adopted for use in the seventh and eighth grades. No funds being available to the board for supplying geography material to the lower elementary grades, no books were selected for these grades, but in June, 1922, a Book of Maps for the lower elementary grades was compiled by Myrta Lisle McClellan, associate professor of geography at the Southern Branch University of California, that is giving universal satisfaction.

THE ESTABLISHMENT OF THE KINDERGARTEN-PRIMARY COURSE.

Directly in line with the movement for higher standards of attainment for elementary teaching is that which seeks to break down the wall between the kindergarten and primary or beginning elementary grades. The last legislature authorized the certification of teachers pursuing the kindergarten-primary course, giving power to the State Board of Education to approve the courses of training therefor.

In accordance with this law kindergarten-primary courses (kindergarten through first three grades) have been established in five of our state teachers colleges. These courses are distinct high-grade courses and are taught by some of the most highly trained men and women of the various faculties.

California is to be congratulated upon being one of the first states to recognize the importance of kindergarten education and to insist that it be not differentiated, not a thing apart, but an integral part of the whole plan of public school education.

The line between the elementary and the high school is fast being erased, due largely to the increasing prominence being given the junior high school and the increasing demand for more highly trained elementary teachers. When that between the kindergarten and primary grades is blotted out, we shall have, as we should have, one unbroken line of public school education from the kindergarten through the high school.

PROBLEMS OF SCHOOL ADJUSTMENT.

Progress mentioned in the last biennium of a growing tendency to give to each child in the state his or her individual opportunity and thus establish true democracy in elementary education was greatly furthered by a state conference held under the auspices of the State Board of Education in Oakland, February 17 and 18, 1922.

As a result the Elementary Commissioner (chairman of the conference) was requested to name a legislative committee to consider the problems of school adjustment with a view to the provision of legislation concerning them. The following persons were selected as members of this committee:

Dr. W. W. Kemp, chairman;
Mrs. Agnes Ray,
Mr. Fred C. Nelles,
Dr. Grace M. Fernald,
Dr. Virgil Dickson,
Superintendent Will C. Wood,
Dr. Lewis M. Terman.

By courtesy the Commissioner of Elementary Schools has always been invited to be present at the meeting of this committee.

Subcommittees have been appointed to consider matters for legislative action as follows:

(1) The provision of a central research office within the State Department of Education.

(2) Appropriate legislation that will strengthen the Pacific Colony and that will provide training for special prevention work, such as that in contemplation at the twenty-four hour school.

(3) Proper legislation for the certification of all those who give psychology measurements and diagnosis in the public schools.

A SUGGESTIVE COURSE OF STUDY FOR THE ELEMENTARY SCHOOLS.

The county and the city superintendents of schools at their annual state convention held at Coronado October, 1921, unanimously requested the State Board of Education to outline a suggestive course of study for the elementary schools. They also asked that the course be prepared by specialists.

In outlining the course the unit plan, making the child the center of thought and his needs the chief consideration, was chosen, rather than the subject plan usually followed which tends to fix attention upon textbooks and subjects rather than upon the child himself and his experiences.

A portion of such a course, the kindergarten-primary unit, has under the conditions stated been worked out by Miss Katherine McLaughlin, M.A., professor of education and chairman of the kindergarten-primary section of the Southern Branch University of California. It is now ready for approval by the State Board of Education.

Because of the fact, as previously explained, that no textbooks in geography could be adopted for the beginning elementary grades, it was decided to obtain the service of a specialist to outline a course of study in geography. This task was undertaken and completed for the fourth, fifth and sixth grades by Miss Myrta Lisle McClellan, B.S., assistant professor of geography in the Southern Branch University of California. The course was printed in the form of a bulletin and is now in use in various parts of the state. This course of study and the Book of Maps compiled by Miss McClellan have helped very much to strengthen the teaching of elementary geography.

Neither of these courses are scissors-made nor are they merely theoretical. Before undertaking their tasks both specialists spent considerable time in visiting with the commissioner various parts of the state, holding regional conferences, visiting schools and conferring with the faculties of state teachers colleges, an advisory committee of educators, and a number of superintendents and teachers. The state superintendent, the commissioners and other assistants in the Department of Education gave continuous and valuable help.*

The next unit recommended to be wrought out is that dealing with the social and ethical sciences to the end that standards of attainment may be set and methods of procedure outlined for the promotion of better citizenship.

*Bibliographies to accompany these bulletins have been partially completed.

MUSIC CONFERENCE.

On February 11 and 12, 1921, a state conference on music was held in the Senate Chamber of the Capitol at Sacramento. Over a hundred persons were present, some of them coming from a great distance and paying their own expenses. At this conference was presented, among other good reports, one submitted by a committee appointed in 1920 to work out an outline in music for rural schools. This outline has been of a good deal of service, especially before the enactment of the law providing for rural supervision. Portions of it have been copied and used in various counties of the state. Since the provision of supervision for rural schools, music supervisors in the counties in which they are employed have greatly improved the teaching of this subject, and the outline for rural schools is used by a number of these supervisors as suggestive material.

INDUSTRIAL ART CONFERENCES.

Two industrial art exhibits have been presented during this biennium, one in Los Angeles and one in Oakland.

Exhibitions of articles of furniture, carpets, paintings, jewelry, tapestries, metal work, electric light fixtures, vases, urns, china, baskets and various other household articles were sent from different parts of the state, representing commercial wares and the productions of schools of arts and crafts.

Exhibitions also of schools of art and design, showing drawings, colored designs for textiles, wall paper, carpets, etc., were well displayed.

The Los Angeles exhibit was held at the Southern Branch University of California and was well attended. An interesting and most instructive program was outlined, covering a period of three days. Speakers were chosen for this program from the schools of art and design and from various fields of commercial life in which art or the arts and crafts are necessary factors. Questions were asked and answered, discussion encouraged, and at the close resolutions were passed carrying with them the general idea of a closer cooperation among all those interested in the WORLD BEAUTIFUL.

The Oakland exhibit was held in the Auditorium on Lake Merritt and was attended by thousands of people. Open in the evening as well as during the day, opportunity was given to men and women in all ranks of life to visit the Auditorium. Similarly children's school luncheons were set out, some combinations being good, others bad, and the reasons for both were given. Mothers and children manifested great interest in this display.

One section of the hall was set aside for the Americanization department. Here were shown by our citizens born in foreign countries the products in industrial arts and crafts of that section of the world. Proudly they displayed to America their native arts and crafts—pictures, furniture, lace, shawls, embroideries of many kinds, fine rugs, glassware, carved boxes, metal work, jewelry, bookbinding—in fact nearly every kind of article of domestic use or interior decoration were represented.

At fixed periods of the day and evening boys and girls demonstrated to the visitors how they made certain of the articles on exhibition—

groups of girls were to be seen making hats or cutting out gowns; the looms were in operation, so that observers might see rug making in process.

The corridors were filled with exhibits not strictly artistic, but certainly industrial in character. Boys and girls brought their pet chickens and rabbits and the products of their vegetable and flower gardens and were in charge of these exhibits, answering questions and giving information regarding the care of poultry or the cultivation of a garden.

A display of the school papers published in Oakland were most enlightening. There are now thirty-one. Their history is even more interesting than their present existence and activity. Some have been in operation ten years and have grown from little mimeographed leaflets published every two or three months to dignified four-page newspapers published weekly.

No admission was charged. It was a "free school" of children, teachers and the community at large. Exhibits of the handwork of boys and girls in the elementary and high schools were so arranged as to demonstrate and to test the beauty and utility of the articles shown. There were different types of rooms, e.g., a child's room, a living room, a studio, etc., the furnishings of which were all made by the children in the schools. The rugs were woven on the school looms, the furniture was made in the manual training shops, the draperies for windows, table runners, lamp shades and other textile furnishings were designed and made in art and homemaking departments of various schools.

Side by side with these school furnished rooms were similar rooms furnished by local merchants. Comparisons and criticisms pro and con were freely given, earnest discussions often being held between interested citizen observers and those in charge of the exhibit, between groups of observers themselves, between the children of the various schools and between the teachers, or teachers and citizens.

Other sections of the Auditorium were given to special groups of articles, e.g., toys, baskets of various kinds, architectural designs for homes, millinery displays, costumes and underwear, designs and models in both metal and wood of various kinds of useful articles.

In the home making department different kinds of food were exhibited with placards stating their comparative values as food. Loaves of bread baked in different ways were shown with statement attached telling which loaf was baked best and why.

RECOMMENDATIONS.

(1) There should be provision made for regional conferences and occasionally for state conferences of the various departments of the state teachers colleges to the end that there be better understanding by the members of the faculties of the different aims and ideals of the colleges, and that there may be definite knowledge on the part of each faculty as to the content and methods of presentation of the courses offered by all the other faculties. Such conferences too would tend to strengthen and to enrich the work of all these teacher-training institutions.

(2) Regional conferences of rural supervisors should be held, attended also by the State Superintendent of Public Instruction and

the commissioners, in order that general policies regarding such supervision may be agreed upon; but there should be no attempt to make uniform the kind, the amount or the methods of procedure of this rural supervision.

(3) Laws concerning the union of school districts should be so amended as to facilitate what is commonly known as the "consolidation of schools."

(4) Laws should be enacted providing for a central bureau of research within the State Department of Education.

(5) In the near future there should be outlined as the next unit in the suggestive state course of study that dealing with the social and ethical sciences; for the high school period is too late to begin this work and the courses in this field outlined for most of the elementary schools of today need careful revision and radical change. Child life of active good citizenship is a prerequisite to adult life of active good citizenship. Not mere knowledge of but participation in right action must obtain and the elementary public school course of study must outline opportunities therefor—opportunities that will grip the child mind and result in action.

(6) The junior high schools now rapidly forming in cities are full of suggestions for the reorganization of the work of elementary seventh and eighth grades. If it is not possible at once for the state to outline a suggestive course of study for the seventh and eighth grades, local boards of education should begin the task of the "curtailment and enrichment" of the work of these grades. As now constituted there is too much review, too much reiteration, and not sufficient change. Even with the handicap set by law regarding subject matter, some improvement could and should be made.

(7) Notwithstanding the strides made during the last biennium in the matter of teacher training, its lack, when we consider the state as a whole, is still too great. In order that each child in the state may receive as nearly equal opportunity as possible, he should be taught by a well educated, well trained man or woman. To this end much help should be given the teacher training institutions upon which the great responsibility of training teachers for the profession rests and to which all teachers look for the best educational ideals and ideas. By means of extension courses and summer schools and in various other ways they are training teachers also *in* the profession. High grade men and women are needed in their faculties, and adequate equipment is a necessity. The state teachers colleges therefore should be as well financed as possible.

The other great source of teacher training is that given through supervision. Whatever facilitates this work reacts with great force upon the children. With excellent state teachers colleges, well organized and equipped, and worthy local supervision, the elementary schools would be supplied with two forces of high import for the training of its teachers, both for service and in service. If either of these forces are not sufficiently strong, the children suffer.

LETTER OF TRANSMITTAL.

The Honorable STATE BOARD OF EDUCATION,
Sacramento, California.

LADIES AND GENTLEMEN:

I have the honor to submit to you reports for the years beginning July 1, 1920, and ending June 30, 1922.

Very respectfully,

A. C. OLNEY,
Commissioner of Secondary Schools.

A little more than two years ago the Commissioner of Secondary Schools, in speaking to the High School Teachers' Association in Berkeley on the subject of "The Definition of High School Subjects," set up three objectives:

1. A uniform core of subjects which every high school student needs and must have;
2. A uniform system of grading, of record-keeping and of transfer from school to school, and
3. A broad definition of aim and content of each high school course.

Since that time the State Board of Education has adopted the standards for high school graduation which had been recommended by the high school principals assembled in convention; a bulletin containing a description of a uniform system of grading, of record-keeping and of transfer from school to school has been published and distributed. These standards, adopted by the high school principals' convention, were the result of the patient work of a committee of high school principals. The third objective is in process of attainment.

A committee of high school principals and teachers has made a report on the subject of "A Suggested Outline for a Four-Year Course in English Literature for California Secondary Schools." This, by authority of your honorable body, has been printed, distributed and is now widely used throughout the high schools of the State in constructing courses of study. A list of supplementary reading material is now being compiled by a committee of English teachers. Several high schools have offered to print this bibliography.

Another committee, using the first general report as a basis, is working out definite suggestive English courses for schools of different types.

The National Committee on Mathematical Requirements has rendered its report which has lately been printed by the United States Bureau of Education. It has made a valuable contribution for the construction of mathematics courses in high schools and junior high schools.

The content of some high school courses is thus beginning to be established, not by arbitrary authority, but by suggestion.

The results of the State Conference of Industrial Art Teachers have been stimulating. Not only did teachers renew their enthusiasm for their work but they secured ideas for suggesting new vocations for future development. Last year and this year brought to Berkeley, at the call of the State Board of Education, conferences of teachers of oral and dramatic expression. Professor Samuel J. Hume and Irving Pischel of the University of California were the moving and directing influences of the conference. The old charge that oral reading is a lost art was there refuted. "Acting" and "elocution" were taboo. Competing teams of high school students from various parts of the State appeared in a contest where expression and interpretation were the criteria. Dramas were produced by the Greek theatre players on a stage whose setting and properties were simplicity itself.

The conference requested the calling next year of a joint conference of teachers of music, art, and oral and dramatic expression.

The influence of these subjects on the life of the individual high school student is to give additional means and power of self expression, thus raising the standards of appreciation and of objectives and contributing to the sum of human happiness. Every addition to the means for self expression is a step upward in setting the standards of good citizenship, for it makes for the happiness and contentment of the whole people.

A number of conferences of teachers of commercial subjects have been held. They made recommendations concerning the adoption of standardized commercial courses of study which would meet the legal requirements and at the same time raise the quality of work to be required of the student. The suggested programs for commercial work necessarily presuppose the raising of standards for the credentialing of teachers of commercial subjects. Dr. C. H. Marvin, appointed special assistant to your commissioner, has outlined in his report a definite plan for the training of teachers to instruct in four different lines of commercial work: accounting, stenographic, merchandising and transportation.

Following is a table showing the number of junior high schools, senior high schools (or four-year high schools) and of junior colleges for the biennium:

	1920-21	1921-22
Junior high schools	25	47
High schools	337	350
Enrollment	194,246	225,177
Junior colleges	17	23
Enrollment	1442	2259

The growth of the junior high schools has been rapid. During the year from October, 1920, to October, 1921, the junior high schools had increased just twice as rapidly as the regular high schools, the numbers being twenty-two and eleven respectively.

The junior colleges have increased from eighteen to twenty. Although the increase in number of junior colleges is small, the growth in enrollment is great. They have been "consolidating" their positions as community necessities. At San Diego, Santa Barbara, Fresno, San Jose and Chico the junior colleges in their respective cities are by contract conducted by the state teachers colleges, either in whole or in part. In accordance with the recommendations made by the high school principals assembled in convention at Pasadena in April, 1922, the State Board of Education adopted the following standards affecting the courses of study for junior colleges:

I. That all Junior Colleges offer the three following types of courses:

1. The Junior Certificate Course for recommended graduates of high schools who intend to continue their work through the University.

2. Junior College Course open to all graduates of high school regardless of recommendations, this course to stress health, citizenship and home-making.

3. Vocational courses open to anyone over eighteen years of age—this course to conform to the community occupational needs.

II. That sixty-four credit hours be required for graduation from Junior College. Of these not less than six shall be in English, and four credit hours in physical education.

III. That we recommend to the State Board of Education that the said Board authorize the issuance of Junior College diplomas to those who have completed 64 hours (credit) of Junior College subjects which shall include the following:

Subject A, University of California, no credit.
English, 6 hours.
Physical Education and Health, 4 hours.
Social Science, 6 hours.
Science or Mathematics, 6 hours.
An arrangement of courses so as to show 20 hours of work in one department.

IV. That special attention be given to equipping and maintaining adequate library and laboratory equipment.

V. That in assigning work to teachers three hours of college work be considered as equivalent to five hours of high school work.

The growth of high schools in number and in enrollment has been steady and for the most part on a satisfactory basis. The tendency in the large cities has been to increase the enrollment to an enormous extent, while the opposite is to be observed in many regions outside the cities. Instances are multiplying of the formation of new union high school districts by combining some elementary districts of a union high school district with outside elementary districts. The result is too often two small inefficient districts instead of one of moderate size and of greater obtained potential service. Local jealousy is the usual cause. Legislation is needed to make such subdivisions and partitions extremely difficult.

During the past few years much effort has been expended by school administrators to increase the holding power of the secondary school by securing compulsory attendance laws. However, enforced attendance on classes of traditional type in traditional subjects proved only slightly effective. Inglis is authority for the statement that in Iowan city high schools, the percentages of boys and girls who had planned to finish the four-year course but who left school before graduation were 70% and 54% respectively, of those who had not intended to graduate and who did not were 96% and 91% respectively, and of those who were undecided but who left before graduation the percentage was 87% for both boys and girls. The periods of greatest loss were at the close of seventh, eighth and ninth years. A number of independent investigations have shown that the percentage of those who left at these periods on account of economic pressure was small.

Most of the causes for leaving school as given by the children themselves showed dissatisfaction with the subject matter of the courses of study. As an instance of unreasonable and almost unbelievable requirements in this direction may be cited the recent case of a county board of education in California as revealed at a county institute: no child in the county was allowed to enter a high school unless he had completed all eight grades and had spent a full year in each grade.

Attention has lately been centered upon eliminating from the traditional curriculum all non-essentials, especially in the matter of long and tedious reviews. The seventh and eighth grade curricula have been especially loaded with this sort of objectionable material. Added to these objections has been the further requirement of passing searching county board examinations in order to secure graduation.

Adolescent children have resented the review and repetition of already familiar subject matter, the usefulness of which they were

unable to understand. Indeed, if the truth were told, no one else was able to understand it either; the only reason for its continuance was tradition and the fact that the law required it.

This unsatisfactory condition of affairs was one of the important reasons for reorganization of, and inclusion of these grades in the more elastic junior high school. The course of study for this new type of school is, according to the new law, to be subject to the approval of the State Board of Education, and is to be "designed to fit the needs of pupils of the seventh, eighth and ninth grades, or of the seventh, eighth, ninth and tenth grades."

In the reorganized curriculum, each teacher is, theoretically, especially prepared to teach one or two subjects, or has had conspicuous success in the teaching of such subjects. They are expected to become salesmen of these subjects in that they make clear how they will function in the near as well as in the more distant future. Courses are introduced to describe occupations and to inform children as to the knowledge necessary to fit for each vocation.

"Try-out," or exploratory courses, are introduced which will enable students to test their conjectured individual preferences and abilities for certain future vocations.

The great importance of pleasant physical surroundings as an aid in the holding power of schools could be readily established. A beautiful building, surrounded by artistically planned grounds, may be taken as the index of the spirit of a community, and an invitation to home-seekers to settle there. To supply a growing need, Mr. and Mrs. Howard Gilkey of Oakland were invited to prepare a bulletin on the landscaping of school grounds. Mr. Gilkey has since been chosen as the landscape architect of the city of Oakland. The bulletin has been issued by authority of the State Board of Education. It has met a real practical need and has been enthusiastically received. It is a strictly California manual prepared after years of experience with plant material which thrives in the State.

It has been conclusively demonstrated that children vary greatly and that individual differences are especially apparent as adolescence approaches. The old attempt to make every one do the same work and at the same rate has been discarded by progressive teachers. The speed with which students acquire information and gain power to use that information varies as widely as the speed at which they can walk or run. Where numbers permit, groupings are made of those who can proceed at somewhere near the same pace. Perhaps an even greater wrong is being committed against those whose possible rate of progress is being slowed up to the uniform rate demanded as against those whose mental processes are slow but who are continually being compelled to try to advance at a faster rate than that at which they are able to do.

One prominent educator for years kept the records of the boys who had graduated from the large high school of which he was the principal. He found that boys of supernormal ability in school were as a rule less successful than normal boys and often less successful than those who were slightly subnormal. They had acquired in school the habit of laziness and of working below the rate at which they might normally have proceeded. After leaving school the bad habit thus formed persisted with disastrous effects both to themselves and to their communities. They might have become wise and able leaders. Instead they

dropped back and ceased to do even that which the average students accomplished.

Citizenship is being taught in progressive junior high schools and high schools in California today by encouraging pupils to participate in the school government—in the government of themselves.

The organization of junior high schools would be greatly stimulated by a law providing State and county aid on the same basis as for the regular high schools. The last high school principals' convention urged the enactment of such a law.

Co-ordinate power is given to junior high school principals and to the superintendents having jurisdiction over their schools to admit the pupils aged thirteen or over to the junior high school. A little more frequent use of this power would open the way to remove stumbling blocks from the path of many a discouraged over-age child. Another element of discouragement would be removed for eighth grade pupils in regions where the junior high school does not exist if county boards of education were to take advantage of the power which is theirs under the law to accredit the work of teachers of ability by removing the requirement of the final examination for graduation.

Indeed, more attention to the entire subject of examinations both below and in the high school could profitably be given. Much of the labor on the part of both teacher and pupil should be avoided. The testing of pupils who have demonstrated superior ability and superior accomplishment is unnecessary and a pure waste of time and energy.

Most of the examinations given also are mere tests of memory. They are closed-book tests. After graduation, the real test of one's knowledge is the ability to know how and where to obtain quickly certain needed facts. A much higher type of examination than the memory test would be that which would test the individual's power to apply knowledge obtained from the open book or to assemble facts from various books or from various parts of a textbook.

In one high school recently visited, several whole days were devoted at the end of the term to long examinations while the pupils marked time or crammed facts in preparation for the ordeal of memory testing.

The case of the geometry examination paper submitted to a large group of mathematics teachers for grading is a familiar one. The work of the student was graded all the way from 29% to 92%. Evidently each of the various teachers maintained his own individual standard. According to his varying stages of physical and mental poise, each teacher is doubtless (for examination-grading purposes) a whole group of individuals. Yet, if examinations are to be given, whether to test memory or growth in power, questions may often be arranged somewhat in the fashion of the ordinary intelligence tests. Short, simple answers may be required, the grading of which admits of only one possibility.

As already stated the testing of pupils whose ability and performance from day to day is already known is an enormous waste of time both for pupil and teacher. Usually only those need to be tested who have done poor work or who wish to demonstrate that their ability is greater than that indicated by their daily work.

A committee authorized by the State Board of Education has been appointed by the commissioner of secondary schools to investigate and to report upon the aims, objectives and course of study of the junior high school.

The high school principals' convention urged the passage of legislation requiring all children between the ages of sixteen and eighteen to be either at school full time or at work; if at work, then to be required to do part-time work in school.

For a time the enforcement of the laws for part-time and adult education was limited largely to the cities. Later the more progressive school administrators in the smaller communities made a success of classes for adult seekers after citizenship and for part-time work for those who felt obliged to leave school to earn or to help to earn a livelihood. These attempts have borne fruit and are being successfully emulated over a constantly increasing area.

The problem of the high school fraternity is still unsolved. If the presidents of colleges and universities were successfully to urge college fraternities to bar from their fellowship members of high school secret organizations the solution would be easy.

I deem it my duty to point out two items in school administration which involve considerable waste of public funds. The removal of this evil would involve the elimination of certain forms sanctioned by tradition and enacted into law or written into the constitution. California teachers are hampered by having to provide themselves with two documents as authority to teach: a credential from the state and a separate certificate from the county. Fees are charged for both and much effort as well as money is employed in the issuance of the double set of documents. If county boards of education were authorized to consider state board credentials as certificates as well, or if the constitution were amended to remove from local school authorities the burden of duplicating the state documents, an enormous saving to the state would result, and the local superintendents would be enabled to secure more time for professional supervision in exchange for the eliminated clerical work. The second source of waste is in the continuance of the small elementary school district as the unit of separate school control. Each such district school is controlled by a board of three school trustees who elect teachers, purchase school supplies and otherwise conduct the school business of their respective districts. The substitution of the high school district and the inclusion of every elementary district in some high school district would enable a single board to conduct all the school affairs of the district as a continuous system from the kindergarten through the high school or junior college, to engage adequate supervision of teaching which can not now ordinarily be obtained on account of the cumbersome legal obstacles, and to purchase school supplies in large instead of small quantities. A bill providing for this change passed both houses of the legislature at the last session but failed to secure executive approval. The Pasadena convention of high school principals went on record as favoring such future legislation.

The most encouraging advance made in the secondary school field during the past biennium seems to your commissioner to be in the socializing influence of the high school. Within the school itself the socialized recitation, and the encouragement offered to students to participate in (not to control) the government of the school are outstanding features. The use of the school house is becoming quite general as the community center for the gathering place of the Farm Center Bureau, the Parent-Teacher Association and the various social and educational organizations.

In his recent excellent essay on "The Mind in the Making," James Harvey Robinson, the historian, calls attention to the fact that man in his plans to secure social betterment has tried three methods without success. Briefly, these are said to be attempts to secure reform by a change in ordinances, laws and constitutions—what he calls changes in the rules of the game; spiritual exhortation, and education for citizenship. He proposes the untried application of Intelligence to the solution of this social problem in the same way that it has been applied to the study of the natural sciences. Intelligence has applied itself to the discovery of the fundamental laws of science by discarding wholesale the stupid misconceptions of tradition. His objection to the attempts to secure social improvement by educating for citizenship is that efforts have heretofore been directed toward preparation for the traditional type of citizenship.

The present trend in education toward social improvement within the school itself, the setting up of ideals in citizenship, and the training and practice in student citizenship, and the use of the school house as a community center of wholesome influence, is the initial step in the application of intelligence to training for citizenship. With advance in the ideals of the body of citizens will come an improvement in the social relationships of mankind. Present conditions seem to warrant a report of progress in the task of raising the level of improvement in man's relationship to his neighbor.

LETTER OF TRANSMITTAL.

The Honorable STATE BOARD OF EDUCATION,
Sacramento, California.

LADIES AND GENTLEMEN: In accordance with your request I have the honor to submit to you my report for the period beginning July 1, 1920, and ending June 30, 1922.

Very respectfully yours,

HERBERT R. STOLZ, M. D.,
State Supervisor of Physical Education.

BIENNIAL REPORT.

July 1, 1920, to June 30, 1922.

I. General Objective:

There has been no change in the objectives of the Department of Physical Education. The guiding principles so clearly stated in the two previous biennial reports of the state supervisor have been followed during the biennium just concluded. The training of boys and girls in habits of healthy living, in loyalty to their fellows, in practical leadership, in self control and in conscious preference for fair play continues to be the contribution to education which the department is striving to give through supervised physical activities.

II. Changes Within the Department:

In June, 1921, Clark W. Hetherington, the first state supervisor who laid the foundation for the program of physical education in California second to none in the United States, resigned to carry on research at Teachers College, Columbia University.

In July of the same year, assistant supervisor, George Hjelte, after about two years and a half of invaluable service to the department resigned to take charge of physical education and recreation in the city of Berkeley, California.

In January, 1922, Arthur J. Schuettner was appointed assistant supervisor so that in June, 1922, the department staff consisted of Dr. Herbert R. Stolz, Miss Winifred Van Hagen, and Mr. Arthur J. Schuettner, a total of three as against four in July, 1920.

III. Routine Work of the Department:

The following list of items, although it is far from complete, will give a general idea of the routine activities of the staff:

Addresses and demonstration at county institutes	19
Demonstrations and talks at local institutes	130
County-wide inspections of elementary schools	24
High schools visited	186
Courses given at summer sessions of teacher training institutions	10

Passing on credentials.
Giving advice to schools concerning playgrounds and apparatus.
Conferences with county supervisors.

IV. Special Projects Undertaken by the Department:

Of the special pieces of work done by the department the following deserve passing mention:

(*a*) The preparation of a cumulative record form to be used in recording the growth and development of the individual school child. The number of schools using this form is steadily increasing.

(*b*) The organization of an annual state-wide all-round contest for high schools having an enrollment of less than one hundred pupils. This contest, in addition to supplying an avenue for competition for

small high schools, has served to illustrate the value of having all the able-bodied pupils in a school take part in athletic contests.

(*c*) A comprehensive survey of the recreational facilities and needs in the state hospitals, state schools, and the home for the feeble-minded. A separate report of this survey was made to the Director of Institutions.

(*d*) The stimulation of play days for school districts and counties. Expert advice and personal assistance has been supplied in numerous instances.

(*e*) The preparation of two bulletins, one for use in secondary schools and entitled "Special Physical Training Activities for Use in Secondary Schools"; the other entitled "Physical Training Activities for Use in Small Rural Schools."

(*f*) The preparation of a plan for classification of high school boys according to physiological age so as to lessen the danger of injury which is likely to occur when immature boys are pitted against those who are mature. This plan is receiving the careful consideration of high school principals and physical directors in every part of the state.

V. Evidences of Progress:

While it cannot be asserted that any of the problems confronting the department two years ago have been completely and satisfactorily solved, there is evidence that some progress has been made by the teachers of physical education, by the pupils who have received the leadership and instruction, by the parents who pay for the instruction, and by the institutions which prepare the teachers. The following facts are illuminating:

During the summer of 1922, there were more than three times as many teachers taking theory courses in the organization and leadership of physical training activities, as there were during the summer of 1920.

In 1920 there was no research in physical education carried on by physical directors in the schools; in 1922 there are at least half a dozen directors engaged in research in this field in California.

Records from widely separated communities show a steady average increase in the strength and skill of pupils; the records of the students entering the universities show the same upward trend.

Of twenty-eight county superintendents answering a questionnaire, twenty-three state the physical education program has been of positive value in solving disciplinary problems in the schools.

The policy of securing adequate space and facilities for play activities has become very general with boards of school trustees in this state.

In 1920 there were approximately 31 play days held in California; in 1922 there were approximately 115.

VI. County Supervision:

The passage by the legislature of the law authorizing the creation of an emergency and supervision fund to be used for supervision in small elementary schools marks what is probably the most far-reaching development in the progress of physical education since it became compulsory in this state.

No adequate and satisfactory supervision of individual elementary schools can be maintained from the state department. Under the law referred to, it is possible to have part-time and full-time supervisors of physical education in counties and smaller geographical units. During the school year 1921-1922 there were twelve counties which employed full-time supervisors and eight which employed part-time supervisors of this activity and results have been very gratifying. From the efforts of these supervisors we may expect greater progress during the next two years.

LETTER OF TRANSMITTAL.

To the Honorable STATE BOARD OF EDUCATION,
Sacramento, California.

LADIES AND GENTLEMEN:

Pursuant to law and at your request, I hereby submit Division I of the annual reports of the Commissioner of Industrial and Vocational Education for the biennial period ending June 30, 1922. This division of the report deals mainly with the administration of the Federal and State Vocational Education Acts, vocational education in the secondary schools of the state, and the training of teachers for vocational subjects.

Division II of the report deals exclusively with the subject of Vocational Rehabilitation under the federal and state acts.

Very respectfully yours,

EDWIN R. SNYDER,
Commissioner of Industrial and Vocational Education.

ACKNOWLEDGMENT.

As part of the period of post-war reconstruction, the last two years have been years of economic readjustment. Industrial and business conditions have been unsettled, with the result that public improvement has somewhat languished. In many of the states the programs for special fields of education have suffered. On the other hand, in this state vocational education has greatly developed. This improvement has been due largely to the efforts of the teachers, principals, special supervisors, and superintendents, who have interested themselves in the cause of vocational education, the promotion of which is essential if we are to provide for all youths an education that properly fits them for the duties and responsibilities of full citizenship.

I wish to express to the members of the State Board of Education, to the Superintendent of Public Instruction and his assistants, and especially to Mr. J. B. Lillard, Supervisor of Agricultural Instruction, to Miss Maude I. Murchie, Supervisor of Home Economics Instruction, and to Mr. J. C. Beswick, Supervisor of Trade and Industrial Instruction, my appreciation of their splendid cooperation in advancing the work of vocational education in the state. I wish also to express to Professors Robert J. Leonard, Edwin A. Lee, Fred L. Griffin, Benjamin W. Johnson, and John G. Miller, of the University of California and its Southern Branch, my gratitude for their cordial support in furthering the program for the training of vocational teachers.

DIVISION I.

RECOMMENDATIONS FOR LEGISLATION.

In general, the vocational education program of the state has been progressing satisfactorily. In two respects only does it appear that the securing of further legislation is sufficiently important to be taken up in this report.

Due to the lack of funds, this department has found it impossible to cooperate with a number of high schools that have applied to maintain agricultural divisions under the provisions of the Federal and State Vocational Education Acts.

The evening high schools and special classes for adults are constantly increasing in number and yet no special provision has been made for the training of teachers for this important service.

Relating to Departments of Agriculture.

Last year we expended for the promotion of agricultural divisions, in fifty high schools of the state, $63,913.86. One-half of this fund was received from the federal government; the other half was appropriated by the state under the provisions of the vocational education act.

There are now more than 350 four-year and senior high schools in the state. Of this number nearly 300 are located in rural communities, the economic future of which depends upon the promotion and refinement of the industry of agriculture.

California is rapidly assuming leadership as a manufacturing state. Its population is increasing very much faster than that of other states. These millions must be sheltered, fed, and clothed. The question is, shall California supply this demand, or shall its citizens find it necessary to import the raw material for food and factory?

We have the natural resources in climate, water, power, and soils. But modern farming is a highly skilled occupation that requires either a very long apprenticeship, or a short apprenticeship with special education and training. The content of instruction, the influence of the usual teacher, the press and other publicity all tend to extol urban life, with the result that there is a constant flow of the youth of the land to urban communities.

We must reach the boy and girl during the early years of adolescence if we desire to instruct them in farming and rural life. We cannot hope to persuade the parents of these youths to send them away from home in order to secure their education and training. Only a reorganized local high school can successfully overcome the tendency to educate away from rural life, and provide the needed training to prepare for the occupation of farming.

During the first years of their establishment vocational departments are relatively more expensive than book courses of instruction. Agricultural instruction is especially so because it requires a teacher who has had a high grade of technical training, and who has had also successful experience in farming.

Because of the additional cost involved, and the risk of failure due to lack of proper supervision by an expert, the high school authorities of the state are not inclined to take up the work except in cooperation with the State Vocational Education Department.

With the special aid and the assurance of expert supervision, which we have been able to provide, we have succeeded during the last five years in having fifty high schools undertake the training.

However, there are about 250 other rural high schools that should be starting the work; but while the special funds available for promoting instruction during the coming years will gradually increase, this increase will be absorbed in providing for the upper years of the course in the fifty high schools now operating under the vocational education acts.

For three years past this department has been compelled to deny special aid to many schools that wished to undertake the work. In fact, we feel sure that, if we had the necessary additional funds, we could add at least fifty other rural high schools to the list of those that maintain courses of instruction preparing for farming and rural life.

Under the provisions of the Federal and State Vocational Education Acts, the following funds are available for the promotion of agricultural education in secondary schools:

For the fiscal year ending June 30, 1922-23	$74,566 18
For the fiscal year ending June 30, 1923-24	85,218 48
For the fiscal year ending June 30, 1924-25	106,523 10
For the fiscal year ending June 30, 1925-26, and annually thereafter	127,827 72

Recommendation for Appropriation for Agricultural Department.

In view of the pressing need for the further promotion of agricultural divisions in the rural high schools of the state, we would recommend that legislation be sought which will appropriate additional funds for the promotion of farm education in the high schools, as follows:

For the fiscal year ending June 30, 1923-24	$85,218 48
For the fiscal year ending June 30, 1924-25	106,523 10
For the fiscal year ending June 30, 1925-26, and annually thereafter	127,827 72

This will provide double the funds now available for the promotion of the work, and will enable the State Department of Vocational Education to cooperate in the promotion of vocational courses in agriculture with all schools now in position to profitably introduce the work.

Relating to the Training of Teachers for Part-Time and Adult Classes.

In his biennial report of two years ago your Commissioner discussed at some length the teacher-training problem presented by the recent rapid growth in the number of part-time general continuation classes, special day and evening classes for adults, and evening high school organizations.

The students in part-time and adult classes generally fall into two classes, one of which is composed of aliens and illiterates, who are seeking to better prepare themselves for the duties and responsibilities of citizenship, the other of which is composed of youths and adults who wish to secure instruction in English, mathematics, science, drawing, or the arts, supplementing their day occupations.

The teachers of these persons are at the present time recruited from two sources. A part of them are selected from the regular day school force; the remainder are from the various vocations in the community. By and large, neither group has ever had the teacher-training that would make them highly expert instructors of the special subjects, and

of the class of students that they are supposed to teach, so a relatively small amount of teacher-training would very greatly increase their efficiency as teachers.

Part-time and adult education present problems of teaching peculiarly their own. With a teaching force thoroughly trained to cope with these problems, much time could be saved by those who are in attendance upon these classes and schools, and thereby indirectly a large saving in public expenditures could be made.

These persons who are teaching for a part of the day only and who have local business establishments find it impossible to attend teacher-training classes maintained at a distance during a summer session. Likewise, the regular teachers frequently find it very difficult and expensive to attend the same; besides, better instruction could be provided locally where the teacher-trainer would have an opportunity to observe these teachers at work. Up to date the attempt to solve this problem by having special class and evening school teachers attend summer sessions has failed.

This department has had experience in training on the job. It has also had experience in training locally, teachers for part-time general continuation pupils. Both ventures have proven successful.

Recommendation Concerning the Training of Teachers for Part-Time, and Adult Classes and Schools.

In view of the above, we would, therefore, recommend that legislation be sought which will enable the State Board of Education to provide for the maintenance of itinerant classes for the training of teachers of part-time classes for minors, and of special classes and evening schools for adults.

Relating to Vocational Rehabilitation.

This subject has been dealt with in Division II of the Biennial Report of the Commissioner of Industrial and Vocational Education.

DIVISION II.

RETROSPECT.

The First Movement for Vocational Education.

As early as fifty years ago, some of the leading educators of this country began to voice the need for vocational education of less than college grade. At that time and for many years public education in this country was in the frontier stage of its development. The population was greatly scattered, school houses were far apart, trained teachers were scarce and school terms were short, with the result that only a limited number of persons succeeded in eradicating illiteracy by the time that they reached the age of eighteen. The wail of wealthy property owners against the excessive gross cost of education and the resulting high school-tax rate was, if possible, much louder than at present. In fact, many of the people did not yet believe in free education at public expense. Population was increasing so fast that school authorities found great difficulty in providing for the resulting increase in school attendance.

Under these conditions advance in public education was possible in several directions, as follows: School terms could be extended, schools could be more widely distributed, better school plants could be provided, universal school attendance could be attained, better methods of teaching could be applied, better teachers could be secured and, finally, a broader curriculum could be provided. The latter of these was, of course, the last to be achieved, so it is not surprising that the movement for vocational education made little or no headway, except in theory, for nearly twenty years. However, the discussion of this subject did result in giving it a theoretical place in the schemes for public education set forth by the leading educators of the country.

Commercial, Technical, and Manual Training Introduced.

In the late eighties and early nineties the subject became a burning issue with certain educational leaders, with the result that there were established throughout the country many technical schools of secondary grade, designed to prepare young men for industrial pursuits.

Commercial education, which had prior to this time been almost entirely a private venture, also found its way into the public high schools.

Drawing and manual training were alike introduced into the elementary and high schools of the country.

In some instances skilled workers were employed to teach the crafts; in others, the teaching was done by persons who had made special preparation for the work.

During all of this period the public education forces of the country were divided into two groups: Those who opposed the introduction of the new lines of work; and those who favored the same.

At first, industrial subjects were defended and introduced on the basis of their practical value in preparing young people for occupations. But this aim was not considered a legitimate one by those opposed to the work; and the supporters of the movement allowed themselves to be sidetracked into defending the subject on the ground

of its liberal, rather than its special, educational value. The result was that the courses of instruction were made over to meet the aims and ideals of a general, rather than a special, education. Thus the vocational value of these subjects was almost, if not entirely, lost.

The Recent Movement for Vocational Education.

The recent movement for vocational education began less than twenty years ago.

The first state to seriously interest itself in the problem was Massachusetts, the legislature of which established a commission on industrial education in 1906. In 1908 this commission issued a voluminous report containing the status of the subject in the United States and the principal foreign countries.

About this time The National Society for the Promotion of Vocational Education was organized. This institution immediately began to develop a national program for vocational education. Several of the states at once formed organizations which cooperated with the Federal Society in its program of promotion. Local and state teachers' associations, the National Education Association, local, state, and national organizations of farmers, manufacturers, merchants, and labor unions, and prominent educators and laymen in other vocations joined with the Federal Board in furthering the program for vocational education.

In the meantime, bills providing federal subsidies for the promotion of vocational education had been introduced in Congress. In 1913, near the end of the session, two of these measures, the Page-Lever bills, passed their respective houses and were referred to a joint conference committee, where they died with the closing of the session.

This congress did, however, provide for the appointment of a commission to study the question of the need for federal aid for vocational education, and to report, with recommendations, on or before December 1, 1913.

It was upon the basis of the findings of this commission that the Federal Vocational Education Act was finally passed, in 1917.

In the meantime, a number of the states had already passed legislation and made special appropriations for the promotion of the work.

California Officially Takes Up Movement.

In 1912 the people of the State of California amended the Constitution, thereby authorizing the legislature to provide for a State Board of Education. When, under this constitutional amendment, the legislature of 1913 created a new board, it provided for a Commissioner of Elementary Schools, a Commissioner of Secondary Schools, and a Commissioner of Industrial and Vocational Education. The board appointed these commissioners in December of that year and they took charge of their respective offices on January 1, 1914.

They, with the Superintendent of Public Instruction, are the professional advisers of the board in all matters relating to public education. They are, however, by statute also made responsible for the development of the fields of education indicated by their respective titles.

During the first years of his service a large part of the time of the Commissioner of Vocational Education was spent in arousing public interest in vocational education.

In 1911 a measure for the promotion of vocational education was introduced in the legislature, but it failed to pass. In 1913 a second measure was introduced, which also failed of passage. However, by the time the legislature met in 1915 the people were so thoroughly converted to the idea that public vocational education was a pressing need that the legislature of that year passed, without a dissenting vote, a very comprehensive vocational education act fostered by your honorable body.

This measure carried a large appropriation and, due to the financial stringency and the indefinite prospects of future income for the state, the Governor found it impossible to approve the bill.

The County High School Fund Measure.

The county high school fund measure, passed by this same legislature, was a great aid in stimulating the introduction of new subjects into the curricula of the secondary schools of the state.

Since this act provided for the raising and apportioning of county funds on the basis of average daily attendance, high school authorities did everything in their power to increase attendance upon their respective schools.

In order to secure such additional attendance, courses of instruction were expanded to include many new subjects. And in order to retain this attendance it was necessary for the teachers to modify the content and method of instruction in the various subjects already maintained in the high schools.

Due to the operation of this law and to the promotion of vocational education, under the provisions of the federal and state acts, adult education began to develop very rapidly.

Legislation for Adult Education.

In 1917 legislation was secured providing for the establishment of special day and evening classes for the benefit of persons (minors and adults) not in attendance upon the regular full-time day schools.

The law provides that these classes may convene at such hours and for such length of time during the school day or evening, and at such periods and for such length of time during the school year as may be determined by the local boards. It also provides that the enrollment and attendance upon these classes shall be kept, and the units of average daily attendance added to the attendance of the high schools.

Prior to the passage of this act it was impossible for a high school to maintain classes outside of the regular school hours or to maintain evening classes without establishing and maintaining a complete evening high school.

The counting of the attendance of pupils upon these classes enables the high schools to secure state and county aid for the same on a basis proportionate to that allowed for the attendance of regular full-time students.

This section of the law freed the high school from restrictions that made it impossible to meet the educational needs of the community, and enabled it to provide educational opportunities for those who are already serving the state in the capacity of producers.

The act of 1915, which provides county aid, a prior act which provides state aid, and a new method of apportionment adopted by legis-

lative action in 1921, enable the high school district not only to open its doors to the entire community, but also to finance courses of instruction that meet the needs of all of the people of the community.

Federal and State Vocational Education Acts Passed.

In 1917 the Federal Vocational Education Act, known as the Smith-Hughes Act, was passed. The California legislature immediately accepted the provisions of the act, passed the necessary legislation and appropriated the necessary funds to put the act into operation.

The state act designates the State Board of Education as the Board for Vocational Education, and provides for appropriations which shall equal the apportionments made to the State of California through the operation of the federal act, thus placing in the hands of your honorable body a fund for the promotion of vocational education in this state, which is double the amount provided by the federal act.

The various sums from federal and state sources provided for vocational education for the next few years are set forth in Bulletins Nos. 23 and 23-A, California State Board of Education.

The fact that the federal act sets up in detail many restrictions as to the use of the funds led to the adoption of a state act which in effect merely accepts the provisions and the benefits of the federal act, which authorizes the State Board of Education to make plans and to establish regulations for the promotion of vocational education in the state.

Compulsory Part-Time Education for Minors.

In 1919 the legislature passed the Part-time Education Act, which requires illiterate persons between eighteen and twenty-one years of age to attend evening classes for at least four hours per week; and persons between sixteen and eighteen years of age, not in attendance upon full-time schools, to attend part-time classes for not less than four hours per week for the entire annual school term.

Special State and County Aid for Part-Time and Adult Education.

Up to 1921 the laws covering the apportionment of the state and county high school funds operated to the interests of large urban communities by providing a special allotment for evening high schools and making no special provision for allotment on account of special classes, the only type of organization that could provide instruction for part-time pupils and for adults in small high school communities.

The new high school apportionment acts provide special state and county aid to high schools for adult education as follows:

State aid:

$80 for each and every unit or major fraction of a unit of the first ten units of average daily attendance upon evening schools or upon classes maintained for adults.

$60 for each and every unit or major fraction of a unit of the second ten units of average daily attendance upon such classes.

$40 for each and every unit or major fraction of a unit of the third ten units of average daily attendance upon such classes.

And, in addition thereto, the usual average daily attendance allotment which amounts to approximately $20 per unit of attendance.

County aid:

$40 for each and every unit or major fraction of a unit of the first ten units of average daily attendance upon evening schools or upon classes maintained for adults.
$30 for each and every unit or major fraction of a unit of the second ten units of average daily attendance upon such classes.
$20 for each and every unit or major fraction of a unit of the third ten units of average daily attendance upon such classes.
And, in addition thereto, the usual county apportionment on the basis of average daily attendance.

These acts also provide special state and county aid to *high school districts* for part-time general continuation classes as follows:

State aid:

$80 for each and every unit or major fraction of a unit of the first ten units of average daily attendance upon part-time general continuation classes.
$60 for each and every unit or major fraction of a unit of the second ten units of average daily attendance upon such classes.
$40 for each and every unit or major fraction of a unit of the third ten units of average daily attendance upon such classes.
And, in addition thereto, the usual average daily attendance allotment which amounts to approximately $20 per unit of attendance.

County aid:

$40 for each and every unit or major fraction of a unit of the first ten units of average daily attendance upon part-time general continuation classes.
$30 for each and every unit or major fraction of a unit of the second ten units of average daily attendance upon such classes.
$20 for each and every unit or major fraction of a unit of the third ten units of average daily attendance upon such classes.
And, in addition thereto, the usual county apportionment on the basis of average daily attendance.

Thus, a small high school district that has an attendance of 20 pupils for four hours each week for the annual high school term will have an average daily attendance of four pupils which will automatically allow the district an apportionment as follows:

From the state:		
	$80 x 4	or $320.
	$20 x 4	or $ 80.
From the county:		
	$40 x 4	or $160.
The usual county allotment	x 4,	or ?.
Total		?.

Since the county must as a minimum raise for high school purposes twice the amount received from the state for such purposes, but not less than $60 for each unit of average daily attendance, it will be seen that part-time and adult education is well financed in the high schools of the state.

The state and county aid mentioned above and the special funds provided for the promotion of vocational education place California in an unusually good position to develop a system of secondary schools which will provide adequate vocational, part-time, and adult education.

Federal and State Vocational Rehabilitation Acts Passed.

During the period of the late war there were introduced in congress measures providing federal funds for the rehabilitation of persons injured in the military service of the United States and persons injured in industry. The measures were amended by striking out the provision for the rehabilitation of civilians and, in due time, passed.

Those interested in the subject of vocational rehabilitation for persons injured in civil life still continued to press the matter with the result that the Sixty-sixth Congress passed an act appropriating a million dollars per annum for the four successive fiscal years beginning June 30, 1920, and ending June 30, 1924.

There being no session of the legislature in 1920, California was unable to take advantage of the act for the first year. However, in 1921 the legislature passed an act accepting the provisions and benefits of the federal act and making an appropriation of $35,000 per annum for the fiscal years ending June 30, 1922, 1923, and 1924.

The State Board of Education administers these acts through the Commissioner of Vocational Education.

The organization maintained for the promotion of the work is as follows: a general state and district office at Sacramento; a district office at San Francisco; and a district office at Los Angeles.

A State Supervisor of Vocational Rehabilitation is employed who, under the general direction of the Commissioner of Vocational Education, has charge of the entire state service. The San Francisco and Los Angeles offices are each manned by an Assistant Supervisor and a Training Officer.

The Sacramento office was opened on August 3, 1921; the San Francisco office on September 6, 1921; and the Los Angeles office on October 17, 1921.

A special report dealing with the subject of Vocational Rehabilitation will be submitted to your honorable body as Part II of the Biennial Report of the Commissioner of Industrial and Vocational Education.

DIVISION III.

REPORT ON VOCATIONAL EDUCATION.

The California Plan.

The original plan for the promotion of vocational education adopted by the State Board of Education in 1917 has, with the approval of the Federal Board, been readopted for a period of five years. The only material modifications made in the original are those relating to the special aid provided for the part-time general continuation classes.

Some school authorities have felt that the requirements set forth in the bulletin are in some respects unnecessarily restrictive. However, five years of experience have convinced us that the vocational department in high schools must be real and distinct from other departments.

Where high schools have allowed pupils to dip into the vocational department for certain subjects and into other departments of the school for certain other subjects, the work has not been fully successful.

The strongest vocational departments in the state are to be found in those schools that have conformed strictly to the requirements of Bulletin No. 23. As a matter of fact, every high school in the state that has closely followed the instructions set forth in Bulletin No. 23, has succeeded in establishing a permanent vocational department.

Lack of permanency of policy is the greatest enemy to the establishment of a new department in a high school. Where the organization of the work has not been set forth in considerable detail in writing, or in print, policies and procedures are constantly being changed.

For various reasons boards of education, principals of high schools, heads of departments, and teachers are constantly changing. A change in any one of these factors has in the past usually meant the upsetting of the entire high school course of instruction.

The fixing of objectives and the restriction of procedure, set up in Bulletin No. 23, make it possible for us to maintain a constant aim, a constant content, and a constant method of instruction, long enough to enable a class of pupils to secure an ordered course of instruction.

Vocational education has been attempted by secondary schools for years. Except when the program has been organized under the federal and state acts, it has usually failed. Without doubt its failure has been due either to complex objectives or to frequent changes of plan.

It is our opinion that the present California plan should remain in operation for at least five years more. At the end of that time, when we shall have had a decade of experience to draw upon, we can decide with intelligence upon the modifications necessary.

Development of Vocational Courses in Agriculture.

In my last biennial report it was pointed out:

"That the purpose of the vocational acts is *to promote vocational education.*

"That the first and most important problem in this promotion is the building up of workable high school courses for the training of farmers and other skilled workers, as type courses for the various high schools of the state.

"That in order to reduce the possibility of failure, as far as possible, a selection should be made of the larger rural high schools and of such high schools in cities as had large attendances of rural pupils, as the institutions in which to promote courses in farming.

"That high schools should be selected in one or two of the large cities for the purpose of establishing courses in farming that would meet the needs of city boys who anticipate taking up their life work in the country.

"That the schools selected for such work should be distributed over the largest possible geographical area.

"That a selection should be made which would enable the development of courses covering all of the various phases of agriculture."

These objectives and policies have been constantly kept in mind by this department.

Also it was stated in our department report rendered in 1918, that:

"There is only one way to train the student in the business of farming and that is to have him, while under instruction in the high school, engage in the business of farming. This experience can be secured only through the project method of instruction. If a strict accounting is made of everything that goes into the project, as well as of everything that comes out of the same, and if this accounting is conducted on a common sense, practical basis, then at the end of the school course the youth, his parents, the school authorities and the community will know whether or not he can make a commercial success of farming. If the people of the community, as well as the parents, know that he can make a commercial success, he will have no trouble in securing the financial assistance necessary to establish himself in his chosen occupation."

STATISTICAL TABLE I.

Federal and State Aided Classes in Agriculture for the Year 1917-18.

Place and school	Full time, part-time or special class	Number of classes	60-minute hours of instruction per week	Enrollment	Amount of federal and state aid
Ontario—Chaffey Union High	Full-time	4	30	60	$1,000 00
Clovis Union High	Full-time	1	30	21	500 00
Fresno High	Full-time	1	30	10	450 00
Holtville Union High	Full-time	1	30	12	950 00
Los Angeles—					
Gardena High	Full-time	1	30	20	410 00
Jefferson High	Full-time	1	30	12	433 33
Pomona City High	Full-time	1	30	11	400 00
Pasadena High	Full-time	1	30	7	500 00
Roseville Union High	Full-time	1	30	8	900 00
Visalia High	Full-time	1	30	11	450 00
Totals		13		172	$5,993 33

The following statistical tables set forth the number of classes, the enrollment, and the reimbursement of the high schools of the state cooperating with the State Board of Education for the promotion of agricultural education during the last five years.

The fifty schools listed in Table V are located wholly or partly in thirty different counties of the state. The territory covered extends from Adin, in Modoc County, and Fortuna in Humboldt County, to El

Centro in Imperial County. The counties in which these schools are located include every type of farming found in the state.

In addition to these schools, forty-two other four-year and junior high schools offer instruction in agriculture. The work in these institutions varies greatly: some give only one or two textbook courses in certain phases of the subject; others maintain well organized agricultural departments that maintain full four-year courses. Between these extremes we find as many different types of courses as schools.

For the purpose of supervision and conference work the state has been divided into five regions. The localities composing each of these regions present more or less homogeneous agricultural conditions. At least two regional conferences of teachers are held during each year. At these conferences administrative as well as teaching problems are considered.

Statistical Table II.

Federal and State Aided Classes in Agriculture for the Year 1918-19.

Place and school	Full-time, part-time or special class	Number of classes	60-minute hours of instruction per week	Enrollment	Amount of federal and state aid
Anderson Valley Union High, Boonville	Full-time	1	30	19	$1,000 00
Arcata Union High	Full-time	1	30	6	950 00
Chaffey Union High, Ontario	Full-time	4	30	39	2,500 00
Esparto Union High	Full-time	1	30	6	800 00
Fresno High	Full-time	1	30	16	850 00
Gonzales Union High	Full-time	1	30	4	1,000 00
Healdsburg High	Full-time	1	30	16	1,000 00
Holtville Union High	Full-time	2	30	19	1,296 66
Huntington Beach Union High	Full-time	1	30	9	1,000 00
Kingsburg Joint Union High	Full-time	1	30	7	1,000 00
Los Angeles—					
Gardena High	Full-time	1	30	17	625 00
Jefferson High	Full-time	1	30	26	625 00
McKinley Ave. Intermediate	Full-time	1	30	28	625 00
San Fernando High	Full-time	1	30	22	625 00
Oakland, Fremont High	Full-time	1	30	24	935 62
Roseville Union High	Full-time	1	30	11	900 00
Salinas Union High	Full-time	1	30	20	1,000 00
San Juan Union High, Fair Oaks	Full-time	1	30	10	950 00
Santa Rosa High	Full-time	1	30	9	888 88
Selma Union High	Full-time	1	30	13	970 00
Templeton Union High	Full-time	1	30	5	863 66
Visalia High	Full-time	1	30	11	900 00
Totals		26		337	$21,307 82

The statistical table below shows the comparative distribution of the schools of the state by regions.

Federal and State Aided Departments of Agriculture for the years 1917-22.

Regional divisions of state	917-18	1918-19	1919-20	1920-21	1921-22
Southern California	6	7	9	11	13
South Coast, Contra Costa to Ventura	0	4	6	7	8
North Coast, Marin to Del Norte	0	4	6	6	8
San Joaquin Valley	3	4	6	5	8
Sacramento Valley	1	3	5	10	13
Total schools reimbursed	10	22	32	39	50
Total enrollments in above schools	172	337	640	1097	1281

It will be noticed that twenty-five schools maintain one-year courses; twenty, two-year courses; four, three-year courses; and one a four-year course. It is the policy to lengthen the courses just as soon as the number of pupils desiring the work is sufficient to warrant the same.

The shortage of competent teachers of agricultural subjects, which has heretofore handicapped the development of the work, is being overcome; and the standards for the special credential in agriculture are being raised so that by the year 1924, five years of college training will be required.

Statistical Table III.

Federal and State Aided Classes in Agriculture for the Year 1919-20.

Place and school	Full-time, part-time or special class	Number of classes	60-minute hours of instruction per week	Enrollment	Amount of federal and state aid
Analy Union High, Sebastopol	Full-time	1	30	14	$975 91
Antelope Valley Union High, Lancaster	Full-time	1	30	11	893 24
Arcata Union High	Full-time	1	30	12	893 24
Campbell Union High	Full-time	1	30	8	992 49
Chaffey Union High, Ontario	Full-time	4	30	65	2,481 22
Chico High	Full-time	1	30	21	934 58
Esparto Union High	Full-time	1	30	13	992 49
Fresno High	Full-time	2	30	24	1,687 23
Fullerton Union High	Full-time	1	30	13	992 49
George Jr. Republic, Chino	Full-time	1	30	24	744 36
Geyserville Union High	Full-time	1	30	8	942 86
Gilroy High	Full-time	1	30	12	992 49
Gonzales Union High	Full-time	1	30	6	992 49
Healdsburg High	Full-time	1	20	22	496 24
Holtville Union High	Full-time	1	30	29	992 49
Huntington Beach Union High	Full-time	1	30	4	942 86
Kingsburg Joint Union High	Full-time	1	30	15	992 49
Lodi Union High	Full-time	1	30	26	992 49
Los Angeles—					
Gardena High	Full-time	1	30	15	727 84
Jefferson High	Full-time	1	30	19	727 79
McKinley Ave. Intermediate	Full-time	1	30	31	727 84
Madera Union High	Full-time	1	30	17	992 49
Marysville High	Full-time	1	30	15	985 03
Oakland—Fremont High	Full-time	3	30	60	1,687 23
Paso Robles High	Full-time	1	30	8	893 24
Petaluma High	Full-time	1	30	15	992 49
Roseville Union High	Full-time	2	30	18	1,455 63
Salinas Union High	Full-time	1	30	26	992 49
San Juan Union High, Fair Oaks	Full-time	2	30	32	1,417 91
Santa Rosa High	Full-time	1	30	25	939 54
Selma Union High	Full-time	1	30	23	992 49
Visalia High	Full-time	1	30	9	727 84
Totals		40		640	$33,191 51

The University of California cooperates with the State Board of Education in the training of teachers for agricultural instruction. Special courses in education are offered to seniors and to post-graduates during the regular session of the university. However, up to date a large part of the special teacher-training has been provided by intersessions and summer sessions. Four of the latter have been held at the Davis Farm, and one at the Ontario Junior College, in Southern California. During the last summer session at Davis, 130 teachers and prospective teachers were in attendance.

The importance of having broadly trained teachers of agriculture can not be over-emphasized. These teachers must be leaders who are capable of convincing teachers, parents, and students that the full course in agriculture provides ample opportunity to secure a sound, liberal education of secondary grade.

Statistical Table IV.

Federal and State Aided Classes in Agriculture for the Year 1920-21.

Place and school	Full-time, part-time or special class	Number of classes	60-minute hours of instruction per week	Enrollment	Amount of federal and state aid
Adin, Big Valley Joint Union High	Full-time	1	30	11	$477 18
Azusa, Citrus Union High	Full-time	1	30	20	954 34
Campbell Union High	Full-time	2	30	20	1,154 74
Chico High	Full-time	1	30	29	954 34
Chino, George Jr. Republic	Full-time	2	30	30	1,065 70
Colusa High	Full-time	1	30	18	477 18
Esparto Union High	Full-time	1	30	23	954 34
Fair Oaks-San Juan Union High	Full-time	3	30	36	1,779 84
Fresno High	Full-time	4	30	91	1,622 38
Fullerton Union High	Full-time	1	30	20	954 34
Geyserville Union High	Full-time	1	30	11	954 34
Gilroy High	Full-time	2	30	15	1,049 76
Holtville Union High	Full-time	2	30	28	1,607 34
Kingsburg Joint Union High	Full-time	2	30	17	954 34
Lakeport, Clear Lake Union High	Full-time	2	30	17	954 34
Lancaster, Antelope Valley Union High	Full-time	1	30	11	954 34
Lodi Union High	Full-time	2	30	39	1,622 40
Los Angeles—					
Gardena High	Full-time	2	30	10	596 46
Jefferson High	Full-time	2	30	25	596 46
McKinley Junior High	Full-time	1	30	34	596 46
Owensmouth High	Full-time	1	30	23	596 46
Los Molinos High	Full-time	1	30	20	954 34
Marysville High	Full-time	1	30	25	954 34
McArthur, Fall River Joint Union High	Full-time	1	30	10	954 34
Modesto High	Full-time	2	30	52	1,399 70
Morgan Hill, Live Oak Union High	Full-time	2	30	17	1,049 76
Napa High	Full-time	1	30	20	881 82
Oakland, Fremont High	Full-time	3	30	71	1,860 90
Ontario, Chaffey Union High	Full-time	4	30	120	2,385 90
Oroville Union High	Full-time	1	30	9	715 78
Pasadena High	Full-time	2	30	47	954 34
Paso Robles Union High	Full-time	1	30	15	954 34
Petaluma High	Full-time	2	30	28	1,399 70
Roseville Union High	Full-time	1	30	19	1,355 16
Salinas Union High	Full-time	2	30	30	1,622 38
Santa Cruz High	Full-time	2	30	25	1,206 50
Sebastopol, Analy Union High	Full-time	1	30	17	954 34
Selma Union High	Full-time	1	30	18	954 34
Upper Lake Union High	Full-time	1	30	22	954 34
Totals		64		1,097	$42,389 40

The project method predominates in all phases of agricultural instruction. It is the best method because it provides for practical business experience, farm economics, plant and animal care, and farm science. It gives the pupil an opportunity to measure his qualifications for, and his interest in, his occupation.

Each high school district maintaining a department must be surveyed by the teachers of agriculture. Based upon the findings of this sur-

vey, these teachers must make out an annual program of work. They must determine what farm enterprises shall be taught, must analyze the same, establish the different jobs under each, and arrange the instructional units according to the seasonal sequence of the farm enterprises.

STATISTICAL TABLE V.

Federal and State Aided Classes in Agriculture for the Year 1921 - 22.

Place and school	Full-time, part-time or special class	Number of classes	60-minute hours of instruction per week	Enrollment	Amount of federal and state aid
Adin, Big Valley Joint Union High	Full-time	1	30	9	$794 38
Azusa, Citrus Union High	Full-time	1	30	21	1,074 76
Brawley Union High	Full-time	1	30	20	1,074 76
Campbell Union High	Full-time	2	30	24	1,411 22
Caruthers Union High	Full-time	1	30	16	941 30
Chico High	Full-time	1	30	11	673 84
Chino High	Full-time	1	30	76	1,635 44
Chowchilla Union High	Full-time	1	30	15	794 38
Colusa High	Full-time	2	30	27	1,108 96
Concord, Mount Diablo Union High	Full-time	1	30	22	1,074 76
El Centro, Central Union High	Full-time	1	30	20	962 62
Esparto Union High	Full-time	2	30	28	1,443 92
Easton, Washington Union High	Full-time	1	30	20	1,074 76
Fair Oaks, San Juan Union High	Full-time	2	30	33	1,518 70
Fortuna Union High	Full-time	1	30	17	1,074 76
Fresno City High	Full-time	1	30	18	1,074 76
Fullerton Union High	Full-time	2	30	28	1,074 76
Geyserville Union High	Full-time	2	30	15	988 08
Gilroy High	Full-time	2	30	33	1,439 26
Gonzales Union High	Full-time	2	30	14	1,046 00
Grass Valley High	Full-time	1	30	15	934 58
Hemet Union High	Full-time	1	30	23	1,018 70
Holtville Union High	Full-time	3	30	35	1,532 70
Kingsburg Joint Union High	Full-time	2	30	24	1,251 66
Lakeport, Clear Lake Union High	Full-time	2	30	18	1,261 68
Lancaster, Antelope Valley Union High	Full-time	2	30	16	1,443 92
Lodi Union High	Full-time	3	30	44	1,803 18
Los Angeles—					
Owensmouth High	Full-time	1	30	24	906 54
Jefferson High	Full-time	1	30	17	906 54
Los Molinos High	Full-time	1	30	22	1,015 88
Marysville High	Full-time	1	30	20	794 40
McArthur, Fall River Joint Union High	Full-time	1	30	14	1,018 70
Modesto High	Full-time	3	30	43	1,626 16
Morgan Hill, Live Oak Union High	Full-time	2	30	17	1,448 60
Napa Union High	Full-time	1	30	17	794 38
Oakland, Fremont High	Full-time	2	30	40	1,803 00
Ontario, Chaffey Union High	Full-time	4	30	99	1,869 00
Oroville Union High	Full-time	1	30	9	841 12
Pasadena High	Full-time	3	30	50	1,692 00
Petaluma High	Full-time	2	30	36	1,822 00
Princeton Joint Union High	Full-time	1	30	6	1,074 76
Riverdale Joint Union High	Full-time	1	30	15	991 30
Riverside, Polytechnic High	Full-time	1	30	22	1,074 76
Roseville Union High	Full-time	2	30	39	1,074 76
Salinas Union High	Full-time	2	30	28	1,523 00
Santa Cruz High	Full-time	2	30	43	1,175 70
Santa Rosa High	Full-time	1	30	34	1,045 70
Sebastopol, Analy Union High	Full-time	2	30	30	1,542 00
Upper Lake Union High	Full-time	2	30	17	1,261 00
Woodland High	Full-time	2	30	20	1,074 76
Totals		81		1,281	$59,713 86

The Extension Division of the College of Agriculture of the University, and the farm bureaus of California have given the State Department of Vocational Education full and unqualified support.

Due to the fact that there did not appear to be any provision in the federal act under which part-time courses for adults in agriculture could be promoted, no special effort has been made to develop this type of work to date. However, the legislature of 1921 made available certain extra funds for adult education in small high schools. This extra aid makes it possible to promote short courses of instruction in the rural high schools where available qualified teachers can be obtained for the work. Hereafter the department will promote this type of instruction wherever possible.

While the number of pupils enrolled in vocational courses in agriculture, maintained under the state and federal acts, is not large, it does, upon the whole, represent persons who are pursuing bona fide courses of instruction. With a less restrictive program and a more liberal distribution of our funds, we would be able to report a larger number of schools and a much greater enrollment. However, such a policy would not materially contribute to the solution of the real problem, which is the establishment of satisfactory courses of instruction for secondary schools.

The attitude of the high school authorities, the teaching force, and the pupils, toward the work is splendid. There is a growing and strengthening belief that the type of work attempted is correct for secondary schools. We, therefore, feel very much encouraged with the general condition of vocational agricultural instruction in this state.

Development of Vocational Courses in Trades and Industries.

1. *All-Day Trade and Industrial Classes*:

In 1917-18 there were maintained	42	classes which enrolled		756
In 1918-19 there were maintained	77	classes which enrolled		1778
In 1919-20 there were maintained	85	classes which enrolled		2043
In 1920-21 there were maintained	94	classes which enrolled		2227
In 1921-22 there were maintained	122	classes which enrolled		2890

The above figures indicate an accelerated growth in the number of departments and of pupils enrolled in the full-time classes in trade and industrial subjects. During the two years immediately following the close of the war, the increase in the number of classes and in the enrollment was relatively slight.

Of the 122 classes maintained during the year just closed, there were 36 in automobile and gas engine repair work; 25 in machine shop; 15 in the electric trade; 11 in printing; 9 in sheet metal; 5 in carpentry; 4 each in mill cabinet, pattern making, and dressmaking; 2 each in cabinet making, trade art, restaurant cooking, and power machine operation; and 1 each in boat building, drafting, laundry work, machine bookkeeping, machine and boiler making, mechanical drafting, oil production, shorthand, typewriting, and millinery.

There has been a distinct increase in the number of vocational classes in printing. This growth has been brought about by promotion on the part of this department and of the printing-trades organizations.

A decided increase in the number of courses preparing for the woodworking industries is also noticeable.

The gas engine and automobile repair courses are growing in favor. Perhaps there is a tendency to overdo in this field. However, the educational interest of the boys who take these courses, as vocational courses, cannot in any way suffer, even if they should find themselves

in the wrong occupation, because the course of instruction in this subject is so broad in scope that it contributes greatly to the liberal education of the individual.

There is, at the present time, a shortage of skilled workmen in building trades lines. Without question there will be a continuing increase in the number of homes built during the next few years; consequently, there will be an increasing demand for trained workers along these lines. With this situation in mind, it will be the policy of the Vocational Education Department to stimulate, in every way possible, the maintenance of classes for training in the building trades.

2. *Part-Time Trade and Industrial Classes*: These classes are maintained during the usual working hours of the persons who attend them.

In 1917-18	there were maintained	3	classes which enrolled	46
In 1918-19	there were maintained	12	classes which enrolled	638
In 1919-20	there were maintained	19	classes which enrolled	1387
In 1920-21	there were maintained	15	classes which enrolled	737
In 1921-22	there were maintained	8	classes which enrolled	800

Part-Time classes for adults have not developed as expected. During the last year of the war, and during the first year immediately following it, there was considerable interest manifested in this type of instruction. Since then the number of classes maintained has constantly decreased, and the enrollment has either decreased or remained stationary. Of course these classes deal only with vocational extension work.

The school is not well equipped to give vocational extension work in the applied phases of the crafts. In general, vocational extension for adults, engaged in trade and industrial occupation, is confined to instruction in English, drawing, applied mathematics, or applied science. Upon the whole these subjects have an indirect, rather than a direct, bearing on the job, with the result that neither the employer nor the workman is very much impressed with the view that it is necessary to secure this kind of training during the usual working hours, and on the time of the employer.

Vocational educational service for men and women engaged in occupations is provided for through evening schools and adult classes maintained by more than 100 high schools in this state. And, while the type of instruction provided for these workers could be improved, it compares favorably with the same type of instruction provided by schools maintained elsewhere.

Aside from *part-time instruction for employed minors*, which is being developed in every possible way in this state, the Department of Vocational Education is making every effort to stimulate the organization of cooperative part-time classes, especially for the pupils in the upper classes of the vocational departments of the high schools. These courses require half-time on the job, at a wage, and half-time in the school, studying subjects that supplement the occupation, and provide for a liberal social training.

The institutions that maintain such courses find that the instruction is more satisfactory where the pupils spend two weeks on the job and two weeks in school, during each school month. Since the final test of the value of an education is that of success, the pupil who satisfactorily completes such a course knows that he can make good on the

job. Transition from preparation to service, from school to job, ceases to be in any sense a gamble.

Another field for part-time instruction, which this department is interested in promoting, is that of foremanship training. We are especially interested in promoting this line of work because the trained foreman will become a teacher of all apprentices that are placed in his charge. However, before much can be accomplished in this line it will be necessary to train, through teacher-training agencies, teachers capable of giving the necessary instruction to the foremen employed by the various industrial plants of this state.

3. *Special Trade and Industrial Classes*: The purpose of these classes is to provide vocational extension opportunities for men and women during the day, before and after working hours.

During the war, and immediately following it, a number of such classes were maintained, and the enrollment ran into the thousands. Last year but one such class remained. This was a class in Los Angeles for laundry workers.

Conclusion: During the last few years, the type of pupil attending the vocational classes in trade and industrial subjects has improved. The teachers are becoming better and better qualified, and instruction is improving from year to year. The increase in the number of Departments established, and the enrollment therein, would indicate that vocational education in trade and industrial lines is in a healthful growing condition. There are indications that would lead to the conclusion that when we have permanently adjusted ourselves economically, the promotion of vocational education along trade and industrial lines will again assume a prominent place in the public mind.

Development of Federal and State Aided Home Economics.

1. *Full-Time Home Economics Departments*: These departments maintain courses that provide for six hours of instruction daily, and cover a period of from one to two years.

They are open to first year students and are so arranged that should the student desire to complete a full high school course she may do so.

These courses appeal to the interest of the home maker and prepare her for the duties and responsibilities of that occupation. While they include such subjects as hygiene, English, and citizenship, fifty per cent of the time is devoted to home hand craft occupations. The instruction is especially well adapted to meet the needs of girls who leave school, marry, and become mothers at an early age.

For most women home making is, sooner or later, a principal occupation, although for many, wage earning occupations are also important.

The importance of developing the highest type of American home can not be over emphasized, and since home making is an occupation which requires the broadest culture, the highest grade of education, and unusual skill in many crafts, special education and training for the service is indispensable.

A course of instruction preparing for home making may occupy a small part of the school time of the student for a long period of years, or it may occupy all of her time for a short period of years. Which of these two types may prove most suitable for the secondary school

can be determined only by experience. However, it is certain that a short intensive course, which absorbs the entire interest, thought, and time of the pupil, for a short period, offers the best opportunity for working out a balanced program of education for home making. And since the development of a broad, balanced program of instruction in this field is the first step in promoting a better class of home economics instruction in the public schools, it is very important that the establishment of such departments be encouraged in every possible way.

In 1917-18 there was maintained 1 class which enrolled	16
In 1918-19 there were maintained 4 classes which enrolled	61
In 1919-20 there were maintained 11 classes which enrolled	228
In 1920-21 there were maintained 14 classes which enrolled	316
In 1921-22 there were maintained 16 classes which enrolled	334

At present most of these classes are located in large cities, and though they are well adapted to smaller schools, only one or two rural schools maintain them.

These courses offer a wonderfully fine opportunity for sound instruction in citizenship; consequently the courses are crowded with pupils of foreign parentage who leave the schools at the end of the compulsory education period. They should be popular with girls who contemplate leaving school after completing one or two years of the high school course, with young married women, or women who contemplate early marriage. When their usefulness is fully realized they will rapidly increase in number and importance.

2. *Part-Time Home Economics Classes*: These classes are maintained for adult housewives and prospective housewives. They are usually maintained four to six hours per week. Minors not in full-time school attendance are provided for in the general continuation part-time classes.

In 1917-18 there were maintained 20 classes which enrolled	576
In 1918-19 there were maintained 70 classes which enrolled	2243
In 1919-20 there were maintained 158 classes which enrolled	6013
In 1920-21 there were maintained 171 classes which enrolled	6446
In 1921-22 there were maintained 201 classes which enrolled	8671

The persons enrolled in the part-time classes, mentioned above, for the year 1921-22 are segregated as follows:

65 dressmaking classes enrolled	2349
94 millinery classes enrolled	4140
Combined millinery and dressmaking classes enrolled	1431
Home nursing classes enrolled	301
Business law and home accounting classes enrolled	158
Nutrition classes enrolled	121
Home decoration classes enrolled	107
Household mechanics classes enrolled	64

During the year 1920-21 the claim for reimbursement, on account of home economics instruction, far exceeded the available fund, with the result that only 78 per cent of the claims for that year could be met. Last year but a very slight reduction was necessary. This was due to a large increase in the fund, brought about by the large relative increase in the population of the state during the last decade.

The department is making a special effort to promote instruction in child care, nutrition, motherhood, home art, and home science. Although there is a growing recognition of the need of such instruction, progress is slow because of the difficulty of securing instructors competent to teach these special phases of the work. This situation will be met by providing special courses of instruction in these lines.

PART-TIME GENERAL CONTINUATION CLASSES.

The state department reimburses local school authorities for expenditures on account of part-time instruction for minors, only when the local community provides for the coordination of the youth's home, school, employment, and recreational activities. The statistics for part-time general continuation classes, found in Table XVII, do not, therefore, include the enrollment for all of the schools of the state, since some of them do not provide for coordination service under the provisions of Bulletin No. 23.

The part-time act has been in effect in this state for two years only. During the first of these two years it was in effect only for persons under seventeen years of age. Many schools have found it difficult to swing into the work at once. In very few communities has the work been developed to such an extent as to meet the needs of all of the youth affected by the law. School authorities are constantly discovering more and more persons of this age who are not in attendance upon full-time schools.

One of the indirect effects of the part-time act has been to greatly increase the enrollment in the regular day high schools of the state.

In 1920-21 special State aided part-time classes enrolled	6965
In 1921-22 special State aided part-time classes enrolled	13275
The total enrollment in compulsory part-time classes was	14477

There is a feeling on the part of some high school principals that the main function of the part-time act is to drive the youth into the full-time high school classes, but however satisfactory such a result may be from their viewpoint, it is not the function of the act to do this. The principal purpose of part-time education is to ease the youth from the school into the job. The need for part-time education would remain even though we had every child in the state enrolled in a full-time school until the age of eighteen.

The part-time school is an institution designed to bridge the gap between schooling and employment, and not an institution designed to over-emphasize the value of schooling versus productive employment.

The solution of the problem of part-time education is not to be found in forcing all youngsters, between sixteen and eighteen years of age, out of jobs and into the school, and then in turning them out without guidance to adjust themselves to life by the law of chance. As a matter of fact, many of the youth of this age would be better off if they would give a part of their time to productive employment and a part to school work.

To be sure, it must always be remembered that under present conditions it is more economical to have those who contemplate securing a higher education continue in school for full-time.

The part-time act makes it the duty and responsibility of high school authorities to provide for individual counsel and guidance in social and vocational matters for each pupil enrolled in part-time classes. Apparently it is assumed by the law that this function is already performed for those in full-time attendance upon public schools.

High school principals are required by the part-time act to assume certain responsibilities regarding the employment of minors under eighteen years of age.

The legal responsibilities mentioned above would indicate that the best solution of the part-time education problem would require the establishment of a department of attendance, guidance, and employment, in each high school. It would be necessary to place such departments under the administration of trained coordinators whose duties it would be to familiarize themselves with the home, employment, school, and recreational activities, of all minors in the community, and to see that these factors were so conditional as to insure the proper physical, mental, and moral development of the youth.

The coordinators should find satisfactory employment for all who are in need of it. They should promote organizations among the young, which would provide for healthful social contact and recreation. In short, they should assume joint social guardianship over all of the minors of the community, and where other adequate guardianship does not exist, they should either assume full guardianship, or see that it is otherwise provided for.

The youth of part-time age are passing through that period of development when human character is inevitably and frequently unchangeably cast. In many instances, parental, religious, or other social guidance and control are completely absent. It is from this group that most criminals are recruited. The young are, at this age, an ever ready prey for those who would sow the seeds of social destruction.

It is a grave responsibility which the people of the State of California have placed upon school authorities, but the good to be accomplished is so great that we are sure that the principals of the high schools and the other school authorities made responsible for the promotion of part-time instruction will endeavor, as heretofore, to meet the needs of the situation.

DEVELOPMENT OF VOCATIONAL TEACHER-TRAINING COURSES.

Teachers of Agriculture: The State Board of Education has arranged with the University of California for the training of teachers of agriculture under the provisions of the vocational education acts. In general, only three types of persons are admitted to this training:

First, those who are graduates of agricultural colleges and who have had farm experience since the age of eighteen.

Second, those who have had a good fundamental education and several years of experience on a farm conducted along scientific lines.

Third, experienced high school teachers in special fields such as English, mathematics, science, and trades, who desire to prepare as teachers of supplemental subjects.

Vocational courses in agriculture were started in California the year that war was declared.

Having had military training the graduates of agricultural colleges were among the first to respond to the call of their country. Consequently, the supply of qualified teachers was greatly depleted.

During the years of the war and immediately thereafter, we admitted to the classes persons with less technical training than desired. However all such persons did possess equivalents in successful farm experience.

The number of young men completing the courses of agricultural colleges is constantly increasing. As a result, the State Board of Education is, from year to year, advancing its standards. During the year 1921-22, twelve units, or two summer school sessions, of instruction in addition to a bachelor's degree were required for certification. For the year 1922-23, twenty-four units of post-graduate work will be required, and thereafter thirty-two units.

The accompanying statistical tables report 153 men and 40 women enrolled in the classes maintained at Davis during the year 1918-19. It will be noticed that this enrollment exceeds that of the following year. This is due to the fact that the summer school enrollment of 1919 was included in the report for the school year ending June 30, 1919, and also in the school year ending 1920. Since only a few days, never more than five, of the summer school session fall in the year just closing, we have adopted the custom of enrolling the summer school students in the year following, only. This is necessary in order to avoid a duplication of enrollment.

In the beginning when there was a great shortage of teachers, classes were maintained at the University Farm throughout the entire school year. Recently they have been maintained during one semester, and the summer period only. This arrangement has been made in order that the supervisors of teacher-training may find time to give instruction on the job to the men already in service.

Experience seems to indicate that the best teacher-training that we do is that which occurs on the job, where real problems can be taken up and disposed of in their proper settings. It is the policy of the department to extend this service as far as possible.

Teachers of Trades and Industries: In general, there are two types of teachers engaged in giving instruction in trade and industrial courses. They are the teachers of applied subjects and the teachers of supplemental subjects.

The teachers of applied subjects are in every instance skilled workers who have had at least three years of journeyman experience in their respective trades. Most of these persons have also had the teacher-training provided in the classes maintained by the University of California for the State Board of Education. At present, the State Board of Education will not issue a long-term credential authorizing the holder to give instruction in the applied phases of a vocational course unless he has completed the prescribed twelve units of work in teacher-training.

The teachers of supplemental subjects are recruited from several sources. Some are experienced teachers of English, mathematics, science, or drawing. Others are experienced graduate engineers who have had no previous teaching experience. A few are persons (not graduates of colleges) who have had a large amount of practical experience in the applied phases of the subject, and in addition thereto

a considerable amount of schooling in the supplemental subjects in which they qualify to instruct. All of these persons must take twelve units of special teacher-training before they can fully qualify as instructors in trade and industrial classes.

In accordance with its agreement with the State Board of Education, the University of California and the Southern Branch of the University of California maintain evening classes wherein employed persons may qualify as teachers by attending such classes for two evenings a week for a two-year period. They also maintain classes during regular summer sessions.

During the first years that these classes were maintained, it was necessary to admit to the courses for applied subjects persons who in some instances had but elementary schooling. Recently, the standard has been increased so that such persons must show at least some high school training. It is hoped that supply and demand will soon make it possible for us to require that all persons admitted to these classes shall have completed a full four-year high school course.

In these classes no attempt is made to give instruction in the applied phases of the crafts. If a person enrolled in a class is deficient in any phase of his craft, he must remove such deficiency by securing further experience or by attending vocational courses maintained by other institutions.

A large percentage of the skilled craftsmen completing these courses have been employed as teachers of home and community mechanics by local school boards. Such courses of instruction are, naturally, not strictly vocational, and the teachers for the same should be prepared in the various teachers colleges of the state. It is the aim of the department to promote programs for the training of such teachers in at least two or three of the teachers colleges.

Teachers of Part-Time General Continuation Classes: The compulsory part-time education act went into force July 1, 1920. Just prior to that time, the University of California, in cooperation with this department, set up extension classes wherein preliminary teacher-training was given to more than eleven hundred public school teachers. It was from this group of persons that the administrators and teachers of part-time classes were largely recruited. These extension courses provided a two-unit course.

The University of California and its Southern Branch have, since that time, maintained two other courses of two units each for the benefit of teachers of part-time general continuation classes. The University of California contemplates adding additional courses for the coming summer session.

The State Board of Education requires a minimum of six units of special training before it will grant a credential authorizing the certification of teachers to give instruction in part-time classes. The University of California also maintains a service department which provides instruction on the job for supervisors, coordinators, and teachers of part-time pupils.

Teachers of Home Economics: When the vocational education acts went into effect, a survey of the situation revealed the fact that California was well provided with institutions training teachers for home economics instruction. Also, many trained teachers of home economics

were being recruited from Eastern institutions. The courses given by the California institutions were, upon the whole, on a par with those given in the East, but the subject of instruction was comparatively new and in the process of making.

In the beginning, home economics instruction was confined to cooking and sewing, and though it had in some measure expanded, a comparison of the content of the course, with the demands made upon the housewife clearly indicated that it was entirely too narrow in scope to meet the needs of the situation. One of the main ends, then, in the promotion of the subject was to broaden its scope, but before any great progress could be made in this direction, it was necessary to provide for supplementing the training of many of the teachers in service. For this reason, the State Board of Education provided for a supervisor of teacher-training in home economics who divides her time between the instruction of teachers on the job, and the supervision of teacher-training in the various institutions of the state.

The survey mentioned above also revealed the fact that most of the persons in training for teaching service in home economics were young women whose main occupations throughout their lives had been attending school. Consequently, they could not bring to their profession the breadth of experience in their chosen fields, which is desirable on the part of a teacher.

It was felt that the introduction into the force, of women who had had both extended home experience and special training would greatly strengthen the corps of teachers in the field. The remainder of the fund available in this department for the training of home economics teachers has, therefore, been used in encouraging the teacher-training institutions to seek and, when found, enroll for training in home economics teacher-training courses women who have had both schooling and extended experience as home-makers. While the number of such persons prepared for the service has not been numerically large, their services have been in great demand.

Schooling never fully takes the place of experience and adequate experience in home-making can not be provided for in a school. Like all other occupations, home-making can best be prepared for by a combination of vocational and school experience.

Statistical Table VI.

Federal and State Aided Classes in Trades and Industries for the Year 1917-18.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrollment	Amount of federal and state aid
Fresno	Machine shop	Full-time	1	30	10	$300 00
Fresno	Auto repair	Full-time	1	30	9	150 00
Los Angeles—						
Hollywood	Navigation	Full-time	1	30	16	150 00
Hollywood	Oil operation	Full-time	1	30	21	150 00
Jefferson	Auto repair	Full-time	3	30	60	900 00
Lincoln	Sheet metal	Full-time	1	30	20	300 00
Lincoln	Electrical	Full-time	2	30	45	500 00
Lincoln	Pattern making	Full-time	1	30	20	150 00
Lincoln	Dress making	Full-time	1	30	12	300 00
Lincoln	Printing	Part-time	1	15	9	110 00
Lincoln	Auto mechanics	Part-time	1	6	15	60 00
Lincoln	Auto mechanics	Part-time	1	5	22	50 00
Manual Arts	Machine shop	Full-time	2	30	32	300 00
Manual Arts	Printing	Full-time	1	30	5	150 00
Polytechnic	Electrical	Full-time	1	30	25	225 00
San Pedro	Machine shop	Full-time	1	30	14	225 00
San Pedro	Machine drafting	Full-time	1	30	11	225 00
Boyle Heights	Restaurant cooking	Full-time	1	30	10	150 00
Fourteenth Street	Restaurant cooking	Full-time	2	30	31	600 00
Oakland—						
Vocational	Machine shop	Full-time	4	30	89	1,867 50
Vocational	Auto repair	Full-time	3	30	66	1,225 00
Vocational	Electrical	Full-time	3	30	61	1,472 50
Vocational	Carpentry	Full-time	1	30	33	412 50
Vocational	Printing	Full-time	1	30	14	485 00
Vocational	Dress making	Full-time	3	30	69	1,335 60
Vocational	Millinery	Full-time	1	30	34	390 00
Sausalito—						
Tamalpais	Machine shop	Full-time	1	30	16	338 00
Tamalpais	Carpentry	Full-time	1	30	7	338 00
Tamalpais	Electrical	Full-time	1	30	12	338 00
Stockton	Carpentry	Full-time	1	30	14	283 00
Totals					802	$13,479 83

Statistical Table VII.

Federal and State Aided Classes in Trades and Industries for the Year 1918-19.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrollment	Amount of federal and state aid
Fresno	Automobile	Full-time	2	30	59	$805 76
Fresno	Machine shop	Full-time	1	30	20	600 00
Long Beach	Chemistry	Part-time	1	4	19	90 00
Los Angeles—						
Boyle Heights Inter.	Carpentry	Full-time	1	30	21	600 00
Central Intermediate	Building trades	Full-time	1	30	15	300 00
Central Intermediate	Citizenship	Special	1	4	254	112 00
14th St. Intermediate	Boys' restaurant cooking	Full-time	2	30	33	1,004 85
Hollywood	Radio buzzer	Full-time	1	30	20	300 00
Hollywood	Sugar chemistry	Full-time	1	30	28	300 00
Hollywood	Oil chemistry	Full-time	1	30	30	300 00

STATISTICAL TABLE VII—Continued.

Federal and State Aided Classes in Trades and Industries for the Year 1918-19.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrolment	Amount of federal and state aid
Los Angeles—Continued:						
Jefferson	Auto shop	Full-time	4	30	108	$1,448 75
Jefferson	Carpentry	Full-time	1	30	16	525 00
Jefferson	Mechanical drafting	Full-time	1	30	9	525 00
Jefferson	Electricity	Full-time	1	30	31	525 00
Labor Temple Eve.	Power sewing machine	Part-time	2	15	153	300 00
Lincoln	Automobile	Full-time	2	30	45	840 05
Lincoln	Electricity	Full-time	2	30	36	908 64
Lincoln	Machine shop	Full-time	2	30	51	805 76
Lincoln	Sheet metal	Full-time	1	30	27	600 00
Lincoln	Trade art	Full-time	1	30	19	300 00
Lincoln	Trade sewing	Full-time	1	30	34	500 00
Lincoln	Power sewing machine	Part-time	1	15	117	100 00
Lincoln	Printing	Part-time	1	6	9	120 00
Lincoln	Salesmanship	Part-time	2	4	154	80 00
Lincoln	Supplemental nursing	Part-time	1	6	58	90 00
Los Angeles High	Radio buzzer	Full-time	1	30	27	300 00
Manual Arts	Auto shop	Full-time	1	30	28	300 00
Manual Arts	Electricity	Full-time	2	30	44	562 50
Manual Arts	Foundry	Full-time	1	30	18	300 00
Manual Arts	Machine shop	Full-time	2	30	47	600 00
Polytechnic	Automobile	Full-time	1	30	12	150 00
Polytechnic	Electric wiring	Full-time	2	30	22	702 88
Polytechnic	Machine shop	Full-time	1	30	33	500 00
San Pedro Evening	Supplemental ship building	Special	4	4	144	315 00
San Pedro High	Boat building	Full-time	1	30	5	300 06
San Pedro High	Industrial drawing	Full-time	1	30	8	300 00
San Pedro High	Machine shop	Full-time	1	30	19	600 00
Torrance	Machine shop	Part-time	1	4	17	600 00
Oakland—						
Technical	Automobile	Full-time	1	30	19	150 00
Technical	Carpentry	Full-time	1	30	22	600 00
Technical	Electricity	Full-time	1	30	31	600 00
Technical	Machine shop	Full-time	4	30	94	1,834 55
Technical	Pattern making	Full-time	2	30	44	1,011 51
Vocational	Automobile	Full-time	3	30	88	1,320 16
Vocational	Carpentry	Full-time	1	30	30	555 00
Vocational	Dressmaking trade	Full-time	2	30	51	833 18
Vocational	Electricity	Full-time	3	30	80	1,241 29
Vocational	Machine shop	Full-time	4	30	113	1,659 68
Vocational	Millinery	Full-time	1	30	17	567 00
Vocational	Pattern making	Full-time	1	30	32	555 00
Vocational	Printing	Full-time	1	30	17	468 00
Vocational	Sheet metal	Full-time	2	30	32	480 00
Vocational	Printing	Part-time	1	30	18	120 00
Vocational	Ship fitting	Special	1	4	33	45 00
Pomona	Automobile	Full-time	1	30	31	300 00
Roseville	Machine boilermaking	Part-time	2	8	27	240 00
Sacramento	Salesmanship	Part-time	1	7½	66	37 50
San Francisco—						
Irving M. Scott	Shipbuilding	Special	15	4-6-10	438	298 82
San Jose	Machine shop	Full-time	2	30	36	805 76
Santa Barbara	Automobile	Full-time	2	30	67	1,011 51
Sausalito—						
Tamalpais	Machine shop	Full-time	2	30	35	805 76
Stockton	Carpentry	Full-time	1	30	12	600 00
Stockton	Machine shop	Full-time	2	30	37	1,011 51
Totals					3,260	$34,762 42

Statistical Table VIII.

Federal and State Aided Classes in Trades and Industries for the Year 1919-20.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	Number of hours per week	Enrollment	Amount of federal and state aid
Berkeley Evening	Stenography	Part-time	1	4	45	$80 00
Berkeley Evening	Typewriting	Part-time	1	4	72	80 00
Chino	Auto and tractor	Full-time	1	30	10	600 00
Fresno	Auto repair	Full-time	2	30	40	1,058 91
Fresno	Electric trades	Full-time	1	30	9	600 00
Fresno	Machine shop	Full-time	2	30	29	1,058 91
Long Beach	Chemistry, trade	Part-time	1	5	13	89 45
Los Angeles—						
Central Evening	Citizenship	Part-time	1	5	256	90 00
Central Evening	Salesmanship	Part-time	1	4	170	40 00
14th St. Intermediate	Boys' restaurant cooking	Full-time	2	30	34	1,058 91
Gardena	Auto machine shop	Full-time	1	30	14	600 00
Hollywood	Auto mechanics	Full-time	2	30	47	921 26
Hollywood	Industrial chemistry	Full-time	1	30	20	300 00
Jefferson	Auto repair	Full-time	6	30	114	2,435 65
Jefferson	Electric trades	Full-time	2	30	40	1,058 91
Jefferson	Sheet metal	Full-time	1	30	25	600 00
Jefferson	Salesmanship	Part-time	1	6	14	30 00
Labor Temple Eve.	Power sewing machine	Part-time	2	30	362	600 00
Lincoln	Auto repair	Full-time	2	30	45	944 21
Lincoln	Mechanical drafting	Full-time	1	30	28	500 00
Lincoln	Trade dressmaking	Full-time	2	30	53	829 46
Lincoln	Electric trades	Full-time	2	30	57	867 71
Lincoln	Machine shop	Full-time	1	30	21	550 00
Lincoln	Printing	Full-time	1	30	9	300 00
Lincoln	Sheet metal	Full-time	1	30	22	500 00
Lincoln	Trade art	Full-time	1	30	23	300 00
Lincoln	Power sewing machine	Part-time	1	15	271	300 00
Lincoln	Printing	Part-time	1	30	9	37 50
Manual Arts	Auto repair	Full-time	2	30	50	450 00
Manual Arts	Electric trades	Full-time	1	30	17	300 00
Manual Arts	Machine shop	Full-time	2	30	47	714 74
Manual Arts	Salesmanship	Part-time	1	6	41	30 00
Polytechnic	Machine shop	Full-time	1	30	25	450 00
Polytechnic	Salesmanship	Part-time	3	15	83	90 00
San Pedro Evening	Mechanical drawing	Special	1	6	30	120 00
San Pedro Evening	Navigation	Special	1	10	11	100 00
San Pedro Evening	Oxy-acetylene welding	Special	2	8	49	160 00
San Pedro Evening	Ship fitting	Special	1	4	24	80 00
Monterey	Auto repair	Full-time	1	30	16	600 00
Oakland—						
Garfield	Sheet metal	Full-time	1	30	21	360 00
Prescott	Sheet metal	Full-time	1	30	29	600 00
Technical	Auto repair	Full-time	2	30	66	1,058 91
Technical	Carpentry	Full-time	1	30	36	600 00
Technical	Electric trades	Full-time	2	30	47	829 46
Technical	Machine shop	Full-time	4	30	121	1,747 29
Technical	Pattern making	Full-time	2	30	59	1,058 91
Vocational	Auto repair	Full-time	4	30	106	1,616 31
Vocational	Carpentry	Full-time	1	30	32	542 50
Vocational	Dressmaking, trade	Full-time	2	30	58	946 10
Vocational	Electric trades	Full-time	4	30	134	1,760 68
Vocational	Machine shop	Full-time	4	30	119	1,478 62
Vocational	Millinery, trade	Full-time	1	30	30	525 00
Vocational	Pattern making	Full-time	1	30	30	555 00
Vocational	Printing	Full-time	1	30	20	520 00
Vocational	Sheet metal	Full-time	1	30	23	600 00
Vocational	Printing	Part-time	1	12	33	255 00
Redlands	Auto repair	Full-time	1	30	20	600 00
Roseville	Machine boilermaking	Part-time	4	16	24	400 00

Statistical Table VIII—Continued.

Federal and State Aided Classes in Trades and Industries for the Year 1919-20.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrolment	Amount of federal and state aid
San Francisco—						
Irving M. Scott	Machine design	Special	2	6-10	74	$45 00
Irving M. Scott	Electric trades	Special	2	10	77	55 00
Irving M. Scott	Industrial English	Special	1	10	25	55 00
Irving M. Scott	Marine engineering	Special	2	6	35	28 00
Irving M. Scott	Indus. history and citizenship	Special	1	10	4	19 00
Irving M. Scott	Hull drafting	Special	5	4-6-10	93	76 00
Irving M. Scott	Mold loft work	Special	1	8	22	12 00
Irving M. Scott	Ship calking, riveting	Special	2	10	34	33 00
Irving M. Scott	Electric welding	Special	2	6	56	50 00
Irving M. Scott	Oxy-acetylene welding	Special	2	12	85	35 00
San Jose	Auto repair	Full-time	2	30	49	829 46
San Jose	Machine shop	Full-time	2	30	30	1,058 91
Santa Barbara	Auto repair	Full-time	2	30	53	1,058 91
Sausalito—						
Tamalpais	Carpentry	Full-time	1	30	15	600 00
Tamalpais	Electric trades	Full-time	1	30	22	600 00
Tamalpais	Machine shop	Full-time	2	30	46	1,058 91
Stockton	Auto repair	Full-time	1	30	21	600 00
Stockton	Carpentry	Full-time	1	36	23	600 00
Stockton	Machine shop	Full-time	2	30	47	1,058 91
Stockton	Dietetics, nurses, trade	Part-time	2	4	28	109 50
Totals					4,083	$43,562 00

Statistical Table IX.

Federal and State Aided Classes in Trades and Industries for the Year 1920-21.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrolment	Amount of federal and state aid
Berkeley High	Applied electricity	Full-time	1	30	25	$600 00
Berkeley High	Auto repair	Full-time	1	30	26	600 00
Berkeley High	Machine shop	Full-time	2	30	37	868 26
Berkeley High	Printing	Full-time	1	30	11	600 00
Berkeley High	Shorthand	Part-time	1	8	38	105 46
Berkeley High	Typewriting	Part-time	1	5	53	98 80
Chino—						
George Jr. Republic	Auto mechanics	Full-time	1	30	11	600 00
George Jr. Republic	Carpentry	Full-time	1	30	7	600 00
George Jr. Republic	Printing	Full-time	1	30	11	600 00
Fresno High	Auto repair	Full-time	2	30	44	1,136 50
Fresno High	Applied electricity	Full-time	1	30	8	300 00
Fresno High	Machine shop	Full-time	2	30	36	1,136 50
Long Beach High	Chemistry	Part-time	1	4½	14	79 92
Los Angeles—						
Central Intermediate	Power sewing machine	Part-time	2	15	410	600 00
Gardena High	Auto mechanics	Full-time	1	30	18	416 26
Hollywood High	Auto mechanics	Full-time	2	30	51	798 50
Jefferson High	Auto repair and construction	Full-time	4	30	73	1,941 24
Jefferson High	Elec. repair and construction	Full-time	2	30	46	1,136 50
Jefferson High	Machine shop	Full-time	2	30	24	868 26
Jefferson High	Sheet metal	Full-time	1	30	13	600 00
Lafayette Jr. High	Boys' restaurant cooking and management	Full-time	2	30	37	1,136 50
Lincoln High	Applied electricity	Full-time	1	30	18	550 00
Lincoln High	Auto work	Full-time	2	30	56	1,136 50
Lincoln High	Dressmaking (trade)	Full-time	2	30	52	1,045 30

Statistical Table IX—Continued.

Federal and State Aided Classes in Trades and Industries for the Year 1920-21.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrollment	Amount of federal and state aid
Lincoln High	Machine shop	Full-time	1	30	30	$600 00
Lincoln High	Mechanical drawing	Full-time	1	30	25	600 00
Lincoln High	Printing	Full-time	1	30	13	450 00
Lincoln High	Sheet metal	Full-time	1	30	18	600 00
Lincoln High	Trade art	Full-time	1	30	27	600 00
Lincoln High	Chemistry for capped nurses	Part-time	1	6	61	69 94
Lincoln High	Cooking for capped nurses	Part-time	2	4	73	111 00
Lincoln High	Printing	Part-time	1	4	8	150 00
San Pedro Evening	Auto repair	Full-time	1	30	22	600 00
San Pedro Evening	Elec. const'n and operation	Full-time	1	30	9	600 00
Monterey Union High	Auto and marine engines	Full-time	2	30	31	1,136 50
Oakland—						
Garfield Jr. High	Sheet metal	Full-time	1	30	23	600 00
Lazear Jr. High	Sheet metal	Full-time	1	30	27	600 00
Prescott Jr. High	Sheet metal	Full-time	1	30	24	600 00
Technical High	Auto repair	Full-time	2	30	70	1,136 50
Technical High	Carpentry and mill cabinet	Full-time	1	30	41	600 00
Technical High	Electricity	Full-time	2	30	56	1,136 50
Technical High	Machine shop	Full-time	4	30	140	2,209 50
Technical High	Pattern making	Full-time	2	30	53	1,136 50
Tompkins Jr. High	Sheet metal	Full-time	1	30	23	600 00
Vocational High	Auto repair	Full-time	4	30	129	2,209 50
Vocational High	Cabinet making	Full-time	1	30	35	600 00
Vocational High	Dressmaking (trade)	Full-time	2	30	49	1,136 50
Vocational High	Electricity	Full-time	4	30	129	2,209 50
Vocational High	Machine drafting	Full-time	1	30	18	482 50
Vocational High	Machine shop	Full-time	4	30	129	2,209 50
Vocational High	Millinery (trade)	Full-time	1	30	26	600 00
Vocational High	Pattern making	Full-time	1	30	31	600 00
Vocational High	Printing	Full-time	1	30	24	600 00
Vocational High	Printing	Part-time	1	18	46	333 00
Redlands High	Auto repair	Full-time	1	30	29	600 00
Roseville Union High	Boilermaking	Part-time	1	8	10	99 90
Roseville Union High	General blacksmithing	Part-time	1	4	10	99 90
Roseville Union High	Machinist and boilermaking	Part-time	2	8	6	199 80
Roseville Union High	Machinist	Part-time	1	8	8	99 90
Sacramento High	Auto construction and repair	Full-time	1	30	26	600 00
Salinas Union High	Auto mechanics	Full-time	1	30	10	600 00
San Jose High	Auto repair and garage management	Full-time	2	30	63	1,136 50
San Jose High	Carpentry and mill cabinet	Full-time	1	30	15	600 00
San Jose High	Machine shop	Full-time	2	30	45	1,064 98
San Jose High	Sheet metal	Full-time	1	30	18	300 00
Santa Barbara High	Auto repair	Full-time	2	30	63	1,136 50
Sausalito—						
Tamalpais Un. High	Electric shop practice	Full-time	1	30	23	600 00
Tamalpais Un. High	Machine shop practice	Full-time	2	30	51	1,136 50
Stockton High	Auto repair	Full-time	1	30	18	600 00
Stockton High	Machinist	Full-time	2	30	38	1,136 50
Stockton High	Mill cabinet	Full-time	1	30	12	600 00
Stockton High	Printing	Full-time	1	30	9	600 00
Totals			109		2,964	$53,861 92

Statistical Table X.

Federal and State Aided Classes in Trades and Industries for the Year 1921-22.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrollment	Amount of federal and state aid
Berkeley High	Applied electricity	Full-time	1	30	26	$717 42
Berkeley High	Auto repair	Full-time	2	30	45	1,410 00
Berkeley High	Machine shop	Full-time	1	30	36	690 66
Berkeley High	Printing	Full-time	1	30	16	600 00
Berkeley High	Shorthand	Part-time voc. ex.	1	5	45	124 00
Berkeley High	Typewriting	Part-time voc. ex.	1	5	60	124 00
Chino—						
George Jr. Republic	Auto repair	Full-time	1	30	36	540 00
George Jr. Republic	Carpentry	Full-time	1	30	25	540 00
George Jr. Republic	Printing	Full-time	1	30	38	540 00
Fresno Technical High	Applied electricity	Full-time	2	30	34	1,200 00
Fresno Technical High	Auto and gas engine	Full-time	3	30	44	1,800 00
Fresno Technical High	Machine shop	Full-time	3	30	46	1,800 00
Fullerton Union High	Oil production	Full-time	1	30	22	720 00
Inglewood Union High	Auto repair	Full-time	1	30	27	630 00
Los Angeles—						
Central Jr. High	Printing	Full-time	1	30	8	270 00
Central Jr. High	Power sew. machine operation	Part-time	2	15	527	720 00
Gardena High	Auto and machine shop	Full-time	1	30	20	540 00
Hollywood High	Auto mechanics	Full-time	1	30	23	561 60
Jefferson High	Applied electricity	Full-time	2	30	33	1,323 00
Jefferson High	Auto repair	Full-time	3	30	43	1,962 00
Jefferson High	Machine shop	Full-time	1	30	19	630 00
Jefferson High	Sheet metal	Full-time	1	30	14	630 00
Lafayette Jr. High	Printing	Full-time	1	30	9	315 00
Lafayette Jr. High	Restaurant cooking	Full-time	2	30	42	1,200 00
Lincoln High	Auto repair	Full-time	2	30	37	1,224 00
Lincoln High	Carpentry	Full-time	1	30	11	360 00
Lincoln High	Dressmaking (trade)	Full-time	2	30	54	1,289 96
Lincoln High	Machine shop	Full-time	1	30	29	600 00
Lincoln High	Mechanical drafting	Full-time	1	30	10	600 00
Lincoln High	Printing	Full-time	1	30	7	503 96
Lincoln High	Sheet metal	Full-time	1	30	20	638 96
Lincoln High	Trade art	Full-time	2	30	58	1,008 00
Manual Arts High	Machine bookkeeping	Part-time	1	15	41	360 00
Polytechnic Evening	Laundry work	Special	1	6	55	108 00
San Pedro High	Applied electricity	Full-time	2	30	20	1,170 00
San Pedro High	Auto mechanics	Full-time	2	30	36	1,278 00
San Pedro High	Boat building	Full-time	1	30	14	603 00
Monterey Union High	Engine and auto repair	Full-time	2	30	27	1,232 20
Oakland—						
Elmhurst Jr. High	Sheet metal	Full-time	1	30	21	720 00
Garfield Jr. High	Mill cabinet	Full-time	1	30	38	720 00
Garfield Jr. High	Sheet metal	Full-time	1	30	34	720 00
Lazear Jr. High	Sheet metal	Full-time	1	30	16	720 00
Prescott Jr. High	Cabinet making	Full-time	1	30	20	652 50
Prescott Jr. High	Sheet metal	Full-time	1	30	26	630 00
Technical High	Applied electricity	Full-time	2	30	55	1,395 00
Technical High	Auto repair	Full-time	3	30	94	1,845 00
Technical High	Carpentry and mill cabinet	Full-time	2	30	71	1,327 50
Technical High	Machine shop	Full-time	4	30	145	2,677 50
Technical High	Pattern making	Full-time	2	30	52	1,395 00
Thompkins Jr. High	Sheet metal	Full-time	1	30	21	720 00
Vocational High	Applied electricity	Full-time	4	30	136	2,468 72
Vocational High	Auto repair	Full-time	4	30	127	2,113 24
Vocational High	Cabinet making	Full-time	1	30	39	503 56
Vocational High	Dressmaking (trade)	Full-time	2	30	58	1,119 70
Vocational High	Machine drafting	Full-time	1	30	21	443 54
Vocational High	Machine shop	Full-time	6	30	191	2,638 88
Vocational High	Millinery (trade)	Full-time	1	30	30	607 06
Vocational High	Pattern making	Full-time	1	30	35	533 80
Vocational High	Printing	Full-time	2	30	42	1,031 86
Vocational High	Printing	Part-time	1	15	46	360 00

Statistical Table X—Continued.

Federal and State Aided Classes in Trades and Industries for the Year 1921-22.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrollment	Amount of federal and state aid
Oroville Union High	Printing	Full-time	1	30	22	522 00
Redlands High	Machine shop and auto repair	Full-time	1	30	24	660 00
Riverside Polytechnic	Carpentry	Full-time	1	30	20	585 00
Riverside Polytechnic	Machine shop	Full-time	1	30	19	495 00
Riverside Polytechnic	Printing	Full-time	1	30	11	405 00
Roseville Union High	Apprenticeship electricity	Part-time	1	8	13	106 66
Roseville Union High	Machine and boiler making	Part-time	1	8	13	106 66
Sacramento High	Auto repair	Full-time	2	30	48	$1,271 88
Salinas Union High	Auto repair	Full-time	1	30	17	612 00
San Diego High	Machine shop	Full-time	1	30	25	247 50
San Jose High	Auto repair	Full-time	4	30	91	2,610 00
San Jose High	Machine shop	Full-time	2	30	71	1,320 00
San Jose High	Mill and cabinet work	Full-time	1	30	19	660 00
San Jose High	Pattern making	Full-time	1	30	36	660 00
San Jose High	Sheet metal	Full-time	2	30	48	1,320 00
San Rafael High	Auto repair	Full-time	1	30	20	612 18
Santa Barbara High	Auto repair	Full-time	2	30	52	1,080 00
Sausalito—						
Tamalpais Un. High	Applied electricity	Full-time	1	30	22	659 88
Tamalpais Un. High	Machine shop	Full-time	2	30	49	1,319 76
Stockton High	Auto repair	Full-time	1	30	20	598 50
Stockton High	Machine shop	Full-time	2	30	39	1,377 00
Stockton High	Mill cabinet making	Full-time	2	30	23	931 50
Stockton High	Printing	Full-time	1	30	13	612 00
Totals			131		3,600	$74,709 14

STATISTICAL TABLE XI.

Trade and Industrial Courses by Occupations.

ART (Trade), 2 Classes:				
Los Angeles	Lincoln High School	2—Trade art		Full-time
AUTOMOBILE, 36 Classes:				
Berkeley	Berkeley High School	2—Auto repair		Full-time
Chino	George Jr. Republic High School	1—Auto repair		Full-time
Fresno	Fresno Technical High School	3—Auto repair		Full-time
Inglewood	Inglewood Union High School	1—Auto repair		Full-time
Los Angeles	Gardena High School	1—Auto repair		Full-time
	Hollywood High School	1—Auto repair		Full-time
	Jefferson High School	3—Auto repair		Full-time
	Lincoln High School	2—Auto repair		Full-time
	San Pedro High School	2—Auto repair		Full-time
Monterey	Monterey Union High School	2—Auto repair		Full-time
Oakland	Technical High School	3—Auto repair		Full-time
	Vocational High School	4—Auto repair		Full-time
Sacramento	Sacramento High School	2—Auto repair		Full-time
Salinas	Salinas Union High School	1—Auto repair		Full-time
San Jose	San Jose High School	4—Auto repair		Full-time
San Rafael	San Rafael High School	1—Auto repair		Full-time
Santa Barbara	Santa Barbara High School	2—Auto repair		Full-time
Stockton	Stockton High School	1—Auto repair		Full-time
BOAT BUILDING, 1 Class:				
Los Angeles	San Pedro High School	1—Boat building		Full-time
CABINET MAKING, 2 Classes:				
Oakland	Prescott Jr. High School	1—Cabinet making		Full-time
	Vocational High School	1—Cabinet making		Full-time
CARPENTRY, 5 Classes:				
Chino	George Jr. Republic High School	1—Carpentry		Full-time
Los Angeles	Lincoln High School	1—Carpentry		Full-time
Oakland	Technical High School	2—Carpentry		Full-time
Riverside	Riverside Polytechnic High School	1—Carpentry		Full-time
Drafting, 1 Class:				
Oakland	Vocational High School	1—Machine drafting		Full-time
DRESSMAKING, 4 Classes:				
Los Angeles	Lincoln High School	2—Dressmaking		Full-time
Oakland	Vocational High School	2—Dressmaking		Full-time
ELECTRIC TRADES, 15 Classes:				
Berkeley	Berkeley High School	1—Applied electricity		Full-time
Fresno	Fresno Technical High School	2—Applied electricity		Full-time
Los Angeles	Jefferson High School	2—Applied electricity		Full-time
	San Pedro High School	2—Applied electricity		Full-time
	Technical High School	2—Applied electricity		Full-time
	Vocational High School	4—Applied electricity		Full-time
Roseville	Roseville Union High School	1—Applied electricity		Part-time
Sausalito	Tamalpais Union High School	1—Applied electricity		Full-time
LAUNDRY WORK, 1 Class:				
Los Angeles	Polytechnic Evening High School	1—Laundry work		Special
MACHINE BOOKKEEPING, 1 Class:				
Los Angeles	Manual Arts High School	1—Machine bookkeeping		Part-time
MACHINE AND BOILER MAKING, 1 Class:				
Roseville	Roseville Union High School	1—Mach. and boiler making		Part-time
MACHINE SHOP, 25 Classes:				
Berkeley	Berkeley High School	1—Machine shop		Full-time
Fresno	Fresno Technical High School	3—Machine shop		Full-time
Los Angeles	Jefferson High School	1—Machine shop		Full-time
	Lincoln High School	1—Machine shop		Full-time
Oakland	Technical High School	4—Machine shop		Full-time
	Vocational High School	6—Machine shop		Full-time
Redlands	Redlands High School	1—Machine shop		Full-time
Riverside	Riverside Polytechnic High School	1—Machine shop		Full-time
San Diego	San Diego High School	1—Machine shop		Full-time
San Jose	San Jose High School	2—Machine shop		Full-time
Sausalito	Tamalpais Union High School	2—Machine shop		Full-time
Stockton	Stockton High School	2—Machine shop		Full-time

Statistical Table XI—Continued.

Trade and Industrial Courses by Occupations.

MECHANICAL DRAFTING, 1 Class:				
Los Angeles	Lincoln High School	1	Mechanical Drafting	Full-time
MILL CABINET, 4 Classes:				
Oakland	Garfield Junior High School	1	Mill cabinet	Full-time
San Jose	San Jose High School	1	Mill cabinet	Full-time
Stockton	Stockton High School	2	Mill cabinet	Full-time
MILLINERY, 1 Class:				
Oakland	Vocational High School	1	Trade millinery	Full-time
OIL PRODUCTION, 1 Class:				
Fullerton	Fullerton Union High School	1	Oil production	Full-time
PATTERN MAKING, 4 Classes:				
Oakland	Technical High School	2	Pattern making	Full-time
	Vocational High School	1	Pattern making	Full-time
San Jose	San Jose High School	1	Pattern making	Full-time
POWER SEWING MACHINE, 2 Classes:				
Los Angeles	Central Junior High School	2	Power sewing machine	Part-time
PRINTING, 11 Classes:				
Berkeley	Berkeley High School	1	Printing	Full-time
Chino	George Jr. Republic High School	1	Printing	Full-time
Los Angeles	Central Junior High School	1	Printing	Full-time
	Lafayette Junior High School	1	Printing	Full-time
	Lincoln High School	1	Printing	Full-time
Oakland	Vocational High School	2	Printing	Full-time
	Vocational High School	1	Printing	Part-time
Oroville	Oroville Union High School	1	Printing	Full-time
Riverside	Riverside Polytechnic High School	1	Printing	Full-time
Stockton	Stockton High School	1	Printing	Full-time
RESTAURANT COOKING, 2 Classes:				
Los Angeles	Lafayette Junior High School	2	Restaurant cooking	Full-time
SHEET METAL, 9 Classes:				
Los Angeles	Jefferson High School	1	Sheet metal	Full-time
	Lincoln High School	1	Sheet metal	Full-time
Oakland	Elmhurst Junior High School	1	Sheet metal	Full-time
	Garfield Junior High School	1	Sheet metal	Full-time
	Lazear Junior High School	1	Sheet metal	Full-time
	Prescott Junior High School	1	Sheet metal	Full-time
	Tompkins Junior High School	1	Sheet metal	Full-time
San Jose	San Jose High School	2	Sheet metal	Full-time
SHORTHAND, 1 Class:				
Berkeley	Berkeley High School	1	Shorthand	Part-time
TYPEWRITING, 1 Class:				
Berkeley	Berkeley High School	1	Typewriting	Part-time

Statistical Table XII.

Federal and State Aided Classes in Home Economics for the Year 1917-18.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrollment	Amount of federal and state aid
Los Angeles—						
Jefferson	Home economics	Full-time	1	30	16	$300 00
Lincoln	Home economics	Part-time	1	6	30	60 00
Lincoln	Home economics	Part-time	1	4	15	40 00
Manual Arts	Home economics	Part-time	1	6	28	60 00
Manual Arts	Home economics	Part-time	1	4	24	40 00
Vocational	Home economics	Part-time	6	4-6	118	600 00
Vocational	Home economics	Part-time	6	4-6	150	300 00
Sacramento	Home economics	Part-time	1	6	27	90 72
Sacramento	Home economics	Part-time	1	4	21	60 48
San Jose	Home economics	Part-time	8	6	193	381 85
Totals					622	$1,933 05

Statistical Table XIII.

Federal and State Aided Classes in Home Economics for the Year 1918-19.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrollment	Amount of federal and state aid
Berkeley, Garfield Int.	Dressmaking and millinery	Part-time	1	4	14	$40 00
Long Beach High	Millinery	Part-time	2	4½	66	125 35
Los Angeles—						
Boyle Heights Int.	Home economics	Full-time	1	30	13	300 00
Boyle Heights Int.	Home economics	Part-time	2	4	38	80 00
Gardena High	Dressmaking	Part-time	1	4	23	26 00
Gardena High	Millinery	Part-time	1	4	25	26 00
Jefferson High	Dressmaking and millinery	Part-time	1	15	11	150 00
Manual Arts High	Millinery	Part-time	1	4	42	24 00
Polytechnic Evening	Dressmaking	Part-time	2	4	54	48 00
Polytechnic Evening	Millinery	Part-time	2	4-6	110	52 50
Oakland—						
Fremont High	Millinery	Part-time	2	4½	48	86 66
Fremont High	Dressmaking	Part-time	1	4½	25	43 33
Technical High	Dressmaking	Part-time	4	4½	146	346 64
Technical High	Millinery	Part-time	6	4½	202	611 30
Technical High	Dressmaking and millinery	Part-time	1	4½	44	86 66
Vocational High	Home economics	Full-time	1	30	21	567 00
Vocational High	Dressmaking	Part-time	5	6	124	600 00
Vocational High	Millinery	Part-time	5	6	155	600 00
Ontario, Chaffey Union	Dressmaking and millinery	Part-time	1	4	11	17 77
Pomona, S. Jr. High	Home economics	Full-time	1	30	12	300 00
Sacramento High	Dressmaking and millinery	Part-time	2	5	49	200 00
San Diego Evening	Dressmaking	Part-time	2	4	157	160 00
San Diego Evening	Millinery	Part-time	3	4	92	215 99
San Diego Evening	Nutrition, cook	Part-time	1	4	18	48 00
San Jose High	Dressmaking	Part-time	5	4-6	193	560 00
San Jose High	Millinery	Part-time	2	4-6	144	200 00
San Jose High	Cooking	Part-time	1	4	33	80 00
Santa Barbara High	Home economics	Full-time	1	30	15	600 00
Santa Monica High	Dressmaking	Part-time	1	4	32	80 00
Santa Monica High	Millinery	Part-time	2	4	77	120 00
Santa Monica High	Cooking	Part-time	1	4	31	80 00
Santa Rosa High	Dressmaking	Part-time	1	6	16	20 00
Santa Rosa High	Millinery	Part-time	1	8	54	88 88
Santa Rosa High	Dietetics	Part-time	1	4	11	17 77
Stockton Evening	Millinery	Part-time	2	4	48	160 00
Stockton Evening	Dietetics	Part-time	2	4	40	160 00
Stockton Evening	Home making	Part-time	3	4	58	240 00
Stockton Evening	Americanization	Part-time	3	4	52	240 00
Totals			75		2,304	$7,301 85

Statistical Table XIV.

Federal and State Aided Classes in Home Economics for the Year 1919-20.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrollment	Amount of federal and state aid
Adin, Big Valley Jt. Un.	Combination home economics	Part-time	1	10	9	$126 95
Bakersfield, Lincoln El.	Home economics	Full-time	2	30	44	913 85
Berkeley—						
Berkeley High	Cooking	Part-time	1	4	46	60 91
Berkeley High	Millinery and dressmaking	Part-time	2	4	97	121 85
Berkeley High	Millinery	Part-time	1	4	29	32 95
Edison Intermediate	Millinery, dressmaking, home furnishing	Part-time	1	4	40	60 91
Edison Intermediate	Millinery and home furnishing	Part-time	1	4	33	41 15
Garfield Intermediate	Millinery and dressmaking	Part-time	1	4	53	60 91
Willard Intermediate	Millinery and dressmaking	Part-time	1	4	32	60 91
Inglewood High	Dressmaking	Part-time	3	4-6	89	169 05
Inglewood High	Millinery	Part-time	3	6	99	97 50
Long Beach High	Dressmaking	Part-time	1	4	34	60 91
Long Beach High	Foods, dietetics	Part-time	1	4	14	30 45
Long Beach High	Millinery	Part-time	5	4	252	250 05
Los Angeles—						
Boyle Heights Inter.	Home economics	Full-time	1	30	25	456 95
Central Evening	Cooking	Part-time	1	6	28	79 95
Central Evening	Dressmaking	Part-time	1	6	101	91 40
Central Evening	Millinery	Part-time	1	6	52	63 25
Gardena High	Short unit home economics	Part-time	1	4	25	39 60
Gardena High	Dressmaking	Part-time	1	4	27	54 85
Gardena High	Millinery	Part-time	1	4	50	54 85
Jefferson High	Home economics	Full-time	2	30	47	913 85
Polytechnic Evening	Cooking	Part-time	3	6-8	88	77 70
Polytechnic Evening	Dressmaking	Part-time	5	4-6-9	112	141 65
Polytechnic Evening	Household mechanics	Part-time	1	4	29	56 35
Polytechnic Evening	Millinery	Part-time	15	4-6-9	377	609 50
Oakland—						
Fremont High	Dressmaking	Part-time	4	4½	108	165 65
Fremont High	Millinery	Part-time	4	4½	127	242 75
Garfield Intermediate	Home economics	Full-time	1	30	23	455 95
Garfield Intermediate	Dressmaking	Part-time	1	4½	18	35 25
Oakland High	Dressmaking	Part-time	1	4½	45	59 30
Oakland High	Millinery	Part-time	2	4½	71	118 55
Technical High	Dressmaking	Part-time	3	4½	123	197 95
Technical High	Millinery	Part-time	8	4½	256	483 90
Vocational High	Home economics	Full-time	2	30	30	802 90
Vocational High	Dressmaking	Part-time	8	4-4½-6	182	613 05
Vocational High	Interior decoration	Part-time	1	4	28	42 65
Vocational High	Millinery	Part-time	5	6	160	456 95
Prescott Intermediate	Home economics	Full-time	1	30	21	456 95
Ontario—						
Chaffey Union High	Cooking and dressmaking	Part-time	1	4	77	16 10
Chaffey Union High	Home nursing	Part-time	1	4	56	24 55
Chaffey Union High	Millinery and dressmaking	Part-time	1	4	48	27 90
Paso Robles High	Dressmkg., nursing, home mgt.	Part-time	1	4	54	61 75
Roseville Union High	Foods and health	Part-time	1	4	39	50 75
Roseville Union High	Millinery, dressmaking, home furnishing	Part-time	1	4	38	50 75
Sacramento High	Dressmaking	Part-time	2	4	115	91 40
Sacramento High	Home nursing	Part-time	2	4	136	121 85
Sacramento High	Millinery	Part-time	2	6	144	137 10
San Diego—						
Afternoon and Eve.	Business law and home acc't'g.	Part-time	1	4	36	60 91
Afternoon and Eve.	Cooking	Part-time	2	4	95	115 75
Afternoon and Eve.	Dressmaking	Part-time	16	4	617	815 60
Afternoon and Eve.	Millinery	Part-time	13	4	446	696 05
San Jose High	Cooking	Part-time	2	4	91	$65 50
San Jose High	Dressmaking	Part-time	5	6	192	440 50
San Jose High	Millinery	Part-time	6	4	323	320 20

Statistical Table XIV—Continued.

Federal and State Aided Classes in Home Economics for the Year 1919-20.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrollment	Amount of federal and state aid
Santa Barbara High	Home economics	Full-time	1	30	25	456 95
Santa Monica High	Cookery	Part-time	1	4	14	38 49
Santa Monica High	Dressmaking	Part-time	1	4	29	60 91
Santa Monica High	Millinery	Part-time	4	4	124	205 20
Santa Rosa High	Millinery and dressmaking	Part-time	2	4	126	121 85
Stockton High	Home economics	Full-time	1	30	13	456 95
Stockton High	Millinery	Part-time	4	4	188	205 15
Whittier High	Dressmaking	Part-time	1	4	21	60 91
Whittier High	Millinery	Part-time	4	4	107	243 65
Totals			174		6,178	$13,906 77

Statistical Table XV.

Federal and State Aided Classes in Home Economics for the Year 1920-21.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrollment	Amount of federal and state aid
Bakersfield—						
Lincoln Elementary	Home Economics	Full-time	2	30	60	$936 24
Berkeley—						
Berkeley High	Millinery	Part-time	2	4	54	122 12
Berkeley High	Millinery and dressmaking	Part-time	3	4	68	161 96
Edison Intermediate	Millinery and dressmaking	Part-time	1	4	23	59 78
Garfield Intermediate	Millinery and dressmaking	Part-time	1	4	43	63 22
Willard Intermediate	Millinery and dressmaking	Part-time	3	4	80	96 16
East San Diego Elem.	Millinery and dressmaking	Part-time	1	4	24	22 54
Inglewood Union High	Dressmaking	Part-time	5	6	167	468 18
Inglewood Union High	Millinery	Part-time	3	6	98	296 22
Long Beach High	Dressmaking	Part-time	1	4	23	65 84
Long Beach High	Millinery	Part-time	7	4	190	391 46
Los Angeles—						
Boyle Hts. Inter.	Home economics	Full-time	1	30	25	468 12
Central Evening	Dressmaking	Part-time	2	5-6	121	144 64
Central Evening	Millinery	Part-time	1	6	87	98 74
Gardena High	Dressmaking	Part-time	1	4	29	62 36
Gardena High	Millinery	Part-time	1	4	67	62 36
Jefferson High	Home economics	Full-time	1	30	28	468 12
Jefferson High	Home nursing and child care	Part-time	1	4	61	53 70
Jefferson High	Millinery and dressmaking	Part-time	2	4-6	112	134 26
Lafayette Jr. High	Home economics	Full-time	2	30	40	702 18
Polytechnic Evening	Dressmaking	Part-time	4	4-6-10	79	261 56
Polytechnic Evening	Household mechanics	Part-time	1	4	26	27 72
Polytechnic Evening	Millinery	Part-time	13	4-6-9-10	580	767 36
San Pedro High	Millinery and dressmaking	Part-time	1	4	63	67 56
30th St. Jr. High	Home economics	Full-time	1	30	20	234 06
National City—						
Sweetwater Un. High	Millinery	Part-time	1	4	20	62 36
Sweetwater Un. High	Millinery and dressmaking	Part-time	1	4	17	62 36
Oakland—						
Clawson Jr. High	Dressmaking	Part-time	1	6	33	$93 54
Fremont High	Dressmaking	Part-time	2	4-4½	74	135 98
Fremont High	Millinery	Part-time	3	4½-5	136	187 06
Garfield Jr. High	Dressmaking	Part-time	1	6	25	88 34
Garfield Jr. High	Home economics	Full-time	1	30	22	468 12
Garfield Jr. High	Millinery	Part-time	1	4	26	65 84
Lazear Jr. High	Home economics	Full-time	1	30	19	468 12
Lockwood Jr. High	Dressmaking	Part-time	3	4	98	192 28
Lockwood Jr. High	Millinery	Part-time	2	4	60	131 66
Oakland High	Dressmaking	Part-time	1	4	40	62 36
Oakland High	Millinery	Part-time	2	4-5	65	144 64
Prescott Jr. High	Home economics	Full-time	1	30	22	468 12
Technical High	Dressmaking	Part-time	4	4½-5	153	301 38
Technical High	Millinery	Part-time	6	4-5	190	460 00
Tompkins Jr. High	Dressmaking	Part-time	1	4½	20	74 06
Tompkins Jr. High	Millinery and dressmaking	Part-time	1	4½	18	74 06
Tompkins Jr. High	Home economics	Full-time	1	30	20	468 12
Vocational High	Dressmaking	Part-time	5	6	121	468 18
Vocational High	Millinery	Part-time	5	6	168	468 18
Vocational High	Home economics	Full-time	1	30	20	468 12
Ontario—						
Chaffey Union High	Cooking	Part-time	1	4	46	25 98
Chaffey Union High	Dressmaking	Part-time	2	4	88	145 50
Chaffey Union High	Home nursing	Part-time	1	4	30	19 06
Chaffey Union High	Millinery	Part-time	2	4	52	41 56
Roseville Union High	Short unit	Part-time	1	4	23	46 78
Sacramento High	Dressmaking	Part-time	2	4	128	138 58
Sacramento High	Millinery	Part-time	6	4-6	436	396 70
Sacramento High	Millinery and dressmaking	Part-time	4	5	321	297 94
Sacramento High	Tailoring	Part-time	1	4	36	69 30

STATISTICAL TABLE XV—Continued.

Federal and State Aided Classes in Home Economics for the Year 1920-21.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrollment	Amount of federal and state aid
San Diego High	Dressmaking	Part-time	16	4	468	845 34
San Diego High	Millinery	Part-time	12	4	404	761 32
San Jose High	Dressmaking	Part-time	5	4	218	454 72
San Jose High	Foods and nutrition	Part-time	1	4	45	65 84
San Jose High	Millinery	Part-time	6	4	410	394 96
Santa Barbara High	Home economics	Full-time	2	30	40	936 24
Santa Monica High	Millinery	Part-time	3	4½	83	186 20
Stockton High	Dressmaking	Part-time	2	4-6	52	144 64
Stockton High	Dietetics (nursing)	Part-time	1	4	19	53 70
Stockton High	Millinery	Part-time	6	4	213	355 10
Whittier High	Dressmaking	Part-time	1	4	24	69 30
Whittier High	Millinery	Part-time	4	4	91	277 14
Totals			185		6,762	$17,375 96

Statistical Table XVI.

Federal and State Aided Classes in Home Economics for the Year 1921-22.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrollment	Amount of federal and state aid
Alameda High	Dressmaking and millinery	Part-time	2	5-6	151	$124 50
Bakersfield—						
Lincoln Elementary	Home economics	Full-time	2	30	40	1,063 50
Berkeley—						
Berkeley Part-time	Dressmaking and millinery	Part-time	2	4	85	201 34
Edison Junior	Dressmaking and millinery	Part-time	1	4	41	96 00
Garfield Junior	Dressmaking and millinery	Part-time	1	4	31	96 00
Washington Junior	Dressmaking and millinery	Part-time	1	4	34	96 00
Willard Intermediate	Dressmaking	Part-time	1	4	37	101 00
Willard Intermediate	Dressmaking and millinery	Part-time	1	4	35	101 34
Willard Intermediate	Millinery	Part-time	1	4	34	101 00
East San Diego—						
Edison Elementary	Millinery	Part-time	1	----	41	93 34
Fowler Union High	Dressmaking	Part-time	1	4	53	56 00
Fresno Technical High	Millinery	Part-time	2	4	164	152 00
Fullerton Union High	Millinery	Part-time	1	4	52	66 00
Fullerton Union High	Short unit	Part-time	1	4	41	68 00
Inglewood Union High	Dressmaking	Part-time	5	5	165	534 00
Inglewood Union High	Millinery	Part-time	4	6	115	435 00
Long Beach Polytechnic	Dressmaking	Part-time	3	4	119	304 02
Long Beach Polytechnic	Millinery	Part-time	11	4	303	1,109 40
Los Angeles—						
Boyle Heights Jr.	Home economics	Full-time	1	30	23	455 80
Franklin High	Dressmaking	Part-time	1	9	67	228 00
Franklin High	Dressmaking and millinery	Part-time	2	12	81	294 00
Franklin High	Millinery	Part-time	2	8	93	268 00
Gardena High	Dressmaking	Part-time	1	4	38	101 34
Gardena High	Millinery	Part-time	1	4	51	101 34
Jefferson High	Dressmaking and millinery	Part-time	2	4-6	135	266 66
Jefferson High	Home nursing	Part-time	2	4	85	160 00
Jefferson High	Home economics	Full-time	1	30	30	455 80
Lafayette Jr.	Home economics	Full-time	2	36	46	911 60
Manual Arts High	Millinery	Part-time	2	4-6	122	200 00
Polytechnic Evening	Dressmaking	Part-time	13	4-6-10	589	861 34
Polytechnic Evening	Home nursing	Part-time	1	4	36	14 00
Polytechnic Evening	Millinery	Part-time	15	4-6-9-10	938	1,220 34
Polytechnic Evening	Woodfinishing	Part-time	1	6	64	96 00
San Pedro High	Dressmaking and millinery	Part-time	1	8	40	160 00
30th St. Jr. High	Home economics	Full-time	1	30	13	227 90
Modesto High	Dressmaking and millinery	Part-time	1	10	22	240 00
Mount'n View Un. High	Dressmaking	Part-time	1	4	26	64 00
Mount'n View Un. High	Millinery	Part-time	2	4	34	128 00
National City—						
Sweetwater Un. High	Dressmaking	Part-time	2	4	46	122 00
Sweetwater Un. High	House decoration	Part-time	1	4	18	38 00
Sweetwater Un. High	Millinery	Part-time	2	4	45	104 00
Oakland—						
Fremont High	Dressmaking	Part-time	1	5	45	133 34
Fremont High	Millinery	Part-time	1	5	54	133 34
Garfield Junior	Home economics	Full-time	1	30	20	607 70
Lazear Junior	Home economics	Full-time	1	30	21	607 70
Oakland High	Millinery	Part-time	2	5	60	266 68
Prescott Junior	Home economics	Full-time	1	30	19	455 80
Technical High	Business law and accounting	Part-time	1	6	86	108 00
Technical High	Dressmaking	Part-time	1	7½	40	200 00
Technical High	Millinery	Part-time	1	7½	48	200 00
Tompkins Junior	Dressmaking	Part-time	1	4½	33	120 00
Tompkins Junior	Dressmaking and millinery	Part-time	1	4½	15	120 00
Tompkins Junior	Home economics	Full-time	1	30	25	607 70
Vocational High	Dressmaking	Part-time	5	6	102	400 00
Vocational High	Millinery	Part-time	5	6	235	540 00

Statistical Table XVI—Continued.

Federal and State Aided Classes in Home Economics for the Year 1921-22.

Place and school	Name of vocation	Full-time, part-time or special class	Number of classes	60-minute hrs. of instruction per week	Enrollment	Amount of federal and state aid
Oakland—Continued.						
Vocational High	Home economics	Full-time	1	30	29	$455 80
Palo Alto Union High	Dressmaking	Part-time	1	12	24	128 00
Palo Alto Union High	Food and home management	Part-time	1	12	27	128 00
Princeton Jt. Un. High	Home economics	Full-time	1	30	14	607 70
Riverside Girls High	Short unit	Part-time	1	8	48	41 34
Riverside Girls High	Home economics	Full-time	1	30	19	607 76
Roseville Union High	Dressmaking and millinery	Part-time	2	4	87	122 06
Sacramento High	Dressmaking	Part-time	3	4	124	285 34
Sacramento High	Dressmaking and millinery	Part-time	6	4	529	440 96
Sacramento High	Millinery	Part-time	3	4	244	253 34
San Diego High	Business law and accounting	Part-time	1	4	72	93 34
San Diego High	Cooking	Part-time	1	4	34	76 00
San Diego High	Dressmaking and millinery	Part-time	2	4	70	154 68
San Diego High	Dressmaking	Part-time	14	4	467	1,190 68
San Diego High	Millinery	Part-time	16	4	572	1,362 68
San Jose High	Cooking	Part-time	1	4	40	76 00
San Jose High	Dressmaking	Part-time	4	4	147	288 00
San Jose High	Home nursing	Part-time	2	4	180	117 00
San Jose High	Millinery	Part-time	6	4	243	438 00
Santa Barbara High	Home economics	Full-time	2	30	35	1,215 44
Santa Monica High	Dressmaking	Part-time	2	4	46	152 00
Santa Monica High	Millinery	Part-time	2	4	91	152 00
Santa Paula Un. High	Dressmaking and millinery	Part-time	1	4	34	44 00
Sebastopol—Analy Union High	Millinery	Part-time	1	6	37	124 00
Stockton High	Dressmaking	Part-time	4	4	135	256 00
Stockton High	Dietetics	Part-time	1	4	20	64 00
Stockton High	Millinery	Part-time	10	4	418	640 00
Sutter Creek Un. High	Dressmaking and millinery	Part-time	1	5	41	133 34
Whittier Union High	Dressmaking	Part-time	1	4	48	80 00
Whittier Union High	Millinery	Part-time	3	4	146	240 00
Totals			217		9,005	$25,970 82

Statistical Table XVII.

Federal and State Aided Part-Time General Continuation Classes for the Year 1920-21.

High school district	Hours of instruction per year	Enrollment		Total allowance
		Male	Female	
Alameda	144	125	62	$120 00
Azusa, Citrus Union High	144	37	27	34 00
Berkeley	144	187	355	540 00
Chico	144	39	35	33 00
Chino	144	35	35	40 00
Crockett, John Swett Union High	144	21	19	31 00
Eureka	144	41	27	40 00
Fresno	144	197	193	750 00
Huntington Park	144	23	12	16 00
La Verne, Bonita Union High	144	10	17	13 00
Long Beach	144	76	55	750 00
Los Angeles	144	743	696	3,000 00
Martinez, Alhambra Union High	144	30	18	15 00
Modesto	144	33	21	28 00
Monterey	144	24	37	33 00
Oakland	144	581	425	1,500 00
Ontario, Chaffey Union High	144	42	27	17 00
Palo Alto	144	28	43	46 00
Pasadena	144	34	28	182 00
Petaluma	144	35	37	25 00
Pomona	144	13	20	35 00
Richmond	144	83	62	141 00
Sacramento	144	309	214	750 00
San Diego	144	73	57	356 70
San Francisco	144	596	406	3,000 00
Santa Ana	144	19	28	8 00
Santa Monica	144	30	13	9 00
Santa Rosa	144	68	48	66 00
South San Francisco	144	22	16	32 00
Stockton	144	160	88	500 00
Vallejo	144	102	36	76 00
Visalia	144	9	14	16 00
Watsonville	144	13	6	8 00
Totals		3,808	3,157	$12,170 70
Total both sexes		6,965		

Statistical Table XVIII.

Federal and State Aided Part-Time General Continuation Classes for the Year 1921-22.

High school district	Hours of instruction per year	Enrollment		Total allowance
		Male	Female	
Alameda	144	144	120	$458 56
Azusa, Citrus Union High	144	34	37	96 96
Bakersfield, Kern County Union High	144	11	5	16 00
Berkeley	144	295	255	1,496 50
Chino	144	26	22	79 20
El Monte, El Monte Union High	144	17	28	112 50
Fort Bragg, Fort Bragg Union High	144	12	4	32 96
Fowler	144	8	8	27 74
Fresno	144	341	306	1,454 06
Fullerton	144	10	4	72 44
Huntington Park	144	65	48	192 20
La Verne, Bonita High School	144	25	29	79 96
Long Beach	144	150	79	1,217 90
Los Angeles	144	1,765	1,285	6,601 80
Martinez, Alhambra Union High	144	11	12	60 70
Modesto	144	57	19	145 20
Monterey	144	40	26	151 60
Napa	144	22	34	107 92
Oakland	144	1,119	846	2,685 70
Ontario, Chaffey Union High	144	39	45	174 80
Palo Alto	144	22	42	158 72
Pasadena	144	142	63	593 60
Petaluma	144	55	55	295 42
Pomona	144	78	60	258 60
Redondo Beach	144	6	7	28 64
Reedley	144	37	16	88 80
Richmond, Richmond Union High	144	126	90	304 20
Riverside	144	85	62	306 50
Sacramento	144	506	349	2,216 62
San Bernardino	144	31	19	109 64
San Diego	144	192	130	947 70
San Francisco	144	1,378	967	5,669 80
San Jose	144	246	184	957 50
San Rafael	144	10	9	39 76
Santa Cruz	144	41	17	80 10
Santa Monica	144	47	31	129 92
Santa Rosa	144	73	57	207 90
Sebastopol, Analy Union High	144	6	2	15 84
Stockton	114	245	197	1,044 82
South San Francisco	144	40	19	133 00
Vallejo	144	77	21	240 64
Visalia	144	9	23	52 80
Totals		7,643	5,632	$29,174 22
Total both sexes		13,275		

Statistical Table XIX.

Federal and State Aided Vocational Teacher-Training Classes for the Year 1917-18.

Name of school	Location of class	Kinds of teachers prepared	Enrollment
University of California	Davis	Agricultural	47
University of California	Oakland	Trade and industrial	44
State Normal School	Los Angeles	Trade and industrial	61
State Normal School	Los Angeles	Home economics	3
State Normal School	Chico	Home economics	1
State Normal School	Fresno	Home economics	6
State Normal School	Santa Barbara	Home economics	7
State Normal School	San Diego	Home economics	1
Total			170

Statistical Table XX.

Federal and State Aided Vocational Teacher-Training Classes for the Year 1918-19.

Name of school	Location of class	Kinds of teachers prepared	Enrollment	
			M.	F.
University of California	Davis, Riverside	Agricultural	153	40
University of California	Berkeley	Trade and industrial	52	26
State Normal School	Los Angeles	Trade and industrial	28	21
State Normal School	Los Angeles	Home economics		8
State Normal School	Fresno	Home economics		6
State Normal School	San Jose	Home economics		6
State Normal School	San Diego	Home economics		7
State Normal School	Santa Barbara	Home economics		12
State Normal School	Chico	Home economics		
Totals			233	126

Statistical Table XXI.

Federal and State Aided Vocationl Teacher-Training Classes for the Year 1919-20.

Name of school	Location of class	Kinds of teachers prepared	Enrollment	
			M.	F.
University of California	Davis	Agricultural	91	21
University of California	Riverside	Agricultural	12	1
State Normal School	Chico	Home economics		4
State Normal School	Fresno	Home economics		4
State Normal School	San Diego	Home economics		11
State Normal School	San Jose	Home economics		7
State Normal School	Santa Barbara	Home economics		10
University of California (Southern Branch)	Los Angeles	Home economics		26
University of California	Berkeley	Trade and industrial	87	80
Extension	19 localities	General part-time	222	439
University of California (Southern Branch)	Los Angeles	Trade and industrial	52	28
Extension (Southern Branch)	11 localities	General part-time	159	366
Totals			623	997

STATISTICAL TABLE XXII.

Federal and State Aided Vocational Teacher-Training Classes for the Year 1920-21.

Name of school	Location of class	Kinds of teachers prepared	Enrollment	
			M.	F.
University of California	Davis	Agricultural	112	17
University of California	Ontario	Agricultural	5	
University of California	Oakland Extension	Trade and industrial	72	81
Extension	San Jose	Trade and industrial	17	
Extension	Berkeley	General part-time	40	37
University of California (Southern Branch)	Los Angeles	Trade and industrial	63	31
University of California (Southern Branch)	Los Angeles	General part-time	20	40
University of California (Southern Branch)	Los Angeles	Home economics		21
State Normal School	Chico	Home economics		11
State Normal School	Fresno	Home economics		3
State Normal School	San Diego	Home economics		16
State Normal School	San Jose	Home economics		6
State Normal School	Santa Barbara	Home economics		21
Totals			329	284

STATISTICAL TABLE XXIII.

Federal and State Aided Vocational Teacher-Training Classes for the Year 1921-22.

Name of school	Location of class	Kinds of teachers prepared	Enrollment	
			M.	F.
State Teachers College	Fresno	Home economics		3
State Teachers College	San Diego	Home economics		8
State Teachers College	Chico	Home economics		15
State Teachers College	Santa Barbara	Home economics		3
State Teachers College	San Jose	Home economics		7
University of California (Southern Branch)	Los Angeles	Home economics		20
University of California	Ontario, S.S. '21	Agricultural	101	19
University of California	Berkeley	Agricultural	52	6
University of California	Concord	Agricultural	3	
University of California	Ontario	Agricultural	2	1
University of California	Davis	Agricultural	9	4
University of California	Berkeley, S.S. '21	Part-time Gen. Con.	9	26
University of California (Southern Branch)	Los Angeles, S.S. '21	Part-time Gen. Con.	20	40
University of California (Southern Branch)	Los Angeles	Part-time Gen. Con.	10	63
University of California	Berkeley, S.S. '21	Trade and industrial	70	29
University of California	Berkeley	Trade and industrial	2	3
University of California (Southern Branch)	Los Angeles, S.S. '21	Trade and industrial	44	16
University of California	Oakland	Trade and industrial	67	16
University of California	San Jose	Trade and industrial	16	
University of California	Stockton	Trade and industrial	22	
University of California (Southern Branch)	Los Angeles	Trade and industrial	100	8
University of California	San Diego	Trade and industrial	17	
Totals			544	290

DIVISION IV.

ADULT EDUCATION.

Back in the early days when children were permitted but not compelled by the state to attend school, in the days when child labor was considered an essential personal and social asset, provision was made in the constitution of the state for the maintenance of evening elementary schools, wherein children of tender age, who had already worked ten or more hours during the day, could secure that knowledge of the elementary school subjects considered by all as essential for effective living.

Of course in those days it was considered necessary that these children should labor in order to live; and a remnant of that belief, and the practice growing out of it, still persists in the issuance of work permits only to such children as are not economically provided for by parents, relatives, or others. Even up to two years ago the law required that where children were given such permits they should be required to attend school for two hours each night.

As the years went by, as the people of the state became more prosperous, and as the compulsory education age was advanced, the enrollment of children and minors in evening elementary and evening secondary schools decreased.

Then came the movements for vocational education, the eradication of illiteracy, and the training of immigrants for citizenship, and the evening schools of the state began to rapidly develop into institutions for the education and training of employed adults.

Prior to ten years ago most of the evening schools of the state were of elementary grade, and of those that were of secondary grade two only stood out prominently as schools for the training of adults. Since that time a rapid increase of such schools has occurred.

Up to 1917 it was necessary for an evening elementary, or an evening high school, to maintain instruction on the evening of every school day of the week and during the entire annual school term. No legal provision was made for the maintenance of evening schools or classes that maintained instruction for less time. Since very few adults desire to give up all of the evenings of the week to further schooling, it was very difficult, and frequently impossible, to legally maintain adult schools in districts other than the large cities.

In 1917 the law was changed in such manner as to permit elementary and high school districts to maintain special classes in which they could give instruction in any subject, at any place in the district, during any hour of the day, on any day of the week, and for any period of the year. This resulted in the immediate development of special day and evening classes in a large number of the smaller high schools of the state.

Interpretation of Statistical Table XXIV.

The story of the development of adult education is shown in Statistical Table XXIV; however, certain irregularities, which need explanation, appear in this table.

The number of evening high schools and the number of high schools maintaining special classes appear to fluctuate from year to year. How-

ever, this is not the case. These schools have constantly operated, but have been reported some years as evening high schools, and other years as special classes.

STATISTICAL TABLE XXIV.

High School Statistics for Last Six Years.

	1914-15	1915-16	1916-17	1917-18	1918-19	1919-20	1920-21	1921-22
Number of day high schools	258	266	281	282	284	287	293	295
Number of evening high schools	9	24	28	32	36	32	24	44
Number that maintained special classes				44	72	108	116	95
Enrollment, day high schools	60,206	66,985	74,117	72,206	75,882	87,361	104,419	121,469
Enrollment, evening high schools	16,223	28,420	38,567	45,624	50,450	57,718	56,119	65,511
Enrollment in special classes				7,929	10,745	16,691	27,005	25,209
Enrollment in evening high schools and special classes	16,223	28,420	38,567	53,553	61,195	74,409	83,124	89,720
Enrollment in part-time general continuation classes							6,965	14,457
Grand total of persons enrolled in high schools	76,429	95,405	112,684	125,759	137,077	161,770	194,508	225,646

During the years 1919-20 and 1920-21, a number of evening high schools were disqualified as such because they were not fully conforming with the provisions of the law, which required them to maintain regular courses preparing for the University of California. Where this happened such schools were reported as maintaining special classes instead of evening schools.

The legislature of 1921 eliminated this technical requirement, and also placed the special adult classes on a financial basis similar to the evening schools, with the result that the report of 1921-22 shows a great increase in the number of evening high schools and a relative decrease in the number of schools maintaining special classes.

In considering the progress of adult education, it is, then, necessary to study together the development of both evening schools and the special classes of day high schools.

It will be noted that there was a very rapid development in enrollment in these schools up to 1920; and that since that time the enrollment has not increased as rapidly as previously. There are two factors which probably account for this:

First, there was an accumulation of adult illiterates, immigrants, and workers, who needed further education. The promotion of citizenship and vocational education, and the increase in schools and classes caused a piling up of enrollment during certain years, especially during the period of the war and immediately thereafter.

Second, during the last two years, the regular day high schools have increased their enrollment from 83,000 to 121,000. This was an unprecedented increase, which created a difficult financial situation for high school departments, with the result that many of them had to reduce their service in order to keep within their budgets; and adult education being perhaps less imperative—though this may be questioned where illiteracy is concerned—was the project curtailed.

When the regular day high school has passed through the pioneering stage of its development; when it enrolls all of the youths that can profit by, or desire a secondary education, it can then give more atten-

tion to the extension of the service; and adult education will come into its own.

Economy of Adult Education.

In the meantime there are three classes of adults that should be promptly provided for even though it may mean curtailment in other public expenditures. They are:

First, the native illiterates.

Second, the immigrants.

Third, the employed who need instruction supplementing their occupations.

There is no question but that the investment of a reasonable amount of public funds in further education for the above classes of persons will pay greater dividends in citizenship efficiency than the expenditure of an equal amount for any other class—children and youths not excepted.

Figures based upon the cost of instruction of 8671 adults in homemaking subjects, under the provisions of the Federal and State Vocational Education Acts, show that the total average cost to federal, state, county and local districts, is $7.04 per capita. These figures will probably hold for other lines of instruction.

Of course it must be remembered that many of these persons do not attend the classes for any great length of time, but having secured the instruction they desire, why should they not give up their places to others.

The average daily attendance on evening schools and the special adult classes, is usually about ten per cent of the enrollment. This means that the average time spent on attendance, by each person, is 36 sessions or 72 clock hours per annum.

Adult Schools and Classes Offer the Only Opportunity to Many.

The evening schools and the special classes offer many adults their only chance to further prepare themselves for the performance of some of the most important duties and responsibilities of citizenship.

For the immigrant who knows little or no English, and for the illiterate native American, these schools and classes offer instruction in our language. They also offer such persons an opportunity to learn something of our local, state and national governments; our social institutions, our homes, and our community life.

For the commercial worker, the craftsman, and the homemaker, they offer applied work in the special fields and work in English, science, mathematics, drawing, and art, supplementing the occupations.

For the business man they offer instruction in accounting and auditing, business organizations, commercial law, advertising, commercial art, modern languages, and economics.

For the citizen who has not had his full share of schooling, they offer instruction in languages, history, literature, and the other arts.

In short, these schools and classes are adjusted to the present needs of the people of the respective communities that support them. They offer instruction necessary to enable these people to remove the deficiencies in their education which handicap them for full participation as citizens.

In order that the reader may secure a clearer notion of the character and extent of the courses of instruction provided for adult schools and classes, there are herewith appended a program of studies provided by a district with a population of approximately 40,000, and a program of studies provided by a district with a population of more than 200,000.

These are typical city courses of instruction and are maintained with little change from year to year. Of course, the smaller the high school district, the narrower becomes the range of subjects maintained. However, the choice of subjects in these small high schools usually rests with the patrons, and they vary from year to year. For instance, a rural high school may maintain a course in farm accounting for a period of two or three months. This may fairly well meet the needs of the community for several years. Following this, a short course may be maintained in pruning, cover crops, or any of a large number of subjects designed to better prepare the farmer for his work. The rural high schools usually maintain courses for home-makers, and when necessary, courses in English, naturalization, and Americanization for immigrants.

Program of Evening High School in a California City with a Population of About 40,000.

Americanization (for foreigners)
Anatomy, physiology (nurses)
Architectural drawing
Arithmetic, business
Auto practice (for drivers)
Auto repairs (for garage workers)
Basketry
Blue print reading
Bookkeeping III, IV
Bookkeeping I
Bookkeeping II
Business Efficiency (salesmen, teachers, foremen)
Business English III, IV
Business English II
Business English I*b*
Cabinet making
Carpentry
Chemistry (industrial)
Chemistry (nurses)
Community singing
Commercial art (lettering, posters, etc.)
Cooking
Dietetics (nurses)
Dressmaking
Electricity (industrial)
Freehand drawing
French (beginning)
French (conversational)
French (advanced)
Literature (selected)
Machine shop practice
Machine design
Mechanical drawing
Millinery (beginning)
Millinery (advanced)
Naturalization (for declarants)
Office appliances (comptometer, dictaphone, etc.)
Orchestra
Pattern making
Penmanship
Public speaking, parliamentary law
Physical training (men)
Physical training (women)
Shop mathematics
Shorthand I
Shorthand I*b*
Shorthand I*a*
Shorthand II
Shorthand III, IV
Spanish (beginning)
Spanish (conversational)
Spanish (advanced)
Typing I*a* (practice class)
Typing I*b* (practice class)
Typing II
Typing III, IV
Swimming (men)
Swimming (women)
Wood turning

List of Subjects Taught in the Evening High Schools of a California City with a Population Exceeding 200,000.

Accounting and auditing
Acetylene welding and cutting
Advertising
Algebra
Americanization (English for new Americans)
Americanization (teachers' training course)
Anatomy and physiology (nurses)
Arithmetic (academic)
Architectural drafting
Arts and crafts
Auto electricity (ignition, etc.)
Auto practice (lecture and demonstration)
Auto repairs
Biology and bacteriology (nurses)
Bookkeeping I
Bookkeeping II
Business arithmetic
Business correspondence
Business English I
Business English II
Business law
Cabinet making
Carpentry
Chemistry I, industrial and college prep.
Chemistry II, industrial and college prep
Chemistry and physics (nurses)
Choral, sight singing and harmony
Civics
Civil service preparation for clerks and stenographers
Commercial arithmetic
Commercial art—lettering, posters, etc.
Commercial law
Commercial, general bookkeeping, penmanship, arithmetic, etc.
Comptometer operation
Cooking
Desserts for the family, hot breads, etc.
Dictation
Dietetics (nurses P. M.—Red Cross Evenings)
Dramatics
Drawing, freehand
Drawing, commercial
Dressmaking I
Dressmaking II
Economics, applied
Electric shop practice
Electrical engineering—theory and laboratory
English, commercial I
English, commercial II
English composition
English literature
First aid (Red Cross)
Forging and blacksmithing
French
Geometry I
Geometry II
History, U. S.
Home care of the sick (Red Cross)
Home gardening—plant propagation, soil preparation, etc.
Interior decorating
Italian
Journalism
Library
Literature, English and American
Machine design (adv. mech. drawing)
Machine shop practice
Mechanics and strength of materials
Mechanical drawing
Mechanical engineering
Millinery I
Millinery, advanced II
Naturalization (for declarants) I
Naturalization (for declarants) II
Office appliances (comptometer, dictaphone, etc.)
Office practice
Orchestra, community
Orchestra, ensemble
Orchestra, individual
Pattern making and wood turning
Parliamentary law
Penmanship (practice)
Penmanship (teachers' course)
Photography
Physics
Physical training (men)
Physical training (women)
Physical training (teachers' training course)
Public speaking, including parliamentary law
Radio telegraphy
Salesmanship (general and special)
Scientific motherhood
Shorthand I
Shorthand II
Shorthand III
Short story writing
Shop mathematics (courses applied to various trades)
Singing
Spanish I
Spanish II
Spanish III
Spoken English
Stenotypy
Trigonometry
Typing I
Typing II
Typing III
Typing, for blind
Word study

Statistical Table XXV.

Enrollment of Part-time, Adult, and Full-time Students in the Secondary Schools of the State.

High school, by place and name	Compulsory part-time classes		Special adult classes		Evening schools		Full-time day classes		Grand total
	Male	Female	Male	Female	Male	Female	Male	Female	
Adin, Big Valley Joint Union							24	32	56
Alameda	128	110	180		650	416	610	665	2,759
Alhambra Union	12	6			151	180	443	480	1,272
Alpaugh							10	12	22
Alturas, Modoc Union							60	74	134
Anaheim Union							207	279	486
Anderson Union							47	62	109
Angels Camp, Bret Harte Union							45	47	92
Antioch, Riverview Union			107	2			72	107	288
Arcata Union	17	1	36	10			101	121	286
Arroyo Grande Union							53	83	136
Atascadero, Marg. Black Union							70	78	148
Auburn, Placer Union							122	138	260
Azusa, Citrus Union	34	37			114	84	122	133	524
Bakersfield, Kern Co. Union	10	4	334	323			670	678	2,019
Banning Union							47	32	79
Barstow Union							32	32	64
Beaumont							28	43	71
Benicia			64	11			29	29	133
Berkeley	207	195	48	356	955	1,116	1,197	1,244	5,318
Biggs Union							50	39	89
Big Pine Union							17	21	38
Bishop Union			35	78			93	100	306
Blythe, Palo Verde Valley Un.							65	73	138
Boonville, Anderson Valley Un.							24	20	44
Boulder Creek Union							18	16	34
Brawley Union			100	135			87	126	448
Brentwood							40	56	96
Burbank							109	103	212
Calexico Union			180	112			84	79	455
Calipatria Union							37	33	70
Calistoga Joint Union			9	6			50	51	116
Cambria, Coast Union							16	10	26
Campbell Union							106	84	190
Carpinteria Union							33	36	69
Caruthers, Alvine Evening			10	2			52	41	105
Cedarville, Surprise Valley Un.							34	39	73
Centerville, Washington Union	1						73	98	172
Ceres Union							85	95	180
Chico	33	18	6	111			289	347	804
Chino	20	15	162	36			69	75	377
Chino, Geo. Jr. Republic							53		53
Chowchilla Union							62	69	131
Claremont							77	65	142
Cloverdale Union							24	37	61
Clovis							99	123	222
Coachella Valley Union							53	42	95
Coalinga Union	11	6	341	232			83	114	787
College City, Pierce Joint Un.							47	47	94
Colton Union			87	79			130	154	450
Colusa Union		5	25	41			80	66	217
Compton Union		2					260	317	579
Concord, Mount Diablo Union							113	142	255
Corcoran Union			44	14			35	23	116
Corning Union							83	105	188
Corona	12	16					86	112	226
Coronado					190	140	78	67	475
Courtland Union							28	26	54
Covelo, Round Valley Union							29	32	61
Covina Union			125	187			160	149	621

Statistical Table XXV—Continued.

Enrollment of Part-time, Adult, and Full-time Students in the Secondary Schools of the State.

High school, by place and name	Compulsory part-time classes		Special adult classes		Evening schools		Full-time day classes		Grand total
	Male	Female	Male	Female	Male	Female	Male	Female	
Crescent City, Del Norte Co.							30	58	88
Crockett, John Swett Union	13	29	216	60			65	61	435
Danville, San Ramon Val. Un.							19	26	45
Delano Joint Union							107	147	254
Denair							23	41	64
Dinuba Union							158	180	338
Dixon Union			1	14			46	52	113
Dos Palos Joint Union							47	57	104
Downey Union							60	64	124
Dunsmuir							38	34	72
Durham							26	22	48
Easton, Washington Union			50	15			114	121	300
El Centro, Central Union			41	107			173	183	504
Elk Grove Union							80	72	152
El Monte Union	17	28	3	3	80		95	99	325
Elsinore Union							31	31	62
Escalon Union							38	52	90
Escondido Union							112	114	226
Esparto Union							45	45	90
Etna Mills Union							39	71	110
Eureka City	57	45			267	155	212	305	981
Exeter Union			23	2			107	125	257
Fairfield, Armijo Union			32	52			81	82	247
Fair Oaks, San Juan Union							124	115	239
Fallbrook Union							26	29	55
Ferndale Union							66	58	124
Fillmore Union			40	40			70	93	243
Fort Bragg Union	10	4	69	35			74	101	293
Fort Jones, Siskiyou Union							35	22	57
Fortuna Union							108	146	254
Fowler Union	2	3	119	155			109	108	496
Fresno City	288	271	2,917	1,916			1,345	1,330	8,067
Fullerton Union	10	4					426	441	881
Galt Joint Union							48	55	103
Garden Grove Union			66	21			34	35	156
Geyserville Union							35	33	68
Gilroy			80	46			59	83	277
Glendale Union					348	319	596	737	2,000
Gonzales Union			56	58			28	32	174
Grass Valley							93	130	223
Gridley Union	1						100	84	185
Gustine Union							42	35	77
Half Moon Bay Union							26	32	58
Hamilton Union				3			25	30	58
Hanford Union	12	13	213	68			195	240	741
Hayward Union							113	150	263
Healdsburg			20	20			115	159	314
Hemet Union							122	117	239
Hollister, San Benito County			113	64			120	171	468
Holtville Union			755	721			112	96	1,684
Hopland Union							16	14	30
Hughson Union			61	41			49	48	199
Huntington Beach Union							111	127	238
Huntington Park	33	34					352	412	831
Imperial Valley Union					429	406	58	62	955
Independence, Owens Valley Un.							8	22	30
Inglewood Union	12	3		283			286	343	927
Ione Union							19	20	39
Irwin, Hilmar Union							65	59	124

Statistical Table XXV—Continued.

Enrollment of Part-time, Adult, and Full-time Students in the Secondary Schools of the State.

High school, by place and name	Compulsory part-time classes		Special adult classes		Evening schools		Full-time day classes		Grand total
	Male	Female	Male	Female	Male	Female	Male	Female	
ackson, Joint Union							45	62	107
ulian Union							10	19	29
elseyville Union							12	21	33
erman Union			24	1			68	64	157
ng City Union							72	76	148
ngsburg Joint Union	10	5	37	6			120	136	314
akeport, Clear Lake Union	1	7	8	2			39	51	108
akeside, Grossmont Union							160	138	298
ancaster, Antelope Valley Un.							67	83	150
aton Joint Union			54	15			38	36	143
aVerne, Bonita Union	22	26	24	8			72	104	256
Grand							42	54	96
emoore Union	5	3	190	67			77	97	439
ncoln Union							54	63	117
nden Union							16	10	26
ndsay			2	1			96	105	204
ve Oak Union							32	32	64
vermore Union							65	98	163
odi Union	33	39	95	101			217	230	715
ompoc Union							67	67	134
one Pine Union							18	23	41
ong Beach	128	64		393	991	1,841	1,689	1,794	6,910
os Angeles:									
Los Angeles City					752	861	2,523	3,381	7,517
Franklin			46	194	817	280	422	618	2,377
Gardena				75			127	139	341
Hollywood					1,602	857	1,208	1,358	5,115
Jefferson					784	615	843	1,043	3,285
Lincoln			6	44	1,487	1,045	1,060	944	4,586
Lomita			19	14			23	44	100
Manual Arts					2,228	2,179	1,494	1,672	7,573
Owensmouth							62	54	116
Polytechnic	3,456	1,487			5,279	5,656	1,759	1,552	19,189
San Fernando							124	221	345
San Pedro					367	97	268	254	986
Torrance							26	33	59
Van Nuys							126	148	274
Wilmington							100	82	182
os Banos, West Side Union	1	7			51	7	37	33	136
os Gatos							102	93	195
os Molinos							45	39	84
oyalton, Sierra Valley Jt. Un.							22	31	53
rArthur, Fall River Joint Un.							19	31	50
rCloud, Siskiyou Union			89	17			15	22	143
adera Union	26		3	4			158	197	388
anteca Union							58	40	98
aricopa							32	56	88
artinez, Alhambra Union	11	12		27			67	85	202
arysville	9	5	88	124			85	46	357
axwell Union							18	40	58
endocino Union							40	53	93
erced Union					38	63	205	228	534
iddletown Union							11	19	30
odesto	48	14	136	221			415	443	1,277
onrovia City	16	7	2				219	231	475
ontebello							60	68	137
onterey Union			33	33	118	35	89	100	408
oorpark Memorial Union							22	39	61
organ Hill, Live Oak Union							66	68	134
ountain View Union		48	15				104	95	262
pa Union	22	34	83	194			203	241	777

Statistical Table XXV—Continued.

Enrollment of Part-time, Adult, and Full-time Students in the Secondary Schools of the State.

High school, by place and name	Compulsory part-time classes		Special adult classes		Evening schools		Full-time day classes		Grand total
	Male	Female	Male	Female	Male	Female	Male	Female	
National City, Sweetwater Un.				89			152	151	392
Needles			211	226			36	31	504
Nevada City	6	2	1				51	83	143
Newman, Orestimba Union			130	17			36	40	223
Norwalk, Excelsior Union							86	105	191
Oakdale Union							100	136	236
Oakland:									
Oakland City					1,423	971	1,343	1,526	5,263
Fremont					405	350	686	947	2,388
Part-time	578	427	6	6					1,017
Technical Continuation and Evening					698	1,080	1,457	1,254	4,489
Vocational					265	229	399	97	990
University					409	327	373	405	1,514
Oceanside							33	56	89
Ojai, Nordhoff Union							27	22	49
Ontario, Chaffey Union	41	40	2	1	841	595	456	465	2,441
Orange Union			110	146			224	314	794
Orland Joint Union			8	7			108	121	244
Orosi Union							67	69	136
Oroville Union							142	130	272
Oxnard Union			100	101			107	117	425
Pacific Grove							64	99	163
Palo Alto Union	22	42	37	58			290	258	707
Parlier Union							41	44	85
Pasadena	121	58	10	460	692	915	1,385	1,367	5,017
Paso Robles Union			21	64			97	129	311
Patterson Union			25				35	63	123
Perris Union							54	55	109
Petaluma	57	52	1		286	105	241	251	993
Piedmont							146	152	298
Placerville, El Dorado County		4					114	98	216
Point Arena Union							20	32	52
Pomona City	78	60	87	75			478	486	1,264
Porterville Union	5	1	103	63			258	268	678
Potter Valley							10	17	27
Princeton Joint Union							31	66	97
Puente Union							66	61	127
Quincy, Plumas County							44	42	86
Ramona Union			1	8			19	21	49
Raymond, Granite Union							19	24	43
Red Bluff Union							119	144	263
Redding, Shasta Union			31	50			92	166	339
Redlands	17	15	7	7			333	372	751
Redondo Beach Union	6	7			169	195	256	287	921
Redwood City, Sequoia Union			70	22			165	174	431
Reedley Joint Union	20	12	44	44			108	210	438
Richmond Union	126	90			280	150	385	473	1,504
Rio Vista Joint Union							41	61	102
Ripon Union							58	56	114
Riverdale Joint Union							45	32	77
Riverside, Girls'		50		28				577	655
Riverside, Polytechnic	82	54	3	8	140	3	541		831
Roseville Union	17	7	128	97			120	109	478
Sacramento	342	235		1,056	852	569	1,224	1,352	5,630
Salinas Union			236	131			169	138	674
San Andreas, Calaveras Union	32	23							55
San Bernardino City	31	19		68	359	354	440	524	1,795
San Diego	184	130	8	703	2,407	2,744	1,583	1,671	9,430

Statistical Table XXV—Continued.

Enrollment of Part-time, Adult, and Full-time Students in the Secondary Schools of the State.

High school, by place and name	Compulsory part-time classes		Special adult classes		Evening schools		Full-time day classes		Grand total
	Male	Female	Male	Female	Male	Female	Male	Female	
San Francisco:									
Commerce					1,564	891	478	1,023	3,956
Galileo	1,410	935					312	218	2,875
Girls'								1,307	1,307
Junior Highs							141	117	258
Lowell							1,084	623	1,707
Mission					1,559	468	534	714	3,275
Polytechnic							1,305	608	1,913
Sanger Union			94				135	157	386
San Jacinto									
San Jose	243	182	2	3	2,508	2,477	1,154	1,198	7,767
San Juan Capistrano Union							20	10	30
San Luis Obispo	17	7	26	10			114	189	363
San Mateo Union					638	315	259	301	1,513
San Rafael	8	9	121	52			143	144	477
Santa Ana							638	603	1,241
Santa Barbara	86	45	96	78	298	193	314	316	1,426
Santa Clara	42	39					150	171	402
Santa Cruz	39	17	42	8			305	353	764
Santa Maria Union	13	6	122	124			168	202	635
Santa Monica City	47	31		85	274	352	540	565	1,894
Santa Paula Union			51	52			74	99	276
Santa Rosa	58	45	1	6	197	261	274	274	1,116
Santa Ynez Valley Union							10	17	27
Sausalito, Tamalpais Union							281	313	594
Sebastopol, Analy Union	6	2		37	156	192	157	186	736
Selma Union	21	9	106	116			227	245	724
Sisson, Siskiyou Union			19	2			16	25	62
Sonoma Valley Union	10	7					78	55	150
Sonora Union							97	110	207
South Pasadena City							222	275	497
South San Francisco	35	20	83	6			62	78	284
St. Helena Union							43	41	84
Stockton	228	178	796	1,746			639	830	4,417
Strathmore Union							62	58	120
Susanville, Lassen Union			16				57	117	190
Sutter							82	92	174
Sutter Creek Union				41			48	45	134
Taft Union			356	194			205	208	963
Templeton Union							32	31	63
Tomales Joint Union							41	43	84
Tracy, West Side Union			9	13			38	69	129
Tranquillity Union			39	26			25	26	116
Truckee, Meadow Lake Union							15	22	37
Tulare Joint Union	26	17	345	92			199	225	904
Tuolumne, Summerville Union							27	24	51
Turlock Union			39	5			272	296	612
Tustin Union							51	62	113
Ukiah Union			14	35			100	115	264
Upper Lake Union							37	34	71
Vacaville Union			50	44			66	61	221
Vallejo	57	14	20	7			235	279	612
Venice Union	20	18			145	129	279	284	875
Ventura Union							136	146	282
Victorville, Victor Valley Un.			7	7			26	25	75
Visalia Union	9	21	46	4			226	254	560
Wasco Union							70	79	149
Watsonville Union	33	18	67	46			218	222	604
Weaverville, Trinity County							19	32	51
Weed, Siskiyou Union			48				21	32	101

Statistical Table XXV—Continued.

Enrollment of Part-time, Adult, and Full-time Students in the Secondary Schools of the State.

High school, by place and name	Compulsory part-time classes		Special adult classes		Evening schools		Full-time day classes		Grand total
	Male	Female	Male	Female	Male	Female	Male	Female	
Westwood							37	42	79
Wheatland							6	17	23
Whittier Union				100			283	344	727
Williams Union							19	23	42
Willits Union							38	45	83
Willows, Glenn County							84	99	183
Winters Joint Union							51	43	94
Woodlake Union							61	59	120
Woodland							186	191	377
Yreka, Siskiyou Union							84	122	206
Totals, males	8,911		11,726		34,293		57,662		112,592
females	5,546		13,483		30,218		63,807		113,054
Totals, both sexes	14,457		25,209		64,511		121,469		225,646

Adult Schools and Classes Provide Instruction Needed by People.

In general, the school authorities do not attempt to decide beforehand, and finally, just what subjects will be offered, and just what the exact content of these subjects will be.

In this type of school and class, such matters are usually decided by the students themselves after advising with school authorities. If they were otherwise decided, no one would attend the classes.

After a school has once established one or more adult classes it usually adopts the policy of providing instruction in any subject, if a certain number of persons desire the same.

The local school district must bear the entire expense of maintaining such instruction during the current school year. However, during the following year it is partly or fully reimbursed by state or county for the cost of such instruction. Thus, any expansion of the program for adult education must depend upon the balance of local funds that may be legitimately applied to the work. As a matter of fact, a few, if any, high school districts of the state have been able to meet all of the legitimate demands made for adult classes.

Subject to financial limitations, some of the high schools have adopted the policy of setting up, at any time and for any period, instruction in any subject desired by at least fifteen residents of the district qualified for the work. These schools also follow the policy of discontinuing any class maintained, if the number of persons belonging to it falls below the number mentioned above.

Without doubt, one of the greatest factors leading to the rapid development of adult education has been the policy of consulting the wishes of the prospective students as to the type of work to be maintained. Yielding to the demand of the students has, in vocational lines, been equivalent to yielding to the educational demands of the craft. This, and the modification of the methods of instruction in language, for adult immigrants, has established a confidence on the part of the public that the schools can, and actually will, provide instruction that can be fully applied to a solution of every day problems.

Adult Education Responsive to Demands of Life.

Less than a generation ago the school and education were looked upon as something apart from the common affairs of life. At that time the adult would not have thought of turning to his local public school for help in securing instruction relative to his occupation. Today he turns to it with full confidence that he can secure the help needed in better qualifying himself as a citizen worker.

Relative Values of Subjects of Instruction in Adult Schools.

Part II of Statistical Table XXVII shows that an average of 20 per cent of the persons attending the adult classes and schools had no special aim in mind other than a desire to satisfy the inner urge for more schooling. If funds are available for the purpose, the local school is justified in maintaining instruction for such persons. If, on the other hand, the funds of the district are limited to the extent that the opportunities for adults to secure further education must be curtailed, then this group of persons should be the first to be refused service.

The subjects of instruction that may be maintained by adult schools and classes are not of equal importance. All will agree that illiteracy

SAMPLE OF QUESTIONNAIRE SENT TO HIGH SCHOOL PRINCIPALS—ENROLLMENT BY AIM OR PURPOSE OF STUDY.

Enter student only once for each subject pursued. Where two or more purposes exist, require a choice on part of student of most important aim.

Should it be impossible to secure the classification contemplated in this part of the report for all of the persons enrolled in the school or in the classes during the earlier part of this year, the report should be made only for those persons enrolled in the school at the present time.

	Male	Female
1. Total enrollment of persons (members of families, not employees) at the present time engaged in housekeeping who are taking subjects that are especially designed to increase their ability to perform the usual common home-making occupations. (Such subjects as basketry and the arts and crafts in general do not belong under this head, but such subjects as house, furniture, or dress design, etc., do belong.) Those taking courses to increase their efficiency as domestics, dressmakers, milliners, etc., should be entered under 3 below		
2. Total enrollment of persons not at this time engaged in housekeeping who are taking subjects as described under 1 above, in order to prepare for home-making occupations as members of families		
3. Total enrollment of persons taking subjects that are especially designed to *increase their efficiency* in occupations in which they are engaged. (Those taking courses to increase their efficiency in home-making occupations as members of families should be reported under 1 above. Domestics, dressmakers, milliners, etc., should be reported under this head.)		
4. Total enrollment of persons who are taking subjects that are especially designed to prepare them *for entering* upon occupations other than home-making as members of families. (Those taking courses to prepare them for entering upon home-making as members of families should be reported under 2 above. Persons preparing to become domestics, dressmakers, milliners, etc., should be reported under this head.)		
5A. Total enrollment of persons taking subjects to remove deficiencies in English due to the influence of foreign birth or the use of foreign languages		
5B. Total enrollment of persons, usually American born, taking subjects to remove illiteracy deficiencies due to causes other than those specified under A		
6. Total enrollment of persons who are pursuing subjects especially designed to prepare for passing naturalization examinations		
7. Total enrollment of persons who are taking subjects especially designed to prepare for a higher class of citizenship. (Do not include persons entered under 5A, 5B, or 6 above, unless they are taking one or more additional subjects especially designed for this purpose)		
8. Total enrollment of persons who are taking subjects that are a part of a regular high school college preparatory course		
9. Total number of persons who are pursuing subjects such as have not been reported by said persons under any of the headings specified above, and such as are taken for personal improvement or because they have a personal appeal		

is tolerable on the part of either an American or a foreign born person. Therefore, whether or not opportunity is offered to adults to secure instruction in other subjects, every high school district in the state ought to provide the instruction necessary to completely eliminate, within its confines, illiteracy. Most persons will also agree that the employed adult who finds himself handicapped because of a lack of knowledge of the English, mathematics, science, and drawing necessary to enable him to advance in his chosen occupation, should be given an opportunity to remove these deficiencies. Likewise, any resident of the community who feels that further schooling would better qualify him as a homemaker and citizen of the community, the state, and the nation, should be given an opportunity for further study.

It appears that the order of importance of the fields of instruction for adult schools and classes is as follows:

First, the removal of illiteracy.
Second, vocational extension.
Third, naturalization and civic instruction.
Fourth, and least important, education for leisure.

In our opinion there is no place whatever in evening schools for persons who desire merely to be entertained at public expense.

Difficulty in Establishing Content of Supplemental Subjects.

As heretofore, the greatest problem before those who would promote adult education for occupations is that of establishing the content of the subjects that supplement the various lines of employment. Naturally the students who lack in this respect are not competent to make the selection for themselves. There are, however, among the employed, some persons who do have a technical knowledge of the supplemental fields. Unfortunately, these skilled workers are not trained teachers. The establishing of the content of the English, science, mathematics, drawing, and art that supplement occupations is practically equivalent to creating a new text book of instruction.

It will be years before we will have accomplished this work for all of the occupations wherein supplemental instruction is necessary and desirable. There is a great need for research in this field.

Similarity of Adult Schools and Special Classes.

A comparison of the matter presented in Statistical Table XXVI would indicate that the schedule of subjects taught in the special day and evening classes is similar to those presented in evening high schools. In fact, about the only difference between the evening high schools and the special class organizations, is that the former have principals and maintain instruction during most of the time covered by the annual high school term, while the latter consist of classes maintained at different times by the regular day high organization.

Source of Material for Study of Adult Education.

The Statistical Tables XXVI and XXVII contain a study of enrollment segregated according to aim and purpose of study. The matter contained in these tables was secured on a special questionnaire sent out to high school principals. On page 136 is a facsimile of the questionnaire submitted. The numbers of these questions correspond to the column numbers on the statistical tables. In making the segregation according to "purpose of study," no individual was included twice. Each person was required to choose the dominant purpose, or what was

Statistical Table XXVI.

A Study of Enrollment in Evening High Schools and Special Classes of High Schools Segregated According to Aim and Purpose of Study.

This data could not be secured for the special classes of all schools nor for the entire enrollment of all reporting. In most instances only those who were in attendance at the time of the investigation are reported. The classes and persons are, however, representative, so that the figures may be safely applied to the entire special class enrollment in the high schools of the state.

Location and name of school		1 Supplemental to home making	2 Preparatory to home making	3 Supplemental to some trade or occupation	4 Preparatory to other skilled occupations	5-A English for non-English-speaking persons	5-B Instruction for illiterate Americans	6 Preparatory to naturalization	7 Citizenship (advanced) other than columns 5-A, 5-B and 6	8 College preparatory	9 Non-classified	10 Total number reported	11 Complete enrollment for year
Alameda	Male	1	2	32	37	46	35	12	3		52	220	830
	Female	40		27	28	83	15				34	227	416
Alhambra Union	Male												151
	Female	21										21	180
Antioch, Riverview Union	Male												107
	Female												2
Arcata Union	Male												36
	Female												10
Azusa, Citrus Union	Male												114
	Female												84
Bakersfield, Kern County Union	Male												334
	Female												323
Benicia	Male												64
	Female												11
Berkeley	Male												1,003
	Female												1,472
Bishop Union	Male												35
	Female												78
Brawley Union	Male												100
	Female												135
Calexico	Male												180
	Female												112
Calistoga Joint Union	Male												9
	Female												6
Caruthers, Alvine Evening	Male												10
	Female												2
Chico	Male												5
	Female												111
Chino	Male												102
	Female												38
Coalinga Union	Male			209	2	15	37	30			43	336	341
	Female	206	18								5	229	232

Colton Union	Male												87
	Female												79
Colusa Union	Male			1	7	1					16	25	25
	Female			5	14	8				9	8	39	41
Corcoran	Male												44
	Female												14
Coronado	Male			30					3	6	120	159	190
	Female			25			12		1	4	98	140	140
Covina Union	Male												125
	Female												187
Crockett, John Swett Union	Male												216
	Female												69
Dixon Union	Male										1	1	1
	Female			2	4						6	12	14
Easton, Washington Union	Male												50
	Female												15
El Centro, Central Union	Male												41
	Female												107
El Monte Union	Male												83
	Female												3
Eureka City	Male			20		13			26		148	207	207
	Female	53		30	14	8					40	145	155
Exeter Union	Male												23
	Female												2
Fairfield Armijo Union	Male												32
	Female												52
Fillmore Union	Male												40
	Female												40
Fort Bragg Union	Male			6	10			12	10	18		56	69
	Female			6	4				10	10		30	35
Fowler Union	Male			18		81		15				114	119
	Female			8		12					131	151	155
Fresno City	Male			169	468	615	7	336		10	1,229	2,894	2,917
	Female	74		390	430	298	8	44		61	587	1,892	1,916
Garden Grove Union	Male												66
	Female												21
Gilroy	Male												89
	Female												46
Glendale Union	Male												348
	Female												319
Gonzales Union	Male												56
	Female												58
Hamilton Union	Male												
	Female												3
Hanford Union	Male					186	18					204	213
	Female					57	1					58	68
Healdsburg	Male												20
	Female												20
Hollister, San Benito County	Male							40	22	12	14	88	113
	Female						1	3	1	28		33	64

STATISTICAL TABLE XXVI—Continued.

A Study of Enrollment in Evenirg High Schools and Special Classes of High Schools Segregated According to Aim and Purpose of Study.

Location and name of school		1 Supplemental to home making	2 Preparatory to home making	3 Supplemental to other skilled occupations	4 Preparatory to other skilled occupations	5-A Emotionally non-English speaking persons	5-B Instruction for illiterate Americans	6 Preparatory to naturalization	7 Citizenship (advanced) other than courses 5-A and 6	8 College preparatory	9 Non-classified	10 Total number reported	11 Complete enrollment for year
Holtville Union	Male			2		3		1			67	73	755
	Female	43	2	4							30	79	721
Hughson Union	Male												61
	Female												41
Imperial Valley Union	Male												429
	Female												406
Inglewood Union	Male												
	Female												283
Kerman Union	Male							24				24	24
	Female							1				1	1
Kingsburg Joint Union	Male												37
	Female												6
Lakeport, Clear Lake Union	Male												8
	Female		2									2	2
Laton Joint Union	Male												54
	Female												15
La Verne, Bonita Union	Male												24
	Female												8
Lemoore Union	Male												190
	Female												67
Lindsay	Male												2
	Female												1
Lodi Union	Male			30	6	22				13	24	95	95
	Female			38	7	4				8	32	89	101
Long Beach	Male		10	144	93	112	8	112	23	12	226	740	901
	Female	245	35	125	233	160	7	8	18	17	739	1,617	3,234
Los Angeles (10 high schools)	Male	211	19	3,537	922	974	59	1,611	68	2,301	1,657	11,229	13,477
	Female	937	116	3,739	950	434	49	193	33	1,621	678	8,750	11,917
Los Banos, West Side Union	Male												51
	Female												7
McCloud, Siskiyou Union	Male												89
	Female												17
Madera Union	Male												3
	Female												4
Martinez, Alhambra Union	Male												
	Female												27

Marysville	Male												83
	Female												124
Merced Union	Male												38
	Female												63
Modesto	Male												136
	Female	61	2	2								65	221
Monrovia City	Male												2
	Female												
Monterey Union	Male					43		9				52	151
	Female					9						9	63
Mountain View Union	Male												15
	Female												
Napa Union	Male												83
	Female												194
National City, Sweetwater Union	Male												
	Female												89
Needles	Male												211
	Female												226
Nevada City	Male												1
	Female												
Newman, Orestimba Union	Male												130
	Female												17
Oakland (6 high schools)	Male			778	478	1,057	12	377	147	57	89	2,905	3,206
	Female	737	33	509	723	368	45	6	316	38	133	2,908	2,963
Ontario, Chaffey Union	Male			350		200		17	100	2	15	684	843
	Female	460		25		15			100		20	560	596
Orange Union	Male			18		29	4				57	108	110
	Female	22		18	8		6				69	123	146
Orland Joint Union	Male												8
	Female												7
Oxnard Union	Male												100
	Female												101
Palo Alto	Male												37
	Female												38
Pasadena	Male												702
	Female												1,384
Paso Robles Union	Male					21						21	21
	Female	29				10					25	64	64
Patterson Union	Male												25
	Female												
Petaluma	Male			65	105	38	2	38	2	2	35	287	287
	Female			38	50	10		6		1		105	105
Pomona City	Male					87						87	87
	Female					75						75	75
Porterville Union	Male				1						102	103	103
	Female			9	10					3	39	61	63
Ramona Union	Male												1
	Female												8
Redding, Shasta Union	Male										11	11	31
	Female										22	22	50

Statistical Table XXVI—Continued.

A Study of Enrollment in Evening High Schools and Special Classes of High Schools Segregated According to Aim and Purpose of Study.

Location and name of school		1 Supplemental to home making	2 Preparatory to home making	3 Supplemental to other skilled occupations	4 Preparatory to other skilled occupations	5-A English for non-English-speaking persons	5-B Instruction for illiterate Americans	6 Preparatory to naturalization	7 Citizenship (advanced) other than preparatory to naturalization, 5-A and 6	8 College preparatory	9 Non-classified	10 Total number pupils	11 Complete enrollment for year
Redlands	Male												
	Female												
Redondo Beach Union	Male												169
	Female												196
Redwood City, Sequoia Union	Male												70
	Female												22
Reedley Joint Union	Male												44
	Female												44
Richmond Union	Male			104	45	89	13	27		2		280	280
	Female			44		12		1		3	90	150	150
Riverside, Girls'	Male												
	Female												28
Riverside, Polytechnic	Male					110						110	143
	Female												11
Roseville Union	Male			46	15	42	6	12			7	128	138
	Female	87				10						97	97
Sacramento	Male												832
	Female												1,625
Salinas Union	Male			31	25	8	3	9	26		41	143	236
	Female	64		50	4			2	10			130	131
San Bernardino City	Male	73				79		9		88	107	359	359
	Female	106	15	92	5	8				90	106	422	422
San Diego	Male												2,415
	Female												3,447
San Francisco: Commerce	Male			368	62	105		189		424	183	1,331	1,584
	Female	46		329	76	35		17		296	92	891	891
Mission	Male												1,559
	Female												468
Sanger Union	Male												94
	Female												
San Jose	Male	5		169	105	271	128	136		172	1,044	2,030	2,510
	Female	143	60	577	310	120	63	4		249	616	2,172	2,480
San Luis Obispo	Male												26
	Female												10

San Mateo Union	Male			240	93	128	27	23	9	4	114	638	638
	Female	65	17	107	45	19	2		4		56	315	315
San Rafael	Male							62			56	118	121
	Female							15			37	52	52
Santa Barbara	Male			31	27	156		43	5	7	44	313	394
	Female			43	40	77		4	12	3	18	197	271
Santa Cruz Union	Male					24		15				39	42
	Female					4	4					8	8
Santa Maria Union	Male												122
	Female												124
Santa Monica City	Male												274
	Female												437
Santa Paula Union	Male												51
	Female												52
Santa Rosa	Male			125		25				6	34	190	198
	Female	73		100	3	15					14	204	237
Sebastopol, Analy Union	Male	5		5	3					19	40	72	156
	Female	111		56	6					24	19	216	229
Selma Union	Male												106
	Female												116
Sisson, Siskiyou Union	Male												19
	Female												2
South San Francisco	Male												83
	Female												6
Stockton	Male			154		197		28		5	361	748	795
	Female	321	43	239	2	113		2			639	1,559	1,746
Susanville, Lassen Union	Male					9						9	16
	Female												
Sutter Creek Union	Male												
	Female	25										25	41
Taft	Male												356
	Female												194
Tracy	Male												9
	Female												13
Tranquillity Union	Male					13						13	39
	Female					5						5	26
Tulare Joint Union	Male												345
	Female												92
Turlock Union	Male					2		37				39	39
	Female					3			1		1	5	5
Ukiah Union	Male				14							14	14
	Female	16			17							33	35
Vacaville Union	Male					32					17	49	50
	Female					5					30	35	44
Vallejo	Male												20
	Female												7
Venice Union	Male												145
	Female												129
Victorville Union	Male												7
	Female												7

Statistical Table XXVI—Continued.

A Study of Enrollment in Evening High Schools and Special Classes of High Schools Segregated According to Aim and Purpose of Study.

Location and name of school		1 Supplemental to home making	2 Preparatory to home making	3 Supplemental to occupations	4 Preparatory to other skilled occupations	5-A English for non-English-speaking persons	5-B Instruction for illiterate Americans	6 Preparatory to naturalization	7 Citizenship (advanced) other than courses 5-A and 6	8 College preparatory	9 Non-classified	10 Total number reported	11 Complete enrollment for year
Visalia Union	Male												46
	Female												4
Watsonville Union	Male												67
	Female												46
Weed, Siskiyou Union	Male												48
	Female												
Whittier Union	Male												
	Female												100
Total males		208	31	6,682	2,518	4,833	359	3,284	444	3,160	5,927	27,536	46,019
Total females		4,127	343	6,647	3,010	1,972	213	306	506	2,465	4,444	24,023	43,701
Total males and females		4,425	374	13,319	5,528	6,805	572	3,590	950	5,625	10,371	51,559	89,720

10—23130

Statistical Table XXVII.

SUMMARY OF TABLE XXVI.

Part I. General Statement.

Number of evening high schools, and day schools combined that maintained adult classes ---------- 142

Number of evening and day high schools that reported segregations of special students, according to purpose of study ---------- 62

	Males	Females	Total
Enrollment in evening high schools and in the classes for adults maintained by day high schools	46,019	43,701	89,720
Number of persons included in segregations, according to purpose, as reported by sixty-two evening high schools and day high schools that maintained adult classes, combined	27,536	24,023	61,559
Percentages of total enrollments, segregated and reported	59.8	55.0	48.7

Part II. Segregations According to Purpose of Study.

	1 Supplemental to home making	2 Preparatory to home making	3 Supplemental to other skilled occupations	4 Preparatory to other skilled occupations	5-A English for foreign-speaking persons	5-B Instruction for Illiterate Americans	6 Preparatory to naturalization	7 Citizenship (Reported other than in columns 5-A, 5-B and 6)	8 College preparatory	9 Non-classified	10 Total number reporting	11 Complete enrollment evening high schools and adult classes
Reported for sixty-two high schools that maintained adult education—Male	298	31	6,082	2,518	4,833	359	3,284	444	3,160	5,927	27,536	----------
Female	4,127	343	6,637	3,010	1,972	213	306	506	2,465	4,444	24,023	----------
Percentages, according to purpose, as reported—Male	1.1	.1	24.3	9.1	17.6	1.3	11.9	1.6	11.5	21.5	----------	----------
Female	17.2	1.4	27.6	12.5	8.2	.9	1.3	2.1	10.3	18.5	----------	----------
Estimated distribution of entire enrollment, according to purpose, by sexes—Male	506	46	11,183	4,188	8,099	538	5,476	736	5,292	9,895	----------	46,019
Female	7,517	612	12,061	5,463	3,583	393	568	918	4,501	8,085	----------	43,701
Estimated distribution of entire enrollment, according to purpose, both sexes	8,023	658	23,244	9,651	11,682	991	6,044	1,654	9,793	17,980	----------	89,720
Percentages according to purposes as reported, both sexes combined	9.0	.7	25.9	10.8	13.0	1.1	6.7	1.8	10.9	20.1	----------	----------

Part III. Analysis of Above Statistics Relating to Enrollment in Courses That Prepare For, or Supplement Occupations.

	Male	Female	Both
Home making:			
Enrollment	552	8,129	8,681
Percentage of enrollment in evening high schools and adult classes	1.2	18.6	9.6
Wage-earning occupations:			
Enrollment	15,371	17,524	32,895
Percentage of enrollment in evening high schools and adult classes	33.4	40.1	36.7
All lines of occupational work:			
Enrollment	15,923	25,653	41,576
Percentage of enrollment in evening high schools and adult classes	34.6	58.7	46.3
Entire enrollment in evening high schools and adult classes	46,019	43,701	89,720

Part IV. Analysis of Above Statistics as They Relate to Enrollment in Citizenship Courses.

	Male	Female	Both
A. Foreign-Born Group.			
English for illiterates:			
Number	8,099	3,583	11,682
Percentage of foreign-born group	59.7	86.3	65.9
Naturalization:			
Number	5,476	568	6,044
Percentage of foreign-born group	40.3	13.7	34.1
Total foreign-born group:			
Number	13,575	4,151	17,726
Percentage of citizenship group	91.0	76.0	87.0
Percentage of enrollment in evening high schools and adult classes	29.5	9.5	19.8
Entire enrollmemnt in evening high schools and adult classes	46,019	43,701	89,720
B. American-Born Group.			
English for American-born illiterates:			
Number	598	393	991
Percentage of American group	44.8	30.0	37.5
Percentage of entire enrollment	1.3	.9	1.1
Advanced course in citizenship:			
Number	736	918	1,654
Percentage of American group	55.2	70.0	62.5
Percentage of entire enrollment	1.6	2.1	1.8
C. Entire Group.			
Foreign and American-born groups combined:			
Number	14,909	5,462	20,371
Percentage of entire enrollment	32.4	12.5	22.7
Entire enrollment in evening high schools and adult classes	46,019	43,701	89,720

Enrollment of Persons in Courses that Relate to Home-Making.

Men enrolled in courses: Statistical Table 27 (a summary of Statistical Table 26) shows that between 500 and 600, or approximately one per cent of the men attending adult schools and classes pursued courses supplemental or preparatory to home-making. In some instances, these persons were pursuing manual arts courses for the purpose of fitting themselves to perform better the common mechanical duties of the home; in others, they were utilizing the school equipment to repair or build furniture.

Women enrolled in courses: Between 8000 and 9000, or approximately 19 per cent of the women attending adult schools and classes were pursuing courses designed to supplement home-making experience

or were preparing for home-making. Nearly 8 per cent of this number were not at the time engaged in home-making occupations, but in other occupational pursuits, mostly in commercial occupations. Most of these women were enrolled in the special day classes of high schools. Also, there appears to be a falling off in the total number of adult women pursuing home economics courses.

Enrollment of Persons in Courses that Relate to Wage-Earning Occupations.

Men enrolled in courses: 15,371, or more than 33 per cent of the men attending adult schools and classes were pursuing courses designed to prepare for, or to supplement trade, industrial, or commercial occupations. Two years ago, the report showed that 38 per cent were pursuing such courses. Thus there appears to be a falling off of 5 per cent.

Women enrolled in courses: 17,524, or more than 40 per cent of the women attending adult schools and classes were pursuing courses that prepared for or supplemented trade, industrial, and commercial occupations. This is a gain of 6 per cent over the number shown by the report of two years ago.

Total number of men and women pursuing wage-earning occupations: 32,895, or approximately 37 per cent of the persons enrolled in adult schools and classes were pursuing courses of instruction that prepared for or supplemented trade, industrial, or commercial occupations.

Total Enrollment of Persons, Men and Women, in Courses that Relate Both to Home-Making and to Wage-Earning Occupations.

Men pursuing occupational courses: 15,923, or nearly 35 per cent of the men enrolled in adult schools and classes were pursuing courses supplmenting home work or wage-earning occupations.

Women pursuing occupational courses: 25,653, or nearly 59 per cent of the women attending adult schools and classes were enrolled in courses that prepare for home-making or wage-earning occupations.

Total number of men and women pursuing occupational courses: 41,576, or more than 46 per cent of the persons, men and women, enrolled in adult schools and classes were pursuing courses of instruction preparing for home-making or other occupational work. The report of two years ago shows 40 per cent. Thus there has been a net gain of 6 per cent over two years ago.

Foreign-Born Persons Enrolled in Citizenship Courses.

Persons enrolled in courses: 17,726, or nearly 20 per cent of the persons attending adult schools and classes were persons of foreign birth pursuing courses of instruction designed to prepare for citizenship. Two years ago, a similar study showed 14 per cent. Thus there has been in this field of instruction a net gain of 6 per cent of the entire high school enrollment.

Of this number, 13,575, or nearly 77 per cent were men, and 4151, or over 23 per cent were women. Two years ago, 83 per cent were men and 17 per cent were women, which shows a net gain of 6 per cent for women and a corresponding decrease for men. The two percentages should approximately balance. Perhaps the number of men will always

be larger because the number of male immigrants somewhat exceeds the number of female immigrants.

Foreign-Born Persons Studying English and Naturalization.

Of the 17,726 foreign-born persons pursuing citizenship instruction, 11,682, or approximately 66 per cent were pursuing courses designed to remove language deficiencies, and 6044, or approximately 34 per cent were pursuing courses designed to prepare for naturalization examinations. The relative distribution of persons in the two types of work mentioned above is exactly the same as that reported two years ago.

While the relative number of foreign-born women pursuing courses designed to prepare for citizenship is small, there has been a distinct gain in this direction. Undoubtedly, there is still further opportunity to promote citizenship instruction for women.

American-Born Persons Enrolled in Citizenship Courses.

Persons enrolled in courses: 991, or approximately one per cent of the persons enrolled in adult schools and classes were American-born persons pursuing courses designed to remove language deficiencies; 393 of these persons were women, and 598 were men. The report of two years ago shows that 2¾ per cent of the entire enrollment of evening high schools were pursuing such courses. Either we have greatly reduced illiteracy, or our interest in the matter has slumped. These figures would indicate that high school authorities should investigate the matter, to find out exactly what the condition is. As stated before, illiteracy in an American community is intolerable, and is a reflection upon the school authorities unless they are exerting every effort to eliminate it.

Statistical Table XXVIII.

AGE SEGREGATION BY YEARS.

Persons Enrolled in Day and Evening Adult Schools and Classes.

	16 to 17	17 to 18	18 to 19	19 to 20	20 to 21	Over 21	To al reported	Complete enrollment
Reported for thirty-nine evening and forty-nine day high schools:								
Male	637	690	1,817	1,936	2,311	21,561	28,952	.....
Female	352	449	1,244	1,530	1,806	20,897	26,278	.....
Percentages of each age reported:								
Male	2.3	2.5	6.3	6.8	8.1	74.0	100.0	.....
Female	1.4	1.9	4.8	5.9	7.0	79.0	100.0	.....
Estimated age distribution of entire enrollment, by sexes:								
Male	1,058	1,150	2,899	3,129	3,728	34,055	.....	46,019
Female	612	830	2,098	2,578	3,059	34,524	.....	43,701
Estimated age distribution, both sexes	1,670	1,980	4,997	5,707	6,787	68,579	.....	89,720
Estimated percentages of each age, both sexes	1.9	2.4	5.6	6.4	7.7	76.0	.....	100.0

DIVISION V.

FINANCIAL REPORT VOCATIONAL EDUCATIONAL FUNDS.

STATISTICAL TABLE XXIX.

FINANCIAL REPORT OF RECEIPTS AND EXPENDITURES OF THE VOCATIONAL EDUCATION FUND OF THE STATE OF CALIFORNIA FOR THE FISCAL YEAR ENDING JUNE 30, 1921.

Item 1. Summary of Receipts and Expenditures During the Year 1920-21.

Item	Agriculture: For salaries of teachers, supervisors, and directors	Trade, industry, and home economics: For salaries of teachers	Teacher-training: For maintenance of teacher-training, including supervisors	Totals
Receipts and Expenditure of Federal Money.				
1. Balance of federal money in state treasury July 1	----------	$6,020 54	----------	$6,020 54
2. Receipts of federal money during the year:				
First quarter	$5,748 67	4,839 43	$6,486 01	17,074 11
Second quarter	5,748 67	10,859 97	6,486 02	23,094 66
Third quarter	5,748 68	10,859 98	6,486 04	23,094 70
Fourth quarter	5,748 68	10,859 98	6,486 03	23,094 69
3. Total of balance and receipts (1 plus 2)	$22,994 70	$43,439 90	$25,944 10	$92,378 70
4. Expenditure of federal money for reimbursement of expenditures from state and local funds	22,994 70	41,708 79	25,944 10	90,647 59
5. Unexpended balance of federal money in state treasury June 30 (3-4)	----------	$1,731 11	----------	$1,731 11
Expenditure from State Fund.				
6. Balance of state money in state treasury	----------	$6,020 54	----------	$6,020 54
7. Receipts of state money:				
First quarter	$5,748 67	4,839 43	$6,486 01	17,074 11
Second quarter	5,748 67	10,859 97	6,486 02	23,094 66
Third quarter	5,748 68	10,859 98	6,486 04	23,094 70
Fourth quarter	5,748 68	10,859 98	6,486 03	23,094 69
8. Total of balance and receipts	$22,994 70	$43,439 90	$25,944 10	$92,378 70
9. Expenditure of state money for reimbursement of expenditures from state and local funds	22,994 70	41,708 79	25,944 10	90,647 59
10. Unexpended balance of state money in state treasury June 30	----------	$1,731 11	----------	$1,731 11
Total Expenditures.				
11. From federal and state funds	$45,989 40	$83,417 58	$51,888 20	$181,295 18

Statistical Table XXIX—Continued.

Item 2. Summary of Expenditures from State and Federal Funds for Supervision and Salaries of Teachers, for the Year Ending June 30, 1921.

Classification of expenditures	From state funds	From federal funds	Totals
1. Teacher-training: For maintenance of teacher-training, including supervision—			
a. In agriculture	$7,510 87	$7,510 87	$15,021 74
b. In trade and industry	12,484 055	12,484 055	24,968 11
c. In home economics	5,949 175	5,949 175	11,898 35
Totals (a, b, c)	$25,944 10	$25,944 10	$51,888 20
2. Agriculture: For salaries—			
a. Of supervisors of agriculture	$1,800 00	$1,800 00	$3,600 60
b. Of teachers of agriculture	21,194 70	21,194 70	42,389 40
Totals (a, b)	$22,994 70	$22,994 70	$45,989 40
3. Trade, industry, and home economics: For salaries—			
A. Of teachers of trade or industrial subjects:			
a. In evening schools			
b. In part-time schools	$1,013 81	$1,013 81	$2,027 62
c. In all-day schools	25,917 15	25,917 15	51,834 30
Totals (a, b, c)	$26,930 96	$26,930 96	$53,861 92
B. Of teachers of home economics subjects:			
a. In evening schools			
b. In part-time schools	$5,645 20	$5,645 20	$11,290 40
c. In all-day schools	3,042 78	3,042 78	6,085 56
Totals (a, b, c)	$8,687 98	$8,687 98	$17,375 96
C. Of teachers in general continuation part-time schools	$6,089 85	$6,089 85	$12,179 70
Totals (A, B, C)	$41,708 79	$41,708 79	$83,422 58
Totals (1, 2, 3)	$90,647 59	$90,647 59	$181,300 18

Item 3. Summary of Expenditures for Maintenance of Teacher-Training by Institutions and by State Board, including Expenditures by State Board for Maintenance of Supervision, for the Year Ending June 30, 1921.

Name of institution	Kind of teachers trained	From state funds	From federal funds	Totals
University of California	Agricultural	$6,674 59	$6,674 59	$13,349 18
State Board of Education	Agricultural	836 28	836 28	1,672 56
University of California	Trade and industrial	7,161 18	7,161 18	14,322 36
State Board of Education	Trade and industrial	877 025	877 025	1,754 05
University of California (Southern Branch)	Trade and industrial	3,568 825	3,568 825	7,137 65
State Board of Education	Trade and industrial	877 025	877 025	1,754 05
University of California (Southern Branch)	Home economics	1,154 74	1,154 74	2,309 48
State Normal, Chico	Home economics	478 14	478 14	956 28
State Normal, Fresno	Home economics	142 53	142 53	285 06
State Normal, San Diego	Home economics	868 49	868 49	1,736 98
State Normal, San Jose	Home economics	320 66	320 66	641 32
State Normal, Santa Barbara	Home economics	281 47	281 47	562 94
State Board of Education	Home economics	2,703 145	2,703 145	5,406 29
Totals		$25,944 10	$25,944 10	$51,888 20

STATISTICAL TABLE XXIX—Continued.

Item 4. Summary of Expenditures for All Teacher-Training. (Agriculture, Home Economics, and Trade and Industry), for the Year Ending June 30, 1921.

Item	From state funds	From federal funds	Totals
1. (a) Salaries of supervisors	$5,425 00	$5,425 00	$10,850 00
(b) Salaries of teachers	13,045 025	13,045 025	26,090 05
2. Clerical service	3,633 76	3,633 76	7,267 52
3. Light, heat and postage	216 57	216 57	433 14
4. Travel	1,876 63	1,876 63	3,753 26
5. Communication	141 735	141 735	283 47
6. Rent, sundries	7 695	7 695	15 39
7. Printing	1,198 82	1,198 82	2,397 64
8. Supplies	388 365	388 365	776 73
9. Janitor service	10 50	10 50	21 00
Totals	$25,944 10	$25,944 10	$51,888 20

Item 5. Summary of Expenditure for Training Teachers of Agriculture, for the Year Ending June 30, 1921.

Item	From state funds	From federal funds	Totals
1. (a) Salaries of supervisors	$1,875 00	$1,875 00	$3,750 00
(b) Salaries of teachers	2,988 295	2,988 295	5,976 59
2. Clerical service	959 895	959 895	1,919 79
3. Light, heat and postage	39 05	39 05	78 10
4. Travel	1,077 095	1,077 095	2,154 19
5. Communication	10 565	10 565	21 13
6. Rent, sundries	9 64	9 64	19 28
7. Printing	447 495	447 495	894 99
8. Supplies	103 835	103 835	207 67
9. Janitor service			
Totals	$7,510 87	$7,510 87	$15,021 74

Item 6. Summary of Expenditure for Training Teachers of Trades and Industries, for the Year Ending June 30, 1921.

Item	From state funds	From federal funds	Totals
1. (a) Salaries of supervisors	$1,750 00	$1,750 00	$3,500 00
(b) Salaries of teachers	6,810 70	6,810 70	13,621 40
2. Clerical service	2,368 54	2,368 54	4,737 08
3. Light, heat and postage	152 085	152 085	304 17
4. Travel	234 93	234 93	469 86
5. Communication	128 375	128 375	256 75
6. Rent	7 695	7 695	15 39
7. Printing	739 00	739 00	1,478 00
8. Supplies	282 23	283 23	564 46
9. Janitor service	10 50	10 50	21 00
Totals	$12,484 055	$12,484 055	$24,968 11

STATISTICAL TABLE XXIX—Continued.

Item 7. Summary of Expenditure for Training Teachers of Home Economics, for the Year Ending June 30, 1921.

Item	From state funds	From federal funds	Totals
1. (a) Salaries of supervisors	$1,800 00	$1,800 00	$3,600 00
(b) Salaries of teachers	3,246 03	3,246 03	6,492 06
2. Clerical service	305 325	305 325	610 65
3. Light, heat and postage	18 095	18 095	36 19
4. Travel	564 605	564 605	1,129 21
5. Communication	2 795	2 795	5 59
6. Rent			
7. Printing	12 325	12 325	24 65
8. Supplies			
9. Janitor service			
Totals	$5,949 175	$5,949 175	$11,898 35

STATISTICAL TABLE XXX.

FINANCIAL REPORT OF RECEIPTS AND EXPENDITURES OF THE VOCATIONAL EDUCATION FUND OF THE STATE OF CALIFORNIA FOR THE FISCAL YEAR ENDING JUNE 30, 1922.

Item 1. Summary of Receipts and Expenditures During the Year 1921-22.

Item	Agriculture: For salaries of teachers, supervisors, and directors	Trade, industry, and home economics: For salaries of teachers	Teacher-training: For maintenance of teacher-training, including supervisors	Totals
Receipts and Expenditure of Federal Money.				
1. Balance of federal money in state treasury July 1		$1,731 11		$1,731 11
2. Receipts of federal money during the year:				
First quarter	$7,989 22	14,500 66	$8,138 03	30,627 92
Second quarter	7,989 23	16,231 77	8,138 03	32,359 03
Third quarter	7,989 23	16,231 77	8,138 03	32,359 03
Fourth quarter	7,989 24	16,231 78	8,138 03	32,359 05
3. Total of balance and receipts (1 plus 2)	$31,956 93	$64,927 09	$32,552 12	$129,436 14
4. Expenditure of federal money for reimbursement of expenditures from state and local funds	31,956 93	64,927 09	30,697 88	127,581 90
5. Unexpended balance of federal money in state treasury June 30 (3-4)			$1,854 24	$1,854 24
Expenditure from State Fund.				
6. Balance of state money in state treasury July 1		$1,731 11		$1,731 11
7. Receipts of state money during the year:				
First quarter	$7,989 23	14,500 66	$8,138 03	30,627 92
Second quarter	7,989 23	16,231 77	8,138 03	32,359 03
Third quarter	7,989 23	16,231 77	8,138 03	32,359 03
Fourth quarter	7,989 24	16,231 78	8,138 03	32,359 05
8. Total of balance and receipts	$31,956 93	$64,927 09	$32,552 12	$129,436 14
9. Expenditure of state money for reimbursement of expenditures from state and local funds	31,956 93	64,927 09	30,697 88	127,581 90
10. Unexpended balance of state money in state treasury June 30			$1,854 24	$1,854 24
Total Expenditure.				
11. From federal and state funds	$63,913 86	$129,854 18	$61,395 76	$255,163 80

STATISTICAL TABLE XXX—Continued.

Item 2. Summary of Expenditures from State and Federal Funds for Supervision and Salaries of Teachers, for the Year Ending June 30, 1922.

Classification of expenditures	From state funds	From federal funds	Totals
1. Teacher-training: For maintenance of teacher-training, including supervision—			
a. In agriculture	$9,183 96	$9,183 96	$18,367 92
b. In trade and industry	14,137 09	14,137 09	28,274 18
c. In home economics	7,376 83	7,376 83	14,753 66
Totals (a, b, c)	$30,697 88	$30,697 88	$61,395 76
2. Agriculture: For salaries—			
a. Of supervisors of agriculture	$2,100 00	$2,100 00	$4,200 00
b. Of teachers of agriculture	29,856 93	29,856 93	59,713 86
Totals (a, b)	$31,956 93	$31,956 93	$63,913 86
3. Trade, industry, and home economics: For salaries—			
A. Of teachers of trade or industrial subjects:			
a. In evening schools			
b. In part-time schools	$950 66	$950 66	$1,901 32
c. In all-day schools	36,403 91	36,403 91	72,807 82
Totals (a, b, c)	$37,354 57	$37,354 57	$74,709 14
B. Of teachers of home economics subjects:			
a. In evening schools			
b. In part-time schools	$8,845 34	$8,845 34	$17,690 68
c. In all-day schools	4,140 07	4,140 07	8,280 14
Totals (a, b, c)	$12,985 41	$12,985 41	$25,970 82
C. Of teachers in general continuation part-time schools	$14,587 11	$14,587 11	$29,174 22
Totals (A, B, C)	$64,927 09	$64,927 09	$129,854 18
Totals (1, 2, 3)	$127,581 90	$127,581 90	$255,163 80

Item 3. Summary of Expenditure for Maintenance of Teacher-Training by Institutions and by State Board, Including Expenditures by State Board for Maintenance of Supervision, for the Year Ending June 30, 1922.

Name of institution	Kinds of teachers trained	From state funds	From federal funds	Totals
University of California	Agricultural	$8,259 94	$8,259 94	$16,519 88
State Board of Education	Agricultural	924 02	924 02	1,848 04
University of California	Trade and industrial	7,536 575	7,536 575	15,073 15
State Board of Education	Trade and industrial	1,233 625	1,233 625	2,467 25
University of California (Southern Branch)	Trade and industrial	4,358 265	4,358 265	8,716 53
State Board of Education	Trade and industrial	1,008 625	1,008 625	2,017 25
University of California (Southern Branch)	Home economics	1,074 75	1,074 75	2,149 50
State Teachers College, Chico	Home economics	577 50	577 50	1,155 00
State Teachers College, Fresno	Home economics	178 725	178 725	357 45
State Teachers College, San Diego	Home economics	369 15	369 15	738 30
State Teachers College, San Jose	Home economics	371 25	371 25	742 50
State Teachers College, Santa Barbara	Home economics	130 80	130 80	261 60
University of California	Home economics*	1,470 22	1,470 22	2,940 44
State Board of Education	Home economics	3,204 435	3,204 435	6,408 87
Totals		$30,697 88	$30,697 88	$61,395 76

*P.-T. instructors.

Statistical Table XXX—Continued.

Item 4. Summary of Expenditure for all Teacher-Training. (Agriculture, Home Economics, and Trade and Industry), for the Year Ending June 30, 1922.

Item	From state funds	From federal funds	Totals
1. (a) Salaries of supervisors	$4,014 56	$4,014 56	$8,029 12
(b) Salaries of teachers	16,672 355	16,672 355	33,344 71
2. Clerical service	3,344 285	3,344 285	6,688 57
3. Light, heat and postage	410 145	410 145	820 29
4. Travel	3,079 89	3,079 89	6,159 78
5. Communication	188 65	188 65	377 30
6. Rent, sundries	489 715	489 715	979 43
7. Printing	2,017 435	2,017 435	4,034 87
8. Supplies	469 845	469 845	939 69
9. Janitor service	11 00	11 00	22 00
Totals	$30,697 88	$30,697 88	$61,395 76

Item 5. Summary of Expenditure for Training Teachers of Agriculture, for the Year Ending June 30, 1922.

Item	From state funds	From federal funds	Totals
1. (a) Salaries of supervisors	$1,671 50	$1,671 50	$3,343 00
(b) Salaries of teachers	4,264 56	4,264 56	8,529 12
2. Clerical service	562 365	562 365	1,124 73
3. Light, heat and postage	65 55	65 55	131 10
4. Travel	1,658 225	1,658 225	3,316 45
5. Communication			
6. Rent, sundries	421 455	421 455	842 91
7. Printing	500 38	500 38	1,000 76
8. Supplies	39 925	39 925	79 85
9. Janitor service			
Totals	$9,183 96	$9,183 96	$18,367 92

Item 6. Summary of Expenditure for Training Teachers of Trades and Industries, for the Year Ending June 30, 1922.

Item	From state funds	From federal funds	Totals
1. (a) Salaries of supervisors	$162 00	$162 00	$324 00
(b) Salaries of teachers	8,235 45	8,235 45	16,470 90
2. Clerical service	2,355 67	2,355 67	4,711 34
3. Light, heat and postage	310 645	310 645	621 29
4. Travel	880 49	880 49	1,760 98
5. Communication	188 65	188 65	377 30
6. Rent	68 26	68 26	136 52
7. Printing	1,495 005	1,495 005	2,990 01
8. Supplies	429 92	429 92	859 84
9. Janitor service	11 00	11 00	22 00
Totals	$14,137 09	$14,137 09	$28,274 18

STATISTICAL TABLE XXX—Continued.

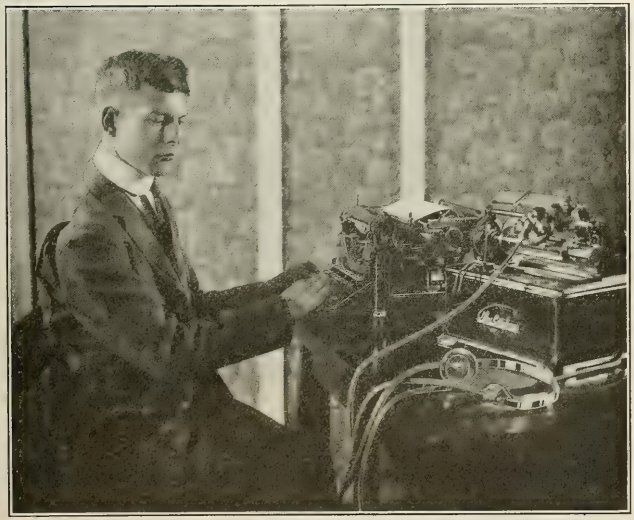
Item 7. Summary of Expenditures for Training Teachers of Home Economics, for the Year Ending June 30, 1922.

Item	From state funds	From federal funds	Totals
1. (a) Salaries of supervisors	$2,181 06	$2,181 06	$4,362 12
(b) Salaries of teachers	4,094 225	4,094 225	8,188 45
2. Clerical service	504 37	504 37	1,008 74
3. Light, heat and postage	33 95	33 95	67 90
4. Travel	541 175	541 175	1,082 35
5. Communication			
6. Rent	22 05	22 05	44 10
7. Printing			
8. Supplies			
9. Janitor service			
Totals	$7,376 83	$7,376 83	$14,753 66

CALIFORNIA STATE BOARD OF EDUCATION

The Vocational Rehabilitation of Disabled Persons

PART II OF THE REPORT
OF THE
COMMISSIONER OF INDUSTRIAL
and
VOCATIONAL EDUCATION
For the Biennial Period Ending
June 30, 1922



LETTER OF TRANSMITTAL.

November 6, 1922.

The Honorable State Board of Education,
Sacramento, California.

LADIES AND GENTLEMEN:

Pursuant to law and at your request, I hereby submit to you Part II of the Annual Report of the Commissioner of Industrial and Vocational Education for the biennial period ending June 30, 1922.

This part of the report deals exclusively with the subject of vocational rehabilitation of disabled persons.

Very respectfully yours,

EDWIN R. SNYDER,
Commissioner of Industrial and Vocational Education.



Loss of Vision Is Proving No Obstacle to This Enthusiastic Young Artist Who Will Soon Be Ready for Concert Engagements. (See Case I, page 186.)

ACKNOWLEDGMENT.

The matter contained in the body of this report was prepared by William M. Coman, State Supervisor of Vocational Rehabilitation.

The Rehabilitation Act has been in actual operation only a little over eight months. The progress made in developing this most difficult service has, in the opinion of your Commissioner, been a remarkable achievement, and is due in large measure to the persons chosen by you to man the different offices maintained.

As director of the service in this State, I wish to express to the members of the State Board of Education, to the Superintendent of Public Instruction, to Supervisor William M. Coman, to Assistant Supervisors J. M. Dodd and H. D. Hicker, to Training Officers F. M. Ballard and J. B. Thomas, and to their assistants, my appreciation for their splendid cooperation in advancing the work of rehabilitation in this State.

I wish also to express my appreciation to the members of the Industrial Accident Commission for their encouraging cooperation and assistance in the work.

EDWIN R. SNYDER,
Commissioner.



One Does Not Need to Hear in Order to Be a Satisfied and Happy Dental Mechanic.
(See Case II, page 186.)



Paralyzed from the Waist Down, This Man Now Earns His Living. (See Case III, page 186.)

FOREWORD.

From the beginning the scope of public education in America has been constantly changing. Scarcely had the elementary schools been placed on a firm foundation before the inclusion of high schools in the system became a burning issue. And although secondary schools have now become a fundamental part of the common school system, there are still some who question the justice of taxing the public for their support.

Within the last decade free educational opportunities have been provided for adults through the maintenance of evening schools and special classes in the high schools of the State. And now the scope of public education has been expanded to provide for the re-education of persons who have lost their occupational opportunities through disability.

Since the function of public education is to prepare for efficient citizenship, this broadening of its scope is fully justified. The citizenship of a person is incomplete if he does not contribute to the welfare of society by performing some useful work.

At last we have reached the stage in our educational development where neither age nor physical defect are permitted to stand in the way of the individual who desires to secure at public expense the education that is necessary to prepare him to become a good and efficient citizen.

The need for the service of vocational rehabilitation can better be understood when we take into consideration the fact that during the fiscal year ending June, 1921, the Industrial Accident Commission of the State reported 125,529 cases of injury. Of this number 1643 were permanently injured.

It is estimated that only about one-third of the persons injured in this State are subject to the benefits of the industrial accident laws. It would appear, then, that approximately 375,000 persons are injured annually in this State, and that 5000 are permanently disabled. It is with this 5000 that the Vocational Rehabilitation Act is concerned.

In the past a large proportion of those who were injured became charges upon relatives, charitable organizations or publicly supported hospitals; or they became beggars, earning a competence by posting themselves on the streets or going from door to door selling to people commodities for which they had no use. In most instances these persons have ceased to become real producers and have become liabilities to their relatives and friends, their communities and their State.

Vocational rehabilitation is the science and art of transforming these liabilities into social assets. How well California is succeeding with the program can be determined by a perusal of this report.

Dependency is usually as irksome to the individual as it is unprofitable to the public. The following extract from a letter written to this department by a beneficiary of the act expresses unusually well the feeling of gratitude that results from escape from dependency through successful rehabilitation. This person had suffered injury to his left hand and was prepared for and secured employment as an automobile salesman at a salary of $150 per month.

> "I feel greatly indebted to your Commission and the Division at San Francisco. They are symbolic of the progress of our State and its civilization. It, indeed, appears to me, that there is very little

reason for the unfortunate becoming charges upon the State, with such an institution as the Commission of Vocational Education at their disposal. It provides opportunities to those who had none before, and so blazes the trail to the dawning of the new age of universal opportunity for all.

"My earnest hope and wish is that your Commission may grow to endless bounds, and that it may be overwhelmed with the success its efforts are bound to justify in both the present and future of human events."

FEDERAL STATE REHABILITATION ACTS PASSED.

During the period of the late war there were introduced in Congress measures providing Federal funds for the rehabilitation of persons injured in the military service of the United States and persons injured in industry. The measures were amended by striking out the provision for the rehabilitation of civilians, and in due time passed.

Those interested in the subject of vocational rehabilitation for persons injured in civil life still continued to press the matter with the result that the Sixty-sixth Congress passed an act appropriating a million dollars per annum for the four successive fiscal years beginning June 30, 1920, and ending June 30, 1924.

There being no session of the legislature in 1920, California was unable to take advantage of the act for the first year. However, in 1921 the legislature passed an act accepting the provisions and benefits of the Federal Act and making an appropriation of $35,000 per annum for the fiscal years ending June 30, 1922, 1923, and 1924.

The State Board of Education administers these acts through the Commissioner of Vocational Education.

The organization maintained for the promotion of the work is as follows: a general state and district office at Sacramento; a district office at San Francisco; and a district office at Los Angeles.

A State Supervisor of Vocational Rehabilitation is employed who, under the general direction of the Commissioner of Vocational Education, has charge of the entire State service. The San Francisco and Los Angeles offices are each manned by an assistant supervisor and a training officer.

The Sacramento office was opened on August 3, 1921; the San Francisco office on September 6, 1921; and the Los Angeles office on October 17, 1921.

RECOMMENDATION.

The first year of the operation of the Rehabilitation Act has closed with 258 disabled persons receiving instruction designed to prepare them for profitable employment.

The funds available for the promotion of the work, for the past year, totalled $67,552.12. Of this amount $43,832.97 has been expended.

It took some time for the department to organize and get started, also the case of each person placed in training had to be investigated and studied. This required considerable time. Thus the attendance mentioned above has been built up gradually during the year's operation of the act.

It is estimated that the $67,552.12 available for the coming year will enable the department to maintain in training a constant enrollment, during the year, of approximately 300 persons.

The training officers have already stopped special recruiting; and it will be but a few weeks until they will have to deny to many injured persons the opportunity to secure at public expense the special training necessary for re-entry into skilled employment.

It appears, then, that we will need additional funds if we are to provide free instruction for all of the injured that desire and can profit by the same.



A Promising Young Illustrator Serenely Faces the Future Since Overcoming Her Physical Handicap.
(See Case IV, page 186.)

Our experience to date would indicate that if we had available funds we could, in a short time, have in training a constant army of 1000 injured persons. And, since on the average it takes less than a year to rehabilitate such persons, we could annually turn back to profitable occupations, almost 1000 persons.

The present Federal law provides, for the State of California, $32,552.12 per annum for the fiscal years ending 1923 and 1924. The State act appropriates $35,000 per annum for each of these two years. It will, therefore, be necessary for us to secure, during the coming

session, further legislation if we are to continue this service after the above date.

Representatives of the Federal Board for Vocational Rehabilitation assure us, that, in their opinion, Congress will re-enact the present law, and that it may increase the appropriation. In any case, we are of the opinion that your Honorable Body should ask the legislature to make the appropriations necessary for gradually expanding this service until all injured persons in the State, capable of rehabilitation, have been given the opportunity to secure, free of cost, the necessary educational service to prepare them for self-support.



Confined to a Wheel-Chair for Life, This Courageous Trainee Looks Forward to Self-employment As a Public Stenographer.
(See Case V, page 186.)

In our opinion, it would take some time to fully develop the service. It would not, therefore, be necessary to provide for the coming year funds to carry 1000 cases. The service can, however, be easily expanded to such extent as to enable us to profitably utilize more than $100,000 for the fiscal year ending 1924, and more than $130,000 for the fiscal year ending 1925. Since we are sure to receive from the Federal Government $32,552.12 for the fiscal year ending 1924, and since, in all probability, we will receive a like amount for the following years, I recommend that you ask the legislature to provide $70,000 for use during the

fiscal year ending 1924, and $100,000 for each fiscal year thereafter. With such a provision, failure on the part of the Federal Government to continue the appropriation for the year ending June 30, 1925, would not interfere with our carrying the same load during that year as was carried the year next preceding.

GENERAL REPORT FOR CALIFORNIA.

There are in the State of California thousands of persons whose opportunities for regular employment have been seriously reduced, if not eliminated, by the misfortune of injury, disease, or physical defect. Through maladjustment or lack of proper training some of these are earning nothing or next to nothing, while others have frankly given up the unequal struggle against overwhelming odds. Through no fault of their own they are inefficient misfits in a busy world. They do not seek sympathy; they want a chance.

Persons, many of whom had already established themselves in life and were the sole support of their families, have suddenly found the occupation upon which they depended for a livelihood swept away by accidents or illness while performing their duties as citizens of the republic. Most of them, if able to work at all, have been forced to accept inferior positions and their families have been denied the income and mode of life to which they were accustomed and are rightfully entitled. Higher education for more than one young person has been cut short and a promising career irrevocably blighted by stern necessity which followed close upon industrial disaster. Delicate women with small children have been forced to seek employment in the most disagreeable drudgery in order that their little ones might not suffer.

Young men and women with all of life before them find themselves suddenly robbed of all hope of ever taking their place in life with those who are privileged to work and support themselves and their families. The tragedy of such cases can not longer go unchallenged. To illustrate: a young man of seventeen, the support of a widowed mother, left home to secure employment in a mountain box factory where better wages offered the possibility for a margin of savings. Three weeks later he returned to his home and mother minus his right hand. Seriously handicapped, he now hopelessly faces the world without resources or occupation. New hope must be instilled within him and he must be re-educated in such a manner as to enable him to again take his rightful place with others in the work of the world. It is for the rehabilitation of such as these that California maintains the service.

THE PURPOSE OF VOCATIONAL REHABILITATION.

For many centuries human life and effort have been the cheapest of all cheap commodities and the men and women worn out or broken in the wheels of industry have been ruthlessly cast upon the scrap-heap—a nuisance to themselves, a charge upon society, and a clog in national progress. Improved working conditions and humane laws have done much to reduce the possibility for injury, but the manifold expansion of modern industry has nevertheless created an ever-increasing flood of human wreckage. The logical answer is "vocational rehabilitation," the newest phase of social engineering. It is based upon sound economic principles and has for its purpose the reclamation for society of all disabled persons.

Vocational rehabilitation is the readjustment or re-training of physically handicapped persons for suitable remunerative tasks. However, rehabilitation should not be thought of as merely vocational education. Its scope is far broader and its purpose may be achieved in part by restoration of impaired physical function, by the furnishing of properly

designed mechanical appliances, by the stimulation of moral courage which will capitalize unused knowledge, or by placement in a suitable job. An opportunist by nature, the successful rehabilitation worker studies each individual problem, and utilizes all factors which will contribute to the future success of the individual without undue sacrifice of previous education or occupational experience.

Many self-reliant cripples have surmounted every obstacle through sheer pluck and perseverance, but the average injured person requires assistance in bridging the chasm which lies between the old and the new conditions of life. When a worker suffers the loss of physical functions which he has always considered indispensable to his work, he falls an easy prey to gloomy forebodings and frequently drifts into a long period of inactivity and despondency which can only result in spiritual



Lack of Legs Is Only a Slight Handicap to An Electrical Engineer. (See page 168.)

loss to the man and serious economic loss to the community. The deterioration is easy, and from the special consideration exacted from sympathetic friends he comes to demand a living from society. The product is seen upon the streets of all our large cities. If, on the other hand, regeneration begins at the hospital, moral courage returns and the healing of mind and body proceeds rapidly.

As indicative of the enthusiastic spirit with which a convalescent enters into his own reconstruction, may be cited the case of a bright young man who lost both legs as the result of a high-voltage power accident. Although confined to his bed or a wheel chair at the hospital, he awaited the coming of the rehabilitation agent with ill-concealed impatience and entered into the discussion of future plans with zest. Following a careful analysis of all factors, it was decided that his experience as a lineman should be capitalized in the study of electrical

engineering. Competent tutorial instruction at the hospital was inaugurated without delay, and all the pent-up energy of idle weeks drove rehabilitation forward. Splendid progress was achieved, and even before artificial limbs could be fitted he was transferred to a technical school where special instruction in mathematics and mechanical drawing could be carried on at his room. He is now enrolled in regular classes and has established for himself an enviable reputation as a student. Following the completion of his training program a position as junior engineer awaits him with his former employers. As a lineman without technical knowledge he had reached the limit, but as an engineer almost limitless opportunity lies before him.

As a basic principle, society demands that each individual shall contribute to his self-support the full measure of his mental and physical



A Clever Show-Card Writer Who Has Attained Success Following the Loss of An Arm.
(See page 170.)

capacity; and by the same principle society as a whole is morally obligated to provide for each disabled person an opportunity for re-training and proper employment which will secure maximum economic independence. That this obligation has been accepted is evidenced by the Federal and State Rehabilitation Acts which provide for the promotion of vocational rehabilitation of persons disabled in industry or otherwise, and their return to useful employment.

DOES REHABILITATION PAY?

The wealth of the State rests upon the productive activities of all its people. Any unproductive factor creates a burden which must be borne by the remainder. Under most circumstances the disabled person becomes a liability, when he could be trained to support himself and to

contribute to society his just share as a producer. In fact, a large percentage of handicapped persons have been unable to produce anything and many others have been able to produce only a small part of their maintenance through occasional odd jobs. On the other hand, rehabilitation usually means satisfactory re-employment of the person who is earning little or nothing. Frequently it means the substitution of skilled for unskilled occupations. As a rule the skilled workman receives about double the wages paid the unskilled laborer.

Proper readjustment and scientific re-training for new types of work restore the injured craftsman to full earning capacity and the privations incidental to the acceptance of inferior positions at reduced pay are unknown at his fireside. He is able to maintain the usual standards of living and his children are given that opportunity for self-expression which has been accepted as the inherent right of the American youth. Discouragement and dissatisfaction have no place in the rehabilitated workman's daily routine and he returns enormous interest upon the small investment made in his behalf.

In many instances handicapped persons have been returned to occupations where their services command higher wages than at the time of injury. The community is richer as a result. By way of example, a young man lost his left arm at the shoulder while employed as a pump tender. During the conference with a representative of the Division he exhibited considerable interest in sketching and it was agreed that he should receive training as a show-card writer. Following a nine months' course of instruction he is now not only doing artistic work as a card writer, but is also developing considerable skill as a painter of posters. He has already been offered a position which pays thirty dollars per week at the start, with promise of advances up to fifty dollars per week as his skill increases.

The public loses, not only through the interrupted production of injured persons but also through the cost of public and private assistance rendered to such persons. Unimpaired men and women consume about all that they can produce under usual conditions so it cannot be expected that persons will be fully self-supporting following injury. Families of injured persons are now usually supported in whole or in part by relatives, or by public or semi-public charities. As a fundamental principle it is cheaper for the State to re-train its disabled citizens for suitable remunerative employment than to continue the payment of inadequate charities over an indefinite period of time.

Unproductive jobs have been created by humane employers to take care of employees injured within the establishment. The public pays the bill. Others are eking out a precarious existence going about from house to house selling to sympathetic people articles which are neither necessary nor desired. Our city streets are lined with disabled mendicants, most of whom are capable of earning an honest living. The thoughtless giving of alms has intrenched them in a life of comparative ease. As an illustration of the fact, the case may be cited of a young man who lost his right foot at the ankle. He now sits in a sheltered nook upon the streets of a large city and importunes the public for aid. He has mental capacity and the personal qualities which should guarantee success in any legitimate undertaking; yet to repeated offers of assistance he has invariably replied: "Why should I learn to work

when I can make ten dollars a day in a few hours on the street?" And again the public pays the bill.

If, however, such characters can be rescued before they have degenerated into the "professional" beggar class, the possibilities for rehabilitation are excellent. Several have been redeemed with the most gratifying results. As a case in illustration of this type may be mentioned that of a young man who lost his leg above the knee as the result of an accident in an eastern coal mine. Following discharge from the hospital, he drifted to California and when interviewed by



A Deaf and Dumb Eskimo with Terribly Deformed Hands Is Developing an Unusual Talent for Commercial Art.
(See Case VIII, page 187.)

a representative of the Division he was begging upon the streets. He was enrolled for instruction in photographic retouching and went to work with an enthusiasm which augured well for future success. He has now completed the course of training and has been placed on a job at good wages.

Total blindness may appear to be an insurmountable obstacle and there has been a consistent disposition upon the part of the public to maintain blind persons in idleness. Nothing could be more detrimental. Experience has demonstrated that such persons are happier when employed and self-supporting. A wide variety of suitable occupations

lies open to them and there remains but the education of the public and employers to a recognition of the fact that blind labor is competent and economically profitable.

A young woman, totally blind and an object of charity from birth, was further handicapped by a very meager education. She was ambitious, however, and it was believed that she could be trained as a dictaphone operator. After seven months of training at an approximate total cost to the State of $200, she successfully passed the State Civil Service examination and is now employed with the California Industrial Accident Commission at ninety dollars per month. Her



From Pencil Vending to Photographic Retouching—A Pictorial Story of Attainment. (See page 171.)

happiness in the first remunerative work of a life-time and her gratitude for the opportunity extended are best expressed in her own words:

> "I take this opportunity to express my sincere appreciation for the valuable assistance that I have received from the Rehabilitation Division of the State Board of Education. The six months' training afforded me at the business college has made my dream of one day becoming a self-supporting citizen a reality, and so I earnestly request that you convey to the State Board of Education, particularly the Rehabilitation Division workers, my keen appreci-

ation and gratitude for the assistance they are rendering to the handicapped young people of the State of California.

"After completing my business course you further manifested your interest in me by securing my present position at the State Industrial Accident Commission, and for this I can never be too grateful, as it is convincing proof that in addition to supervising the training of your students, you also seek to place them in suitable positions. I am very glad to be able to say that my employers consider my work satisfactory, for I realize that upon my success depends the success of others who, like myself, are handicapped."

The legitimate aim of all education is the development of useful, self-reliant citizens, and the Division of Rehabilitation proposes to make economic assets of all persons who may be vocationally handicapped by reason of physical defect or injury. Few handicaps present difficulties which cannot be surmounted by suitable training, moral courage, and assistance in finding suitable employment. If a deaf and dumb Eskimo with terribly deformed hands, as shown in the illustration upon page 171, can be trained as a commercial artist, need any injured person feel discouraged?

NECESSITY FOR REHABILITATION SERVICE.

During recent years specialized methods of production and the multiplication of mechanical devices have largely displaced individual effort and hand tools. The small work shop has been largely eliminated by the great establishment where hundreds of men and women work at power-driven machinery. In such quantity production speed reigns supreme, the human element is never absent and accidents are inevitable. Other hazards lurk in the introduction of electricity and chemistry into modern industrial activity. During the fiscal year ending June 30, 1921, no less than 125,529 industrial injuries were reported to the California Industrial Accident Commission, of which 1643 nonfatal injuries resulted in permanent disabilities. There are at the present time thousands of injured persons in the State who are, because of lack of training or maladjustment, producing little or nothing.

Automobile accidents, transportation disasters and disease annually destroy the economic efficiency of an unknown number of persons. Records of persons injured in public accidents are very meager, but it is estimated by students of the problem that for every person injured in industry there are two injured in public accidents.

TYPE AND SCOPE OF SERVICE.

THE READJUSTMENT.

The most painstaking attention to the matter of morale has been found necessary at every stage of rehabilitation from the moment a man receives his injury until he is again satisfactorily and happily re-employed. It is essential, therefore, that the disabled person be skillfully approached, his interest in life's activities reawakened, and his brain and hands put wholeheartedly to work upon his own reconstruction. The adjustment to new types of work can only be made following a careful analysis of the applicant's mental capacity, previous occupational experience, character of the disability, personal preferences, and

the opportunity for employment following a suitable training program. However, the decision to undertake a course of training must always be voluntary, since the capacity of the human mind to resist education is almost beyond belief and experience has shown that the finest instruction is largely wasted upon an indifferent or rebellious student.

Age is also an important factor in determining feasibility of training, but it is greatly influenced by individual differences. A striking example of this fact may be mentioned in the case of a successful rehabilitant sixty-seven years of age. He had been a master mariner since the age of twenty, but neglected the technical side of navigation as the years passed and fell into the loose "rule of thumb" methods of the sailing vessel. His papers were lost in the San Francisco fire and, being unable to pass the Federal examination, a new license was



Eyes Are Not Essential to the Work of an Expert Dictaphone Operator and Typist.
(See page 172.)

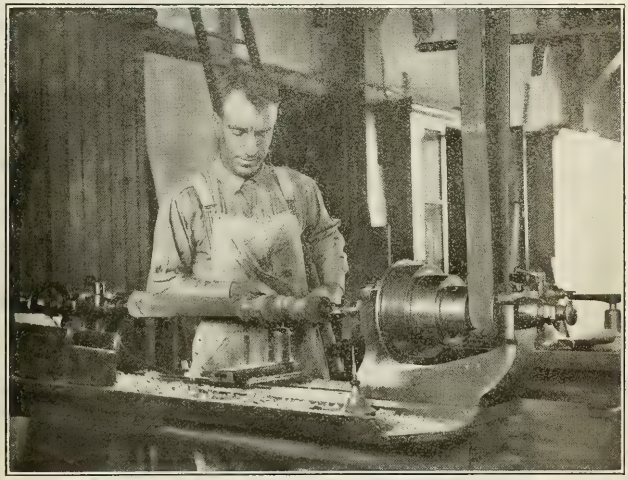
denied. He was then employed as a mate until the accident which crushed his hand barred him from further work of that character. At this point the Rehabilitation Division took up his case and arranged for suitable instruction in a navigation school. Following a brief period of training he successfully passed the Federal examinations for the master's license and was granted the right to sail "any vessel upon any ocean."

In many instances, the transition may be accomplished without the benefit of further training, but the State is morally obligated to interest itself in the welfare of every potential rehabilitation case. The statewide service of the Division has now brought expert advice and vocational re-education within the reach of every person who may find his physical handicap a serious obstacle in earning a decent living.

INDIVIDUAL SERVICE.

Each applicant for rehabilitation service receives a thorough individual investigation, his problem is critically analyzed, and a readjustment is reached upon the merits of the case without reference to class groups or training agencies. No two cases are alike. The training program is designed to meet the specific requirements involved and aims to capitalize, wherever possible, previous education and occupational experience. This method enables the Division to provide for each person the training needed at a point near his home community, renders possible the maximum use of existing educational agencies, and returns the individual to economic independence with the minimum sacrifice of time and money.

Since no maintenance provision has been written into either the Federal or State Acts, it is frequently necessary to assist eligible appli-



From Pile Driving to Wood Turning Following Permanent Injury to His Back.
(See Case VII, page 187.)

cants with the solution of their financial problems. This is especially true of the men with dependent families. Living expenses during the training period are often met wholly or in part by the use of compensation payments or damages, savings, loans, or the income from part-time employment. Where the total income is found to be inadequate, additional aid for worthy cases can usually be secured from interested friends, former employers, social service agencies, or the local county welfare boards. A rather unusual example of the individual service occasionally rendered by the Division of Rehabilitation in the achievement of its purpose may be found in the case of a man rated by the Accident Commission as 90¾% disabled. While employed as a teamster he was caught between a load of hay and a barn door and was badly

crushed. The accident resulted in serious injury to the lumbar spine and partial paralysis of the lower limbs. A wife and four small children are dependent upon him for support. Since payments upon a one-acre lot near a large town were nearly complete, instruction in poultry raising, bee keeping and berry culture was arranged for him; together with competent assistance in planning his work. Additional aid toward the support of his children was secured from the Children's Welfare Bureau, and the local Rotary Club was told of his struggle for independence. True to its spirit of service, the club voted to purchase a second-hand pumping plant for him which will obviate the necessity for pumping all water by hand. This man refuses to consider himself a cripple, and it is but a question of time until he is again self-supporting.

OTHER SERVICE.

Although the following types of service cannot, perhaps, be considered as usual functions of vocational rehabilitation, it is nevertheless true that a large number of handicapped persons may be returned to useful employment by means of:

Physical Restoration which includes the discovery and elimination of mechanical or functional defects which may be removed by corrective surgery. The miracles of modern orthopedic and reconstructive surgery have restored nearly normal functions to many apparently hopeless cripples, and the end is not yet reached. In this type of service the Division of Rehabilitation has enjoyed the fullest possible cooperation from the California Industrial Accident Commission and the various county hospitals. Rehabilitation by the restoration of complete or nearly complete physical function is a promising phase of the work.

The Securing of Suitable Working Prostheses which will enable the injured worker to return to the same or modified duties without the necessity for additional training. Such artificial limbs are considered as working tools and include such mechanical appliances as special tool holders, chucks, etc., which have been designed to function in the performance of particular tasks.

Morale Service without further training, by means of which a man's self-confidence and ambition may be restored to the extent that he is again willing to accept suitable employment and will earnestly endeavor to carry on.

TYPES OF INSTRUCTION.

For convenience, rehabilitation as developed in California may be classified under the following heads:

Institutional Training.

Class, group, and individual instruction covering a wide variety of special and common school subjects is being offered in reputable public, endowed, and private institutions. Agencies thus utilized possess a sympathetic understanding of the problem and are adequately prepared to undertake the efficient training of adults in vocational subjects. The State Board of Education requires that all instruction shall conform to the best recognized standards in each occupation, and that current trade practices shall receive special attention. Although certain standardization of study courses has been possible, flexibility is nevertheless essential, since the type of instruction and the course content must be

reconciled with the employment objective agreed upon. Wherever private or semi-private agencies have been utilized, the character of the curriculum has been brought up to or beyond the standard set by the public schools, and the courses have been modified to meet the requirements of adult students. The State Board of Education is also definitely engaged in the training of public and private school teachers for successful participation in the rehabilitation service. Strict supervision of instruction is maintained at all times.

For the average disabled person who desires training in one of the commoner phases of commercial or industrial activity, group or class



One of California's Thrifty Poultrymen. (See page 178.)

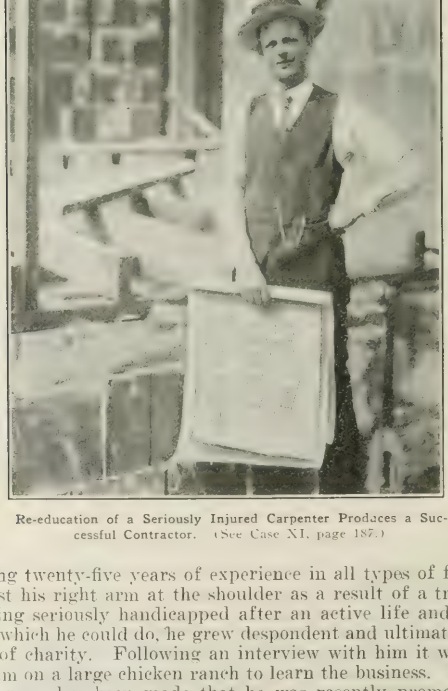
instruction in the fundamental principles and practices, followed by suitable employment under supervision, is probably the most satisfactory mode of rehabilitation.

Tutorial Instruction.

Where a satisfactory training agency does not exist, or where the physical handicap is of such a character that special consideration is necessary, arrangements for special individual instruction by competent tutors have been made in a number of cases. This type of training has been particularly advantageous in the inauguration of vocational instruction prior to discharge from the hospital.

Employment Training.

In many instances the occupation may be best learned under actual working conditions, and frequently the desired instruction can be secured in no other manner. This is particularly true of the smaller communities. In such instances, arrangements are made with a suitable employer to furnish the required training by designating a properly qualified person, acceptable to both the State and the employer, who will act as instructor. Wherever possible, employment training opportunities are developed which will eventually provide regular employment at standard wages.



Re-education of a Seriously Injured Carpenter Produces a Successful Contractor. (See Case XI, page 187.)

Following twenty-five years of experience in all types of farm work, Mr. W. lost his right arm at the shoulder as a result of a tractor accident. Being seriously handicapped after an active life and unable to find work which he could do, he grew despondent and ultimately became an object of charity. Following an interview with him it was decided to place him on a large chicken ranch to learn the business. Such wonderful progress has been made that he was recently promoted to the position of foreman at a good salary.

Correspondence Instruction.

Although the State Board of Education does not favor correspondence courses for injured persons when more suitable direct instruction may be secured, such courses have been found very useful in carrying technical instruction to persons residing in isolated localities or communities having but limited educational opportunities. However, when such training has been given, an effort has been made to secure a competent tutor in the same community who studies with the student and makes sure that the subject matter is thoroughly assimilated. Almost without exception correspondence courses have been provided to supplement daily employment in power houses, industrial establishmnts, or upon the farm.

During the course of employment as a power lineman, a young man accidentally short-circuited a 2400-volt current through his body with resultant electrical burns, impaired use of both hands, and functional nervous disorders. Since injury he has been subject to irregular fainting spells which have prevented return to any regular employment; and as it has been found inadvisable for him to go anywhere alone, he is usually accompanied by his wife. He has succeeded in developing a small electrical contracting business, but his lack of technical knowledge has proven a very serious handicap. The Division has arranged for a suitable correspondence course (supplemented by competent tutorial instruction) in those phases of electrical engineering essential to his success. When improved health and growth of his business venture may warrant, he plans to open a first-class electrical supply shop in his home town.

PLACEMENT SERVICE.

Placement Following Training.

Placement cannot be considered as sharply separable from the other activities of rehabilitation, and every training program contemplates the re-establishment of the trainee in a remunerative occupation. Agents in charge are expected to put forth every effort to secure the right sort of employment at the close of the training period.

Placement Without Training.

As a policy, the Division of Rehabilitation does not wish to establish itself as an employment agency for the benefit of disabled persons. Nevertheless, a number of industrial cripples have been successfully rehabilitated by suitable placement in occupations well adapted to their physical condition. As an instance of such service: a shift boss in a large California gold mine lost his right foot through the tarsus as a result of an accident following the derailment of a skip. He was barred from his formed employment by inability to climb the long steep ladders, and could not be interested in further technical education. In his case a satisfactory solution was reached through arranging for his employment as a hoist operator.

SUPERVISION.

Systematic supervision of all types of instruction is maintained by properly qualified agents, and monthly reports regarding the progress of State Board of Education trainees are required of each training agency. Following the entrance of a trainee upon regular employment, periodical contact is still maintained until such time as the officer in charge may satisfy himself that rehabilitation is complete.

ELIGIBILITY OF SERVICE.

Under the Federal Act, a person to be eligible for service must fall within the class of persons defined to include "any person who by



A Stiff Hip and Knee Ended His Career As a Ship Rigger. Now He Is a Trained Engraver. (See Case XII, page 187.)

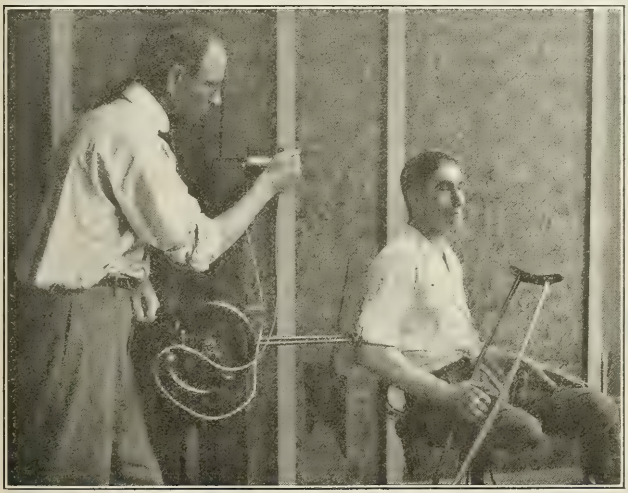
reason of physical defect or infirmity, whether congenital or acquired by accident, injury or disease, is, or may be expected to be, totally or partially incapacitated for remunerative occupation, and who may reasonably be expected to be fit to engage in a remunerative occupation after completing a vocational rehabilitation course."

This section has been interpreted to mean that any person of employable age and sound mind who finds that his disability interferes seriously with regular employment in a profitable occupation may be eligible for service. Such disability may be the result of accident, injury, disease or defect from birth, and need have no relation to previous employment. It is expected, however, that the applicant for rehabilitation service will cooperate to the fullest extent in his own rehabilitation.

ORGANIZATION FOR SERVICE.

In the development of its Rehabilitation Division, California has adopted a highly decentralized system of administrative organization in the belief that more efficient service can be rendered where broad discretionary powers are delegated to responsible executives. The State is too large geographically and its activities too varied to admit centralized authority which contemplates more than the oversight of State policies and procedure. Therefore, each district staff has been organized for the study of its own peculiar local problems and has diligently sought the solution which will most exactly meet the situation encountered.

The policy of delegated authority has also been carried into the personnel of the district office staffs. Each officer has been made respon-



Loss of Speech and Hearing Does Not Interfere with Success As a Photographer.
(See Case XIII, page 188.)

sible for certain phases of the work and is set off with considerable latitude in the development of study courses and placement training methods, and is answerable for results. Furthermore, each staff member has been selected upon a functional basis in order that the broadest possible technical and trade experience may be available in the handling of difficult cases.

For administrative convenience the following territory has been assigned to the several district offees: San Francisco to serve the northwestern coast of California and the coastal counties as far south as and including San Luis Obispo County; Los Angeles to serve all of the counties south of the Tehachapi Range and Inyo and Mono counties; and Sacramento to serve all of Northern California east of the Coast Range, and the San Joaquin Valley.

Coordination between the three district offices is maintained by means of circular letters bearing upon State policies and general procedure, periodical visits by the State Supervisor or Director, and supervisors' conferences at least twice during the fiscal year.

LOCATION OF CASES.

Since it has been found that the person most in need of re-education is usually least able to make the journey to a central office, the State Board of Education has definitely established the principle that rehabilitation service shall be carried to the cripple. With this policy in mind, the Division of Rehabilitation has inaugurated a service which contemplates the investigation of eligible applicants amid home surroundings. Under such circumstances it is very easy to arrive at an accurate estimate of the controlling factors, and to outline feasible plans for successful rehabilitation.

In addition to the cases referred to the Division by the California Industrial Accident Commission, others are presented by social service agencies, hospitals, physicians, employers, educators, and friends of the individual. Many direct applications are received as a result of timely newspaper articles, speaking engagements, and educational exhibits at State and county fairs or industrial expositions.

COOPERATING AGENCIES.

STATE DEPARTMENTS AND INSTITUTIONS.

California Industrial Accident Commission.

As required by law, the State Board of Education has worked out a plan of cooperation with the California Industrial Accident Commission for the efficient handling of cases originating within its jurisdiction. The Commission has done everything in its power to render effective the program of vocational rehabilitation.

1. All cases in which the injury is of such a character that permanent disability appears reasonably certain will be reported to the State Board of Education at the time the initial accident report is received. This plan permits investigation at the hospital, suitable morale work, and the inauguration of a training program during the period of convalescence. It goes without saying that instruction should never be permitted to interfere with physical restoration. All other potential cases will be presented at the time of final compensation award.

2. The Division of Rehabilitation has also arranged to cooperate in the investigation of requests for "lump sum settlements," particularly in those instances where the money is desired to finance business ventures. Where previous commercial experience has not paved the way to success, it is believed that a short intensive course in business management and methods of selling should prove most beneficial. In this connection the Division has, also, the privilege of recommending complete or partial commutation of award in those cases where such action will virtually guarantee successful rehabilitation and financial independence.

3. Since it appeared highly desirable that some one member of the Industrial Accident Commission staff should act as coördinating officer, Elmer M. Shunk has been assigned to that duty. He will also devote a certain portion of his time to the investigation of hospital cases and the development of morale.

State Public School System.

Friendly interest in the problems of rehabilitation and helpful cooperation in the development of a state-wide service has been accorded by the public school system, and every available facility of the regular day, part-time and evening schools has been generously placed at the disposal of the Rehabilitation Division. Special individual instruction has occasionally been granted, and in several instances the Smith-Hughes classes in agriculture have planned and assisted with the construction of small poultry plants as regular class projects.

State University and State Teachers Colleges.

The University of California and the State Teachers Colleges are peculiarly well adapted to carry on efficient instruction for the handicapped by reason of extensive technical equipment and skilled teachers. Special arrangements have been made for the admission of disabled persons under the "special student" provision wherever they have been able to profit by the regular class instruction offered. At the University of California, Southern Branch, a group of non-collegiate trainees has been accepted for instruction in technical and trade subjects upon a strictly rehabilitation basis.

University Extension Service.

Regular class and correspondence service has been secured from the University Extension Division upon terms which guarantee satisfactory results.

State Civil Service Commission.

The State Civil Service Commission has agreed to accept candidates originating with the Division of Rehabilitation without discrimination, provided always that the Division has certified them as physically competent to perform the duties of the position sought.

COUNTY WELFARE SERVICE.

Experience has indicated that county administrators are forward-looking business men who are eager to cooperate for the permanent reduction of distress and poverty. As an example of the generous support received from such bodies may be cited the working agreement now effective with the Los Angeles County Welfare Commission:

1. The entire staff of field agents is available for service in the investigation and reporting of potential rehabilitation cases, and assistance will be forthcoming in the placement of re-educated persons.
2. In the event that a disabled person is receiving no compensation for his injury or is unable to support himself and his family from his current income, the Welfare Commission will budget the family and will award sufficient financial aid to insure satisfactory living conditions during the period of re-training.
3. Medical, surgical and hospital treatment have been made available in all needy cases.
4. The facilities of the "Salvage Department," a county workshop and trade school for unemployed persons, have been placed at the disposal of the State for service in the rehabilitation of disabled unfortu-

nates, and a broader cooperative scheme for re-education will undoubtedly grow out of present tentative arrangements.

In another instance, county authorities furnished two artificial limbs for a dismembered trainee, and provided for the actual cost of subsistence during the period of training.

SOCIAL SERVICE ORGANIZATIONS.

Active assistance and hearty cooperation have been accorded by the Associated Charities, the American Red Cross, the Salvation Army and kindred social service organizations throughout the State. In a number of instances cooperative agreements similar to that in effect with the Los Angeles Welfare Commission have been consummated.



A Carpenter Falls 55 Feet and Becomes an Expert Automobile Mechanic.
(See Case XV, page 188.)

The San Francisco Association for the Blind is doing a splendid bit of humanitarian service in the development of a subsidized workshop for the employment of blind persons under satisfactory working conditions. Instruction is offered in broom making, rattan furniture manufacture, rug weaving, basketry, and other similar crafts, following the completion of which the workers remain at the institution for regular remunerative employment. A minimum wage guaranteed by the association may be increased under a piece work plan of compensation to as high as twenty-five or thirty dollars per week, in the case of deft workers. Under the present able management the institution has become nearly self-supporting, and its capacity for useful service is only limited by available space and ability to market the produce at satisfactory figures. The scheme is fundamentally sound and probably offers the only real solution of the problem.

STATE MEDICAL ASSOCIATION.

Individual members of the State Medical Association have been most helpful in furnishing exact information regarding the physical condition of disabled persons under their observation, and have been of material assistance in determining the eligibility for service.

OTHER AGENCIES.

Under "other agencies" must be included the whole hearted cooperation and active support accorded the rehabilitation service by labor organizations, business men's organizations, women's clubs, county farm advisors, and the personnel departments of the larger corporations.



Courage, Education and Training Will Rehabilitate Almost Any Disabled Person.
(See Case XVI, page 188.)

PROGRESS DURING THE YEAR.

Of the 990 cases investigated during the year, originating from all sources, 629 were registered as eligible for service, and 384 were initiated into training. At the close of the year 247 of these were receiving systematic instruction, 11 were in employment under supervision, and 69 more had been forced to temporarily discontinue their training for various reasons. In addition to the foregoing, satisfactory placement was secured for 32 persons (20 without further training) by agents of the Division, and 32 persons were rehabilitated and returned to economic independence.

Under ordinary conditions it is anticipated that approximately one year will be consumed in the rehabilitation of any seriously disabled person. The comparatively small number of rehabilitations affected is due, therefore, to the fact that the Division of Rehabilitation had been in effective operation for a period of less than one year.

SOME INTERESTING REHABILITATION CASES.

Case I. Age 23. (See illustration on page 159.)

Having been born blind, V. S. R. received his preliminary education at the Idaho School for the Blind, which also provided some instruction upon the piano. In reply to his written request for information regarding our service, a training officer called at his home for a conference and found that he could not be interested in anything but further instruction in music. He was given a thorough try-out by a competent instructor in music and soon convinced both the instructor and the training officer that he possessed rare musical talent. Suitable training has been arranged, and by January, 1923, after nine months of study, he will be ready for concert work. Several newspaper critics who have heard him play regard him as a musical genius and predict a bright future for him.

Case II. Age 22. (See illustration on page 161.)

As the result of an attack of whooping cough when an infant, this attractive young woman is now seriously handicapped by total deafness. Since her brother is establishing a dental practice, she is taking up the study of mechanical dentistry with the expectation of handling all of the laboratory work.

Case III. Age 53. (See illustration on page 161.)

While employed as a laborer in an Alaskan cannery, Charles L. received spinal injuries which have since resulted in total paralysis from the waist down. He is now unable to leave his wheel chair and can sit up but four hours of each day. It was necessary, therefore, to find a type of home work which could be done while propped up in bed. Artificial flower making offered an acceptable solution of the problem, and following three lessons the department store which provided the instructor ordered several gross of California poppies. With increased skill and greater versatility in the variety of flowers produced, no difficulty should be experienced in securing all the orders that can be handled.

Case IV. Age 18. (See illustration on page 164.)

Miss B. came to the attention of the Rehabilitation Division by reason of paralysis of the hip which followed an infection of the foot six years ago. She was naturally depressed at the prospect of facing the future with such a handicap, but was anxious to become a self-supporting member of society. Following a friendly conference at which Miss B. told of her interest in sketching and showed samples of work, it was decided that a course in illustration and design would equip her with a suitable vocation. Splendid progress has been made, and she now faces the future serenely in the knowledge that the special training has overcome her physical handicap.

Case V. Age 47. (See illustration on page 165.)

Mr. F. has spent the past six years in the Los Angeles County Hospital, afflicted with paralysis of the lower extremities, or "multiple sclerosis," and faced the prospect of ending his days there. Although confined to a wheel chair, he has tried to assist in his maintentance by peeling potatoes, etc., in the hospital kitchen. With a high school education, good mentality and an excellent personality as a foundation, it was decided that a course in stenography and typing would prepare him for self-employment as a public stenographer. He is enthusiastic over his prospects and is making rapid progress with his studies. It is believed that in a few more months this man will again be independent.

Case VI.

A young woman, twenty years of age, who had advanced to a position as inspector of lamps in an electric lamp factory was injured by the explosion of a gas tank in the basement of the plant. Severe injuries to both ankles and the right knee have made it impossible for her to stand for any length of time. The rehabilitation agent learned that she was interested in stenography, and since it was necessary that she should remain seated for the greater portion of each day, she was enrolled for a course in stenography and allied subjects. She is now rehabilitated and successfully employed with the company where injury was received.

Case VII. Age 31. (See illustration on page 175.)

While employed as a pile driver, a young man was caught beneath a falling timber and suffered serious injury to several vertebrae of the lumbar spine. This has resulted in loss of strength and severe limitation of spinal movement. He is an intelligent individual of the mechanic type, and it was decided that he should be trained in some of the lighter phases of wood working, with particular emphasis upon cabinet making and wood turning. He has shown remarkable aptitude for the wood turning and has produced some very creditable work. A few more months will complete the training program outlined, and he will then be ready for employment in an occupation well adapted to his present physical condition.

Case VIII. (See illustration on page 171.)

A most unusual case is that of Leo Nugaruk, a deaf and dumb Eskimo with terribly deformed hands who came to California several years ago. Although defective from birth, the "clubbed" hands are the result of severe burns received in childhood. When referred to the Division by the County Welfare Commission the case seemed almost hopeless. It was discovered, however, that he had considerable talent for drawing and he was placed in a school of commercial art for a try-out in that line. He was delighted with the work and the first few lessons demonstrated considerable ability. Progress has been rapid. Some difficulty will be experienced, undoubtedly, in placing the man, but it is believed that his future is assured.

Case IX. Age 44.

While employed as a sluicer in a placer mine eighteen years ago, Michael I. was buried under an eighteen foot gravel bank which caved in upon him. His injuries resulted in amputation of the left leg below the knee, a permanently dislocated right hip joint, and shortening of the leg. He then worked as cook, and chore man until a serious hernia rendered further employment of that character out of the question. When discovered by an agent of the Division he was out of work and suffering severe mental depression. Since "bench" shoe repairing was well adapted to his present physical condition, he was placed for instruction with a small repair shop where little modern machinery is used. He is now an expert repair man, and has opened a shop of his own.

Case X. Age 31.

During the course of his employment as tool dresser in the San Joaquin oil fields, Mr. S. received injuries which resulted in the amputation of the right leg four inches below the knee. He secured a complete settlement of the compensation award and purchased a small grocery store in the heart of the west side oil field. However, he was unfamiliar with the conduct of such a venture and became discouraged at the prospect of continued poor business. An agent of the Division spent the greater portion of a day with him discussing the basic principles of retail selling, suggesting certain alterations, and encouraging a more aggressive campaign for business. A good correspondence course was also provided. Within two weeks the cash book showed double the usual sales and within three months the volume of business had tripled. He is now "too busy to study."

Case XI. Age 44. (See illustration on page 178.)

Following eighteen years of successful experience, a carpenter suffered a fracture of the spine and skull which resulted in loss of hearing of left ear, strabismus of left eye, lengthening of left leg due to tilting of the pelvis, and a highly developed state of nervousness. Having indicated innate capacity for the supervision of construction, he was placed with a business college for elementary accountancy and special tutorial instruction in architectural drawing was arranged. Later he was given more advanced work in architecture and estimating at the University of California, Southern Branch, with the result that he is now working for himself as a contractor and builder. He is doing well.

Case XII. Age 42. (See illustration on page 180.)

This trainee had been a farmer, a truck driver, and a rigger prior to injury and had always led an active out-door life. Then, while employed as a shipyard rigger,

he fell from a staging and injured his left leg in such a manner as to make it very difficult for him to stand upon his feet or move about. He was given a try-out at engraving and soon showed very definite ability in that type of work. He has made such progress that, during a recent absence of his instructor, he was placed in charge of the engraving department at the school which he attends. Very soon he will be in a position to earn the regular wages of an engraver.

Case XIII. Age 40. (See illustration on page 181.)

Having been born deaf and dumb, Ralph S. found himself seriously handicapped for all ordinary employment. He called at one of the district offices to learn whether anything could be done for him. It was found that he had had but little education, had never held a steady position and had not become proficient in any particular line of work. A subsequent conference with his mother, who was doing her best to support him, disclosed the fact that he was much interested in photography—particularly coloring and retouching. With this natural aptitude as a foundation, he has made wonderful progress in the study of technical photography and has already done some commercial work. He will soon be competent to accept a position which awaits him. Many of the photographs utilized for the illustration of this report are the work of this promising commercial photographer.

Case XIV. Age 48.

While engaged in unloading logs from cars at the mill of a large lumber company, this man slipped from a trestle and fell to the ground twenty feet below. His injuries resulted in a severely strained back and weakened left leg which have prevented successful return to any ordinary labor. The accident also left him rather nervous and despondent. Being a Montenegrin with but limited education, he seemed to feel that those faculties which had not been impaired by the injury were of little value, and as a result he had objections to every vocation which was recommended to him as offering a possible solution for his problem. It was finally determined that watch and clock repairing would prove a satisfactory occupation and he was enrolled for instruction. While his absorption of the training has been slow, he has shown marked improvement in his mental attitude and has become very much interested in lathe and light machine work.

Case XV. Age 38. (See illustration on page 184.)

During the construction of a great hydro-electric plant in the Sierras, one of the carpenters fell fifty-five feet, struck his left hip upon a projecting ledge and was plunged headlong into the river. His injuries have resulted in shortening of the left leg, ankylosis of the ankle joint, and almost continuous pain in the left hip. He is unable to do much walking. Although his previous education had been limited to but one year of elementary instruction, he was interested in mechanics and arrangements were made with his former employers looking toward his employment in their garage following suitable training in automobile mechanics. Exceptional progress has been achieved, and he will soon be ready to take up the work which awaits him.

Case XVI. Age 29. (See illustration on page 185.)

This man was a mill laborer at the time of the accident which resulted in the loss of his left arm. Upon recovery he attempted to rehabilitate himself by doing white-washing and odd jobs in a sympathetic community but would have starved had it not been for his compensation. Although somewhat limited in his previous education, he was very ambitious and eagerly grasped the opportunity for training. It was originally planned that he should receive training in mill-detailing but he became so interested in mechanical drawing that the employment objective was changed to "draftsman." He practically lived at the school and not only attended all day and evening sessions but worked in the drafting room on Saturdays as long as the building remained open. Following seven months of such intensive training he was successfully placed as draftsman with a large corporation. He is "making good" in spite of a very severe handicap.

Case XVII. Age 27.

This case is a rather interesting one due to the fact that the injury occurred several years ago and the passing of time had lowered him to mendicancy. His disability resulted from an attack of scarlet fever which settled in the right leg and destroyed the nervous system. The foot froze during the following winter and was amputated; and upon two subsequent occasions freezing of the stump required reamputation. He was advised to come to California for the milder winters and at the time he was found by the Rehabilitation Division he was supporting himself by alms. Being mechanically inclined and having shown considerable interest in finely detailed machine work, he was enrolled for instruction in watchmaking. Rehabilitation is now complete.

STATISTICAL REPORT

for the

Fiscal Year Ending June 30, 1922.

NOTE—In perusing the statistical data presented, it should be borne in mind that the Division of Rehabilitation had been in effective operation for a period of less nine months at the close of the fiscal year. Under ordinary conditions it is anticipated that approximately one year will be required to rehabilitate any seriously disabled person. As the service develops more fully, the number of persons rehabilitated during the year will closely approximate the active training load.

Section I. Status of Live Cases at the Close of the Fiscal Year.

	San Francisco district	Los Angeles district	Sacramento district	State		
				Male	Female	Total
1. Listed pending survey	212	345	133	684	6	690
2. Investigated pending further disposition	102	88	16	202	4	206
3. In training	105	106	36	236	11	247
4. Training temporarily interrupted	36	31	2	65	4	69
5. In employment under supervision	1	10	0	9	2	11
Total live roll of cases	456	580	187	1,196	27	1,223

Section II. Progress of Cases During Year.

	San Francisco district	Los Angeles district	Sacramento district	State		
				Male	Female	Total
1. New cases listed	675	785	407	*1,761	*62	*1,823
a. Number originating with I.A.C.	542	706	376	*1,528	*52	*1,580
2. Cases investigated	397	395	198	951	39	990
3. Registered as eligible for service	309	241	79	600	29	629
4. Original initiations into training program	167	164	53	365	19	384
a. Number originating with I.A.C.	121	123	36	287	13	280
5. Placements:						
a. Following training	3	9	0	12	0	12
b. Without training	5	10	5	20	0	20
6. Closures						
a. Rehabilitated by state	10	14	8	32	0	32
b. Other closures	209	191	212	*542	*26	*568

*Net cases after intra-state closures were deducted.

Section III. Analysis of Registered Cases Eligible for Rehabilitation Service.

I. Sex. Male, 600; female, 29; total, 629.

II. Age. Under 21, 68; 21 to 30, 169; 31 to 40, 181; 41 to 50, 134; 51 and over, 77.

III. Origin of Disability. Employment accident, 529; public accidents, 38; disease, 46; congenital, 16.

IV. Nature of Disability. Hand, 159; hands, 9; arm, 67; arms, 1; leg, 146; legs, 29; hand and arm, 2; hand and leg, 5; arm and leg, 6; multiple, 15; vision, 87; hearing, 8; general debility, 12; miscellaneous, 83.

V. Estimated Permanent Disability Rating. Based upon age and previous occupation. Under 21 per cent, 102; 21 to 40 per cent, 211; 41 to 60 per cent, 69; 61 to 80 per cent, 17; 81 to 100 per cent, 29; not rated, 201.

VI. Schooling Prior to Registration. None, 18; grades 1 to 6, 190; grades 7 to 9, 310; grades 10 to 12, 91; other, 20.

Section IV. Analysis of Case Closures.

A. Registered Cases.

1. Sex. Male, 119; female, 4; total, 123.

2. Rehabilitated by State.

1. By placement without training	10
2. Following institutional, tutorial or correspondence training	20
3. Following employment training	2

3. Other Closures.

1. Not susceptible or training not feasible	4
2. Service rejected	43
3. Deceased	2
4. Other reasons	42

B. Non-registered Cases.

1. Successfully re-employed or self-rehabilitated	144
2. Not susceptible or training not feasible	29
3. Ineligible account minor handicap	49
4. Not interested	103
5. Deceased	7
6. Left State	19
7. Not located	105
8. Closed by intra-state transfer (including registered cases)	44
9. Other reasons	11

Section V. Employment Objectives of Trainees Initiated into Training During the Year.

Accountant	2
Artificial flower maker	1
Assayer	1
Auditor	1
Automobile:	
Driver	3
Ignition-battery	27
Mechanic	20
Tire adjuster	2
Top and body builder	1
Vulcanizer	2
Baker	2
Barber	1
Bookkeeper	27
Bookkeeper-stenographer	1
Breeder of guinea pigs	1
Business proprietor	2
Cabinet maker	2
Carpenter	1
Chiropractor	1
Cigar maker	1
Cleaner-dyer-presser	1
Clerical worker:	
General	8
Clerk-stenographer	3
Clerk-typist	1
Compressor operator	1
Contractor	5
Consular attache	1
Dental mechanic	2
Dentist	1
Designer:	
Fixture	1
Furniture	2
Structural	1
Detailer, mill	1
Dictaphone operator	5
Draftsman:	
Architectural	5
Mechanical	4
Sheet metal	1
Electrician:	9
Engineer:	
Aeronautical	2
Electrical	7
Mechanical	4
Engraver (jewelry)	1
Engraver and jewelry repairman	2
Estimator	10
Farmer:	
Dairy	2
General	3
Fruit	4
Foreman:	
Construction	6
Factory	2
Machine shop	1
Pipe-line	1
Ranch	2
Oil field	2
Freight checker	1
Garage owner	1
Illustrator-designer	4
Insulator	1
Inspector:	
Boiler	4
Building	1
Safety appliance	1
Investigator	1
Jewelry and watch repairman	1
Lawyer	2
Laboratory technician	1
Manager:	
Business	10
Office	2
Traffic	1
Machinist	4
Masseuse	2
Musician	3
Navigator:	
Bay pilot	1
Master mariner	1
Operator:	
Substation	1
Switchboard	2
Photographer	2
Piano tuner	1
Poultry raiser	18
Proofreader	1
Radio operator	2
Retoucher (photo)	3
Rug weaver	1
Salesman	23
Sheet metal worker	2
Shoe repairman	10
Short story writer	1
Show card writer	3
Sorter	1
Station agent-operator (railway)	1
Stationary engineer	8
Stenographer	4
Stock man	1
Storekeeper	1
Superintendent:	
Factory	1
Mill	2
Refinery (petroleum)	1
Refrigeration	1
Teacher	1
Teller (bank)	2
Timekeeper	1
Toy maker	1
Tractor:	
Engineer	1
Mechanic	4
Watch and clock repairman	9
Welder	2
Undetermined	18

FINANCIAL REPORT.

STATE AND FEDERAL REHABILITATION FUND.

Receipts and Disbursements.

Federal allotment	$32,552 12
State appropriation	35,000 00
Total	$67,552 12
Disbursements	43,832 97
Balance	$23,719 15

Analysis of Disbursements.

Classification	San Francisco district	Los Angeles district	Sacramento district	State administration	Total
Salaries	$6,337 71	$5,250 98	$2,865 09	$2,447 23	$16,901 01
Traveling expense	722 07	752 08	632 16	539 89	2,646 20
Communication	64 10	4 33	10 45	7 75	86 63
Printing	16 35	26 75		517 75	560 85
Office supplies	181 56	199 03	92 57	14 10	487 26
Other expenses	1,023 48	614 32	646 77	531 62	2,816 19
Educational institutions	8,746 09	5,004 63	184 79		13,935 51
Industrial and commercial establishments	234 67	208 00	80 00		522 67
Tutors	296 96	906 05	191 00		1,394 01
Correspondence schools	160 27	360 19	355 57		876 03
Instructional supplies	1,703 38	1,494 03	163 75		3,361 16
Transportation for trainees	29 58	13 95	7 92		51 45
Medical examinations		75 00	1 00		76 00
Prostheses	100 00	18 00			118 00
Totals	$19,523 22	$15,017 34	$5,231 07	$4,058 34	$43,832 97

At the close of the fiscal year, approximately one-third of the federal and state funds available for the service remained unused, due to the fact that the Division of Rehabilitation has been in effective operation less than nine months. The active working load has now about reached the limit which can be handled by the present staff and funds, and it is anticipated that the entire allotment will be utilized during the next fiscal year.

23130 3-23 1150

FIRST BIENNIAL REPORT

OF THE

Department of Institutions

OF THE

STATE OF CALIFORNIA

FOR THE

Two Years Ending June 30, 1922



CALIFORNIA STATE PRINTING OFFICE
FRANK J. SMITH, Superintendent
SACRAMENTO, 1923

22803

DEPARTMENT OF INSTITUTIONS

OF THE

STATE OF CALIFORNIA.

PERSONNEL.

E. G. TWOGOOD	*Secretary and Acting Director*
F. W. HATCH, M.D.	*Consulting Psychiatrist*
CHARLES F. WAYMIRE	*Deportation Agent*
EARL D. WHITE	*Attorney*
GEO. HUESTIS	*Financial Agent*
C. E. APPLEGATE	*Chief Clerk*
RUTH M. MORSE	*Stenographer*
ESTELLE HOSKINS	*Stenographer*
PEARL M. STOCKDALE	*Typist and File Clerk*
EVA C. REID, M.D.	*After-Care Physician and Inspector*
MARGARETHA SUERMONDT	*Social Worker*
DR. LEO J. McMAHON	*Department Dentist*

CHAPTER 610.

An act to add a new article to chapter three of title one of part three of the Political Code, to be numbered article two g, embracing sections three hundred sixty-six to three hundred sixty-six e, both inclusive, relating to a department of institutions.

[Approved June 1, 1921.]

The people of the State of California do enact as follows:

SECTION 1. The Political Code is hereby amended by adding a new article to chapter three of title one of part three thereof, to be numbered article two *g*, embracing sections three hundred sixty-six to three hundred sixty-six *e*, and to read as follows:

ARTICLE II*g*.

DEPARTMENT OF INSTITUTIONS.

366. A department of the government of the State of California to be known as the department of institutions is hereby created. The department shall be conducted under the control of an executive officer to be known as director of institutions which office is hereby created. The director shall be appointed by and hold office at the pleasure of the governor and shall receive a salary of five thousand dollars per annum. Before entering upon the duties of his office the director shall execute an official bond to the State of California in the penal sum of twenty-five thousand dollars, conditioned upon the faithful performance of his duties. Except as in this article otherwise prescribed, the provisions of article two of this chapter, title and part of the Political Code as adopted at the forty-fourth session of the legislature, and as the same may be amended from time to time, shall govern and apply to the conduct of the department of institutions in every respect the same as if such provisions were herein set forth at length.

366*a*. For the purpose of administration the department shall be forthwith organized by the director in such manner as with the approval of the governor shall be deemed necessary to properly segregate and conduct the work of the department. The director with the approval of the governor may create such divisions and subdivisions as may be necessary and change or abolish the same from time to time.

366*b*. The director shall have power to appoint the superintendent or executive officer of each institution and define his duties and with the approval of the governor fix his salary. The appointment of the superintendent of state hospitals for the insane and Sonoma State Home shall be made in accordance with the qualifications and examination provided for in section two thousand one hundred fifty-two of the Political Code.

366*c*. The department of institutions shall succeed to and is hereby invested with all the duties, powers, purposes, responsibilities and jurisdiction of the board of directors of the Industrial Home for the Adult Blind, the board of managers of the Stockton State Hospital, the board of managers of the Napa State Hospital, the board of managers of the Agnews State Hospital, the board of managers of the Mendocino State Hospital, the board of managers of the Southern California State Hospital, the board of managers of the Norwalk State Hospital, the board of managers of the Sonoma State Home, the board of trustees of the

Pacific Colony, the board of trustees of the Industrial Farm for Women, the general superintendent of state hospitals, the state commission in lunacy, the board of trustees of the Whittier State School, the board of trustees of the Preston School of Industry, the board of trustees of the California School for Girls, the state dental surgeon, and of the several officers, deputies and employees of such bodies and offices; and whenever by the provisions of any statute or law now in force or that may hereafter be enacted a duty is imposed or authority conferred upon any of said bodies, offices or officers such duty and authority are hereby imposed and conferred upon the department of institutions and the director and officers thereof, the same as though the title of the department of institutions had been specifically set forth and named therein in lieu of the name of any such board, commission, office, officer, deputy, or employee thereof, as the case may be. The offices of general superintendent of state hospitals, state commission in lunacy, state dental surgeon and the positions of all deputies, officers and employees under the several bodies, offices and officers whose duties, powers, purposes, responsibilities and jurisdiction are so succeeded to by and vested with the department of institutions are and each of them is hereby abolished and shall have no further legal existence, but the statutes and laws under which they existed and all laws prescribing their duties, powers, purposes, responsibilities and jurisdiction are hereby expressly continued in force. The department of institutions shall also succeed to and be in control of all records, books, papers, officers, equipment, supplies, moneys, funds, appropriations, land and other property, real or personal, now or hereafter held for the benefit or use of said bodies, offices and officers.

366*d*. The boards of directors, managers and trustees of the several state hospitals and the Sonoma State Home, the Pacific Colony, the Industrial Home for the Adult Blind, the California Industrial Farm for Women, the California School for Girls, the Preston School of Industry and the Whittier State School are hereby respectively continued in force and constituted advisory boards to the department of institutions with power of visitation and advice only in respect to the conduct of said several institutions. The members of said boards shall serve without compensation other than necessary expenses incurred in the performance of duty. They shall meet once every three months and at such other times as they may be called by the head of the department. No expenses shall be allowed except in connection with meetings so held.

366*e*. From and after the date upon which this act takes effect the department of institutions shall be and is hereby authorized and empowered to expend the moneys in any appropriation or in any special fund in the state treasury now remaining or made available by law for the administration of the provisions of all the statutes the administration of which is committed to the department, or for the use support, or maintenance of any board, commission, office or officer whose duties, powers, and functions are by the provisions of this article transferred to and conferred upon the department of institutions. Such expenditures by the department shall be made in accordance with law in carrying on the work for which such appropriations were made or such special funds created.

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LETTER OF TRANSMITTAL.

Hon. William D. Stephens,
Governor of California,
Sacramento, California.

Dear Sir: In compliance with the provisions of chapter 602, Statutes of 1921, I have the honor to submit herewith the report of the Department of Institutions for the biennium ending June 30, 1922.

ORGANIZATION OF DEPARTMENT.

Under the provisions of chapter 610, Statutes of 1921, creating the Department of Institutions, and which act took effect on July 30, 1921, Mr. Ralph T. Fisher was appointed Director of Institutions and assumed the duties of that office on the above date. He immediately reappointed the heads of the thirteen institutions under the jurisdiction of this department, as follows:

F. P. Clark, M. D., medical superintendent of the Stockton State Hospital at a salary of $333.33 per month.

A. C. Matthews, M. D., medical superintendent of the Napa State Hospital at a salary of $333.33 per month.

Leonard Stocking, M. D., medical superintendent of the Agnews State Hospital at a salary of $333.33 per month.

Donald R. Smith, M. D., medical superintendent of the Mendocino State Hospital at a salary of $333.33 per month.

John A. Reily, M. D., medical superintendent of the Southern California State Hospital at a salary of $333.33 per month.

C. F. Applegate, M. D., medical superintendent of the Norwalk State Hospital at a salary of $333.33 per month.

F. O. Butler, M. D., medical superintendent of the Sonoma State Home at a salary of $333.33 per month.

Fred C. Nelles, superintendent of the Whittier State School at a salary of $300 per month.

O. H. Close, superintendent of the Preston School of Industry at a salary of $300 per month.

Blanche Morse, superintendent of the Industrial Farm for Women at a salary of $250 per month.

Olive P. Walton, M. D., superintendent of the California School for Girls at a salary of $300 per month.

D. Keith, superintendent of the Industrial Home for the Adult Blind at a salary of $175 per month.

The following appointments were also made, constituting the central office force:

F. W. Hatch, M. D., consulting psychiatrist at a salary of $200 per month.

E. S. Birdsall, secretary to the department at a salary of $250 per month.

Dr. Leo J. McMahon, department dentist at a salary of $300 per month.

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E. S. Birdsall, secretary to the department at a salary of $250 per month.

Dr. Leo J. McMahon, department dentist at a salary of $300 per month.

Chas. F. Waymire, deportation agent at a salary of $225 per month.

E. G. Twogood, assistant secretary to the department at a salary of $200 per month.

George Huestis, financial agent at a salary of $175 per month.

Ruth M. Morse, stenographer at a salary of $125 per month.

Elsie Latta, stenographer at a salary of $115 per month.

Pearl M. Stockdale, file clerk and typist at a salary of $85 per month.

Dr. Eva C. Reid, inspector at a salary of $25 per month.

On September 6, 1921, Miss Helen Kincheloe was appointed messenger at a salary of $75 per month.

On October 14, 1921, Mr. Clarke Fisk was appointed field engineer at a salary of $250 per month, to make land classifications at the various institutions.

On November 1, 1921, this department took over the pre-audit of estimates from the various institutions, which work had formerly been handled by the Department of Finance. It was therefore necessary to increase the force in this office, and Mr. W. J. Moodey who had been handling the work in the Department of Finance was transferred to this office at a salary of $175 per month.

On November 7, 1921, Mrs. E. Erwin, who had also been connected with the Department of Finance, was added to the office force at a salary of $100 per month.

On January 19, 1922, Miss Neva De Haven was employed as file clerk at a salary of $100 per month.

On January 24, 1922, Mr. A. M. Yonge was employed as department supervisor of mechanical equipment at a salary of $250 per month, to make a survey of the mechanical equipment at the various institutions.

On January 31, 1922, Mr. E. S. Birdsall, who had been secretary of the State Commission in Lunacy and of this department since June, 1913, resigned, and the undersigned, who had been connected with this office since January, 1907, was appointed to the vacancy.

On March 1, 1922, Mr. Milton C. Gordon was appointed to the position of field supervisor of agriculture at a salary of $175 per month.

Mr. Moodey requested a leave of absence for one year, which was granted on March 29, 1922, at which time he left the service of the department.

It was necessary to fill this vacancy, and Mr. C. E. Applegate was appointed to the position.

On April 15, 1922, Mr. Fisher resigned. Much valuable constructive work was accomplished under his directorship, and the foundations were laid for the ultimate development of the department on a basis of efficiency and economy. Experts had been put into the field to secure data and correct conditions in regard to water supplies, agricultural activities and mechanical work, to the end that full information might be available in this office for the intelligent consideration of various problems which come up for consideration from time to time.

This preliminary work naturally required the expenditure of some additional money at the outset, but after this work was completed it was found possible to discontinue the services of the field experts, and on April 30, 1922, Mr. Fisk, Mr. Yonge and Mr. Gordon severed their connections with the department.

Later, it was found possible to reduce the office force, and the services of Mrs. E. Erwin and Miss Helen Kincheloe were dispensed with, May 16, 1922, and on July 6, 1922, Miss Neva De Haven was transferred to the Department of Agriculture.

Dr. John A. Reily, medical superintendent of the Southern California State Hospital, was appointed to succeed Mr. Fisher, and served as director until September 10, 1922, when he resigned to return to the superintendency of the Southern California State Hospital.

On September 15, 1922, the undersigned was appointed acting director, in order to carry on the business of the department until such time as a permanent appointment might be made.

INSTITUTIONAL ACTIVITIES.

It was Dr. Reily's aim to conduct the institutions under this department to the end that there might be the greatest possible efficiency and economy in the proper housing, training, education and treatment of the inmates of the institutions.

An effort is being made to extend various industrial activities in our hospitals for insane, and reformatories, with the hope of providing a more wholesome and natural environment for the inmates of these institutions, and for the further reason that we may thus more nearly approach a basis of self-support and materially reduce the per capita costs of maintenance without lowering the standard of service. To this end larger agricultural work is being encouraged, that more of our foodstuffs and feedstuffs may be produced; the manufacture of shoes, harness, brushes, brooms, floor coverings, toweling, shirting, tinware, furnishings, men's and women's clothing, mattresses, bed linen, toys, baskets, needlework, and various other articles, these industries serving to create a community interest and bring contentment to the institutions' inmates. In some of the institutions many of the above articles are made in quantities sufficient to meet their own needs. Two of our institutions have installed brick plants where brick and tile are made, very largely with inmate labor, for the construction of necessary buildings. All of these various activities serve to materially reduce the cost of operation, and, besides, employment is generally regarded as one of our most valuable therapeutic agencies in the treatment of the insane, and should prove to be the most valuable reformatory measure in our dealings with the delinquent class. In our opinion no reformation is complete without a full knowledge of how to earn an honest living with the hands.

HOUSING PROGRAM.

With the valuable assistance of the Department of Public Works we have undertaken a building program for additional housing facilities in various institutions. Owing to the high cost of such construction work during the war period, and the need of such funds as were available for other purposes, the housing problem has not received proper consideration for several years past, with the result that all of our institutions have become overcrowded to an unwholesome degree. All of our energies have been given to meeting the housing problem for inmates, and there is now planned, or under construction, sufficient housing facilities to provide over 1000 additional beds in our various

institutions. When this program is completed the housing conditions of the various hospitals and reformatories will be greatly improved.

NEED FOR ADDITIONAL HOUSING FACILITIES.

During the year ending June 30, 1922, the six hospitals for insane increased in population 344, the homes for feeble-minded 44, the four reformatories 88, and the home for adult blind decreased 4, making a total increase in population of all institutions under this department of 472. At the same rate, we may reasonably expect the institutions to increase 944 during the next biennial period. Besides this normal increase in population, there are certain buildings in some of our institutions which, through deterioration from age, should be replaced with new and modern cottages. We refer particularly to one building at the Stockton State Hospital which was constructed in 1852 and is, therefore, 70 years old. The walls of this building are greatly deteriorated; it is insanitary, and should not be continued in use for housing the inmates of the Stockton State Hospital. There are, all told, about 800 inmates of our institutions being housed in quarters which are unfit, and for this number new housing facilities should be provided.

Added to the normal increase for the biennial period, which, judging from past experience, will be 944, total need for housing facilities for the next biennial period will be approximately 1744 additional beds.

In this connection it is suggested that all requests for appropriations for housing facilities for the various institutions under this department, and particularly for the hospitals for insane, should provide for a very definite minimum number of beds in each appropriation, and that all appropriations should be based upon the principle that the acute cases and bedridden cases should be housed in Class A construction, with a minimum cost of $1000 per bed, whereas the custodial type should be housed in a high-class, slowly combustible type of building which should cost not to exceed $500 per bed. By placing in each bill calling for an appropriation for housing purposes a statement of the minimum number of beds to be provided for, it would be feasible for the legislature, or the finance committee, to secure data in regard to the increase in population of our institutions during the past two years, and thereby estimate quite accurately the approximate need for the approaching biennium. Under this method it would be possible to determine whether the institutions were asking for a surplus of housing facilities, and this method would also oblige all institutions to use a similar type of construction for housing purposes.

REFORMATORIES.

Buildings are now being erected at the Whittier State School with a housing capacity of 70 beds. This will enable the school to provide suitable quarters for a group of boys who are now obliged to sleep in the basement, in surroundings which are not conducive to reformation, but on the other hand are calculated to give little encouragement to boys living there to assume a normal attitude toward life. In this institution much attention is being given to sports and education. It would seem that the greatest benefit should be expected from teaching the delinquent element some wholesome occupation, with the hope that they

might become interested in earning an honest living with their hands. The application of this principle applies equally to the California School for Girls, and the Preston School of Industry, both of which are also stressing the educational feature. It would seem, therefore, that greater effort should be made to teach the inmates of our reformatory institutions some trade which will enable them to earn a living when they are discharged from the institutions.

INDUSTRIAL FARM FOR WOMEN.

After much delay the Industrial Farm for Women was formally opened in January, 1922. On June 30, 1922, they had admitted 23 inmates. Of this number approximately 19 were narcotic or alcoholic addicts. When the inmates of this institution were interviewed it was found that, with few exceptions, they are of precisely the same class as we have for years been attempting to care for in our state hospitals for insane as female inebriates. The history of moral delinquency of the inmates of the Industrial Farm for Women is no more marked than it is with the state hospital inebriate. The results undoubtedly will not be any more satisfactory in the farm for women than it is in the hospitals for insane. The question, therefore, arises, is the state justified in maintaining two different departments attempting to meet the same problem? In the hospitals for the insane this class can be cared for at an expense not to exceed $20 per month per patient, whereas our experience in conducting the farm for women, covering a period of six months ending June 30, 1922, shows that the cost, with average daily population of 9 inmates, was $573.50 per month per patient. The very small number of admissions to this institution during the first six months of its existence would indicate that the crying need of such an institution was not as real as apparent to those who advocated its establishment. This fact, coupled with the enormous cost of maintaining such a small group with a fully established overhead, and the further fact that most if not all of these cases could be legally provided for under the Inebriate Act, in the hospitals for insane, would raise the question of whether or not the Industrial Farm for Women has met satisfactorily the problem for which it was created and has justified its right to continue in existence.

PACIFIC COLONY.

At the close of the biennium ending June 30, 1922, the Pacific Colony had a total population of 41 patients, most of whom were received on transfer from the Sonoma State Home or the Whittier State School. This property consists of two separate tracts of land, one of 800 acres, the other of 200 acres. On the former are located the present buildings, which are filled to capacity, but further development of this institution can not be made on the 800-acre tract because of inadequate water supply, there being only amout 20 miner's inches available and no possibility of further water development on this tract. Another good reason for not locating the institution on the 800-acre tract is that this site is three miles from the nearest railroad and one and one-half mile from the nearest highway, which makes it practically inaccessible and works an unnecessary hardship upon the friends and relatives of the inmates of

this institution who seek the opportunity to visit the patients confined therein. It would cost approximately $150,000 to purchase from the Pomona Water Company and deliver sufficient water to maintain an institution of 1500 inmates. In addition, it would cost approximately $70,000 to build a spur track from the railroad to deliver supplies to the institution. The 200-acre tract is ideally located for an institution, has ample water, is located adjoining the Valley boulevard, and is very near to two main line railroads. It will be impossible, however, to build the institution upon this tract, because, near the center of the tract are 41 acres which are owned by an outside party. I would respectfully recommend that this 41-acre tract be condemned and purchased, and that future developments of the Colony be established on this tract. In view of this anomalous situation we have not felt justified in spending any of the moneys which were appropriated by the 1921 legislature for the construction of buildings and equipment of this institution. I would also recommend that the present inmates of Pacific Colony be transferred to the Sonoma State Home where they can be amply provided for at much less expense until such time as the development of Pacific Colony may go forward without further interruption.

On May 26, 1922, Dr. C. E. Sisson, assistant physician at the Norwalk State Hospital, was placed in charge of affairs at Pacific Colony, and an active campaign was begun to reduce the cost of maintaining the institution, with the very happy result that the monthly expenditures have been reduced over 35 per cent without reducing the standards of service rendered. Dr. Sisson is greatly to be complimented for this work, as he has been conducting it in conjunction with his work at Norwalk State Hospital.

INDUSTRIAL HOME FOR THE ADULT BLIND.

There are approximately 2000 blind in the State of California who are not being cared for in the Home for the Adult Blind, some of whom have made application for admission. The population of the Home, June 30, 1922, was 133. Inasmuch as this is primarily an industrial institution where the blind are taught trades and encouraged to assist in their own support, it has been thought best to admit only those who may be susceptible of being taught some of the various trades which constitute the industrial aspect of the Home. It is obvious that the extremely old who become blind should be maintained in the homes of their relatives, or, if there are no relatives interested, then by the local charities in the homes for old folks or the county hospitals and almshouses. To congregate all of this class in one institution, conducted by the state, would not be more for the blind than could be done by the local communities, and at the same time would add very materially to the cost of maintaining the state's dependents, and would undoubtedly deny the local communities and charities the right to shed their benevolence upon this very unfortunate class. It is to the great benefit of each community to have its own problems of charity upon which it may be able to bestow its generosity, and there is no class which appeals more to the sympathies of good men and women than those who have been deprived of their eyesight. I would respectfully recommend, therefore,

that the present policy in the conduct of the Industrial Home for the Adult Blind be maintained, admitting only those who may be successfully taught some trade.

GROWTH OF POPULATION.

The population in our various institutions shows a steady growth, especially in the state hospitals for the insane. In the latter institutions we had a total population on June 30, 1912, of 7929 patients. On June 30, 1922, the total population was 11,291, an increase of 45 per cent in ten years. At the same rate of increase it is reasonable to state that in 1932 the population of our state hospitals will have reached the staggering total of approximately 17,000 patients. It is plain to be seen, therefore, that we must continue to build in order to take care of this increase if California is to maintain her position as one of the foremost states in the Union in the care and treatment of the insane.

DEPORTATION.

This department has been active in deporting non-residents to their respective states, and also in cooperating with the federal government in deporting aliens. Attention is particularly called to the report of the deportation agent in this connection, which shows the great saving to the state accomplished through prompt deportation of those who do not belong to the State of California. When it is seen that with an initial expense of about $125 per patient an ultimate saving of approximately $2,500 per patient deported can be made, it would seem to be sound business to appropriate sufficient money to carry on the work conducted by the deportation bureau of this department.

COLLECTIONS AT STATE HOSPITALS.

Collections for the contingent funds of all the state hospitals and the Sonoma State Home show a marked increase over previous years. This is due to the excellent work of the various secretaries to the medical superintendents, and to the activity of our financial agent in following up cases through the system of reports adopted through amendments to the law at the last session of the legislature, and, further, through the vigilance and prompt action of the attorney for the department in securing settlement of doubtful cases.

The total collections for the six state hospitals for the biennium ending June 30, 1920, were $857,227.41. The total collections for the biennium ending June 30, 1922, were $1,168,991.25, an increase of $311,763.84 over the previous two years.

In addition to the above, the Sonoma State Home collected for its contingent fund during the biennium the sum of $97,006.32, making a grand total of $1,265,997.51.

The collections for commitment and transportation expense by this department for the biennium totaled $19,265.61, an increase of $1,569.96 over the previous two years.

As required by law, there is submitted herewith a financial statement showing the total amount expended by this department from its organization on July 30, 1921, to June 30, 1922, also a statement of the amount

expended by the State Commission in Lunacy from July 1, 1920, to July 29, 1921.

Attention is respectfully called to the reports of the various officers connected with the department, all of whom deserve commendation for efficient work performed.

Respectfully submitted,

E. G. TWOGOOD,
Secretary and Acting Director.

November 27, 1922.

MONTHLY RECEIPTS AT THE SIX STATE HOSPITALS, FROM JULY 1, 1916, TO JUNE 30, 1922.

From July 1, 1916, to June 30, 1917.

Months	Stockton	Napa	Agnews	Mendocino	Southern California	Norwalk	Totals
1916—July	$6,869 03	$4,381 91	$4,644 91	$1,977 68	$4,640 75	$350 31	$22,864 59
August	2,683 05	10,201 20	4,500 43	1,832 10	6,060 62	247 35	25,524 75
September	3,498 10	5,132 11	6,001 15	1,007 14	4,068 50	460 55	20,107 55
October	2,775 95	5,126 75	5,024 30	1,644 60	3,869 65	516 06	18,968 21
November	3,161 12	4,042 93	4,013 55	838 90	4,702 89	388 13	17,237 62
December	6,023 04	4,451 02	7,066 96	1,030 25	3,444 12	2,310 21	24,325 60
1917—January	2,882 77	8,677 10	5,649 17	2,344 26	4,545 52	1,542 02	25,640 84
February	2,159 90	4,748 12	4,055 88	873 50	4,338 78	445 75	16,601 93
March	2,805 87	6,034 57	5,737 80	793 75	6,426 24	407 25	22,205 48
April	2,832 19	3,943 38	6,295 16	1,845 25	7,104 52	429 40	22,449 90
May	3,439 11	5,205 51	5,122 85	1,035 50	4,975 32	717 06	20,495 35
June	2,326 44	7,416 42	5,714 98	958 60	5,309 22	231 50	21,956 56
Totals	$41,456 57	$69,361 02	$63,837 14	$16,180 93	$59,486 13	$8,046 59	$238,368 38

From July 1, 1917, to June 30, 1918.

Months	Stockton	Napa	Agnews	Mendocino	Southern California	Norwalk	Totals
1917—July	$3,438 64	$5,294 33	$4,801 95	$1,800 76	$12,257 74	$813 83	$28,407 25
August	5,360 02	4,887 50	6,319 23	778 88	9,145 77	545 38	27,036 78
September	4,480 81	6,969 98	5,653 88	2,312 00	4,813 16	597 60	24,827 43
October	4,300 09	5,230 15	6,826 16	1,633 54	5,404 84	865 38	24,310 16
November	4,019 61	4,027 24	5,602 18	1,083 80	4,066 17	1,882 86	21,821 66
December	4,576 11	9,788 07	5,140 41	1,587 50	6,437 90	2,591 88	30,521 87
1918—January	3,856 11	7,998 30	5,597 85	1,894 21	5,158 05	1,868 84	26,373 56
February	3,471 88	8,553 06	5,326 15	2,041 81	5,924 85	1,005 61	26,323 36
March	7,978 23	6,388 13	6,432 05	955 50	5,015 91	682 40	27,452 22
April	6,151 61	9,146 75	5,608 37	3,371 61	5,253 09	1,851 08	31,382 51
May	3,728 27	13,609 52	6,051 68	1,422 79	8,046 91	434 08	33,293 25
June	5,133 48	8,921 99	10,908 15	3,009 41	5,702 03	984 23	34,659 29
Totals	$56,494 86	$91,745 02	$73,658 06	$21,911 61	$78,066 42	$14,523 27	$336,400 24

From July 1, 1918, to June 30, 1919.

Months	Stockton	Napa	Agnews	Mendocino	Southern California	Norwalk	Totals
1918—July	$6,476 15	$11,381 32	$5,523 17	$5,031 72	$5,205 80	$408 88	$34,027 04
August	3,495 13	6,933 84	7,140 35	1,732 28	5,678 68	518 38	27,498 66
September	6,193 91	7,645 24	6,114 30	1,066 75	6,200 80	553 48	27,777 48
October	5,246 55	12,340 92	5,570 06	2,886 49	6,044 62	1,348 36	33,437 90
November	3,230 15	6,036 54	7,492 20	1,305 00	4,471 40	1,562 63	24,097 92
December	7,659 07	7,386 10	6,412 23	841 00	5,081 95	1,476 14	28,256 49
1919—January	4,183 88	8,946 60	6,472 32	2,273 51	5,588 24	2,599 73	29,965 38
February	4,000 00	8,150 73	6,179 93	1,207 00	4,695 25	1,362 23	25,595 14
March	3,809 94	11,615 34	7,803 32	1,428 01	5,792 81	2,313 16	32,762 58
April	5,649 90	8,500 84	6,787 20	1,932 25	5,973 02	2,178 62	31,021 83
May	5,484 71	25,326 49	5,579 43	1,879 30	5,170 10	2,705 77	46,145 80
June	8,366 41	11,273 28	7,014 23	1,173 93	5,548 46	3,428 21	36,804 52
Totals	$63,201 80	$125,537 24	$78,089 64	$22,857 34	$65,249 13	$20,455 59	$375,390 74

From July 1, 1919, to June 30, 1920.

Months	Stockton	Napa	Agnews	Mendocino	Southern California	Norwalk	Totals
1919—July	$7,866 38	$8,465 61	$8,050 77	$2,077 45	$24,236 83	$2,961 80	$53,658 34
August	5,193 80	6,844 90	7,031 18	5,316 66	5,542 05	2,853 49	32,781 48
September	6,110 62	9,876 71	8,238 25	1,113 49	7,893 67	2,066 71	35,299 45
October	5,798 42	10,754 40	7,618 13	3,814 65	13,517 05	2,410 10	43,942 75
November	5,215 93	10,464 49	7,439 41	1,810 94	7,073 80	1,333 28	33,337 85
December	7,929 81	9,791 60	8,118 57	3,172 37	7,198 37	2,025 86	38,236 78
1920—January	6,029 13	12,176 39	8,600 36	4,000 58	11,278 84	2,133 46	44,218 76
February	6,505 82	10,276 39	6,884 99	1,595 10	6,586 00	1,998 73	33,847 03
March	5,162 18	8,448 28	7,354 70	2,237 30	8,257 46	3,307 78	34,767 70
April	12,848 23	10,029 14	7,767 88	8,912 18	8,220 82	1,857 53	49,635 78
May	8,172 19	9,995 90	7,919 82	2,751 60	8,494 06	1,448 21	38,781 78
June	8,352 81	10,597 99	7,744 35	2,180 88	12,899 74	1,612 90	43,388 67
Totals	$85,185 32	$117,721 80	$92,768 41	$39,012 60	$121,138 69	$26,009 85	$481,836 67

From July 1, 1920, to June 30, 1921.

Months	Stockton	Napa	Agnews	Mendocino	Southern California	Norwalk	Totals
1920—July	$7,550 55	$11,827 62	$10,002 58	$12,109 82	$7,712 70	$2,093 15	$51,296 42
August	8,122 48	12,245 55	7,467 10	7,981 19	7,107 26	4,003 39	46,924 97
September	8,210 74	8,643 55	8,616 63	13,971 42	11,412 43	1,378 57	50,233 34
October	6,122 07	8,409 41	8,370 41	12,853 89	6,599 00	1,720 64	44,075 42
November	7,777 54	9,547 83	7,283 41	11,129 66	7,345 63	1,415 97	44,499 98
December	8,745 73	9,850 61	10,327 97	2,640 45	8,160 10	1,721 79	41,446 65
1921—January	8,401 74	13,277 33	8,593 94	16,444 63	7,142 15	4,290 92	58,150 71
February	8,413 22	12,205 79	7,602 81	8,617 36	6,008 04	1,567 74	44,502 96
March	7,578 55	9,489 94	8,104 67	10,053 27	7,510 99	1,922 73	44,660 15
April	11,134 81	10,962 39	9,636 99	2,594 80	12,731 48	1,993 47	49,053 24
May	9,427 12	10,750 42	7,295 21	8,962 20	7,817 88	1,747 28	46,000 11
June	7,178 40	12,141 55	7,586 00	9,048 91	6,468 22	2,238 16	44,661 24
Totals	$96,662 95	$129,351 99	$100,975 72	$116,407 54	$96,015 88	$26,091 81	$565,505 89

From July 1, 1921, to June 30, 1922.

Months	Stockton	Napa	Agnews	Mendocino	Southern California	Norwalk	Totals
1921—July	$5,498 88	$11,139 35	$9,707 02	$16,970 87	$9,046 66	$3,621 89	$55,984 67
August	6,970 25	11,078 19	9,299 15	15,829 45	6,611 36	2,247 10	52,035 50
September	8,419 74	11,022 46	8,705 19	1,388 71	8,967 67	3,078 73	41,652 53
October	5,958 29	12,493 32	8,655 85	2,597 05	7,582 24	2,485 21	39,771 96
November	7,705 01	11,908 86	9,477 34	1,818 38	8,462 04	3,026 56	42,438 19
Decemebr	7,446 75	10,542 21	9,253 41	1,797 86	5,761 56	2,389 46	37,182 25
1922—January	7,514 95	11,841 85	10,829 25	7,771 58	11,068 90	2,360 15	51,326 68
February	6,860 75	10,351 43	7,755 21	1,483 81	5,511 55	2,524 61	38,467 36
March	7,216 74	12,332 79	8,860 35	19,068 54	10,032 23	1,807 30	59,377 95
April	8,906 66	12,729 62	10,612 11	23,434 41	10,204 28	2,715 14	68,601 62
May	9,671 68	13,212 97	8,716 37	25,578 88	5,629 20	2,794 17	65,603 27
June	12,165 84	14,274 03	12,582 34	2,551 35	6,927 70	2,522 12	51,023 38
Totals	$94,394 94	$142,997 08	$114,433 59	$120,230 92	$99,805 39	$31,623 44	$603,485 36

FINANCIAL STATEMENT.

Amount Expended by State Commission in Lunacy.

(As of June 30, 1921.)

SEVENTY-SECOND FISCAL YEAR.

Appropriation for salaries—645-19		$20,000 00
Emergency Resolution No. 13—State Board of Control		600 00
Unexpended balance, seventy-first fiscal year		24 20
		$20,624 20
Amount expended		20,620 00
Unexpended balance		$4 20
Appropriation for traveling and contingent—645-19		$2,500 00
Unexpended balance, seventy-first fiscal year		497 51
		$2,997 51
Amount expended		2,854 21
Unexpended balance		$143 30
Appropriation for printing—645-19		$4,000 00
Collections from institutions		594 31
		$4,594 31
Amount expended		4,529 70
Unexpended balance		$64 61
Appropriations for deportation bureau—415-19—(two years) unexpended balance		$12,742 68
Collections and refunds		562 30
		$13,304 98
Amount expended		12,811 32
Unexpended balance		$493 66
Appropriation for state dental surgeon—624-09—unexpended balance		$595 90
Amount expended		335 72
Unexpended balance		$260 18

STATE COMMISSION IN LUNACY.

Statement of Expenditures.

(July 1, 1921, to July 29, 1921.)

SEVENTY-THIRD FISCAL YEAR.

Function	Materials and Supplies	Salaries and Wages	Service and Expense	Property and Equipment	Totals
Administration:					
General superintendent	------	$ 389 76	-------	-------	$ 389 76
Attorney	------	233 86	-------	-------	233 86
Secretary	------	233 86	-------	-------	233 86
Assistant secretary	------	187 10	-------	-------	187 10
Financial agent	------	163 71	-------	-------	163 71
Clerical and office	$19 25	304 02	$13 68	-------	366 95
Printing	------	-------	53 90	-------	53 90
Telephones and telegrams	------	-------	61 17	-------	61 17
Postage	------	-------	44 00	-------	44 00
Traveling	------	-------	26 74	-------	26 74
Total Administration	$19 25	$1,512 31	$199 49	-------	$1,731 05
Care and Welfare Supervision:					
Deportation bureau	------	$ 210 48	$373 58	-------	$ 584 06
Dental surgeon	------	280 65	-------	-------	280 65
Total Care and Welfare Supervision	------	$ 491 13	$373 58	-------	$ 864 71
Total Expenditures	$19 25	$2,003 44	$573 07	-------	$2,595 76

DEPARTMENT OF INSTITUTIONS.

Statement of Expenditures.

(July 30, 1921, to June 30, 1922.)

SEVENTY-THIRD FISCAL YEAR.

Function	Materials and Supplies	Salaries and Wages	Service and Expense	Property and Equipment	Totals
Administration:					
Director	-------	$ 4,610 21	-------	-------	$ 4,610 21
Secretary	-------	2,691 14	-------	-------	2,691 14
Assistant secretary	-------	1,362 90	-------	-------	1,362 90
Attorney	-------	2,766 14	-------	-------	2,766 14
Financial agent	-------	1,936 29	-------	-------	1,936 29
Clerical and office	$329 23	7,212 94	$ 315 32	$ 769 73	8,627 22
Printing	-------	-------	7,062 71	-------	7,062 71
Telephones and telegrams	-------	-------	522 22	-------	522 22
Postage	-------	-------	592 10	-------	592 10
Traveling	-------	-------	975 06	-------	975 06
Automobile	154 14	-------	66 45	1,943 72	2,164 31
Total Administration	$483 37	$20,579 62	$9,533 86	$2,713 45	$33,310 30
Care and welfare Supervision:					
Consulting psychiatrist	-------	$ 2,212 90	-------	-------	$ 2,212 90
Dental surgeon	$202 83	3,594 35	-------	-------	3,797 18
After-care	-------	1,557 25	-------	-------	1,557 25
Deportation	-------	2,489 52	-------	-------	2,489 52
Traveling	-------	-------	$ 927 87	-------	927 87
Paroles and discharges	-------	-------	60 00	-------	60 00
Total Care and Welfare Supervision	$202 83	$9,854 02	$ 987 87	-------	$11,044 72
Structural and Farming Supervision:					
Engineers	-------	$ 2,459 67	-------	-------	$ 2,459 67
Farm adviser	-------	875 00	-------	-------	875 00
Traveling	-------	-------	1,034 39	-------	1,034 39
Total Structural and Farming Supervision	-------	$ 3,334 67	$1,034 39	-------	$ 4,369 06

DEPARTMENT OF INSTITUTIONS.

Income and Expenditures.

(July 1, 1921, to June 30, 1922.)

SEVENTY-THIRD FISCAL YEAR.

INCOME.

Appropriations		$12,980 84
Deportation bureau—415-19	$506 06	
Salary dental surgeon—905-21	280 65	
Printing—905-21	5999 83	
Traveling and contingent—905-21	6194 30	
Institutions pro-rata		38,374 03
Agnews State Hospital	$4218 41	
California School for Girls	1360 93	
Industrial Farm for Women	409 34	
Industrial Home for the Adult Blind	476 66	
Mendocino State Hospital	2901 15	
Napa State Hospital	6007 06	
Norwalk State Hospital	2169 26	
Pacific Colony	527 14	
Preston School of Industry	2414 11	
Sonoma State Home	4446 26	
Southern California State Hospital	5035 49	
Stockton State Hospital	6285 51	
Whittier State School	2122 71	
Miscellaneous revenue		26 96
Total income		$51,381 83

EXPENDITURES.

(Per Statements.)

Administration	$33,310 30	
Care and welfare supervision	11,044 72	
Structural and farming supervision	4,369 06	$48,724 08
Lunacy Commission expense		2,595 76
Total expenditures		$51,319 84
Excess accumulated income, seventy-third fiscal year		$61 99

REPORT OF FINANCIAL AGENT.

MR. E. G. TWOGOOD,
Secretary and Acting Director,
Department of Institutions,
Sacramento, California.

DEAR SIR: I submit a report of cases and of claims of the several state hospitals, which have been referred to me, from time to time, during the period beginning July 1, 1920, and ending June 30, 1922; these cases and claims having been reported to me by your department directly, and a number of them from the secretaries of the several state hospitals, and in addition I have investigated and reported on cases referred to me by the attorney for the department.

In regard to these, I can state as follows:

1. The total number of cases and claims of State Hospitals—2 years ended June 30, 1922—investigated by me were	16
2. Number of said cases and claims reported on for relief, compromise, or cancellation	5
3. Number of cases and claims investigated, and then taken up specially with the attorney for your department	2
4. Number of active cases and claims now on hand pending final investigation, settlement, suit, compromise, or cancellation	3
5. Cash collections made directly, and also caused to be paid directly to your department, or directly to State Hospitals as a result of my efforts, covering this period	$25,925

Included in the cash payments made to the State of California, either by payments made directly to me, or made to the several hospitals on account of my efforts, or to your department, about 20 per cent, or approximately $5,000, of the same were on account of outlawed claims.

I wish to make special comment in this report on the effect of some of the legislation passed in the session of 1921, for the purpose of systematizing and making more efficient the adjustment and collection of state hospital claims, particularly the legislation requiring the county clerks of our several counties to make reports to our department of each and every guardianship petition filed in their offices, relating to estates of patients in our hospitals, and in addition having the several superintendents, through their secretaries, report promptly all citations served upon patients in connection with guardianships. I can say that we are now keeping an accurate and complete record of the estates of all our patients. This has grown to be quite voluminous. At the present time, there are in my files and records some 415 such guardianship estates. I have made investigations of the records, and by consultations with the guardians and their attorneys, have thus been able to determine positively just the status of these estates. We now have a record showing just what the assets are, their nature or character, and are therefore in a position to enforce payment in all guardianship estates, in which the estates are of sufficient size to warrant payment under the law. I am satisfied that directly and indirectly, through these records alone, the State of California is being benefited in our

payments to the several hospitals of at least several hundred dollars a year more than it would have been if these records were not kept, and furthermore I am satisfied that each year these payments will be increased because of such records.

Yours respectfully,

(Signed) GEO. HUESTIS,
Financial Agent, Department of Institutions.

REPORT OF ATTORNEY.

MR. E. G. TWOGOOD,

Acting Director, Department of Institutions
of the State of California,
Sacramento, California.

DEAR SIR: In compliance with your request, I submit herewith a brief summary of the activities of the office of attorney for the Department of Institutions, covering the period from July 1, 1920, to June 30, 1922.

COLLECTIONS.

During this period there has been paid to the State of California through my office, $21,636.50, nearly all of which was on account of board and maintenance of patients at the various state hospitals. The cases in which these collections were made are of great variety. Some collections were made from relatives of patients, some from guardians, some from the estates of deceased patients and some from friends or relatives not legally liable. Some of these cases were referred to me by the director of the Department of Institutions, some by the secretary of the department, others by the financial agent and others by the medical superintendents of the various state hospitals, while some come to me directly, in the first instance through estates of patients as the law requires notice of estate proceedings of patients to be served upon the attorney or secretary of the department.

ESTATES.

During the period embraced in this report, I have handled and investigated more than four hundred and fifty (450) different matters. I have investigated and examined proceedings in one hundred forty-three (143) different guardianship matters and estates. As a result of my supervision of these guardianships and estates, many thousands of dollars have been paid to the state on account of board and maintenance of patients at state hospitals, and many thousands of dollars have been saved to these various estates which might otherwise have been diverted from the estates of these unfortunate patients by relatives and guardians for unnecessary expenses and improper allowances and claims. In addition to the $21,636.50 paid to the state directly through this office, I feel warranted in saying that more than $50,000 additional was paid directly to the state hospitals during this period as a direct result of the work of this office.

SUITS.

During the period covered in this report, I have filed, prosecuted and appeared in thirty-eight different suits in addition to the suits which were pending at the beginning of the period embraced in this report. At the end of this period there were twenty-five different actions pending. Most of these actions which I have handled are suits against relatives legally liable for board and maintenance of patients or against patients and their guardians for board and maintenance

although I have appeared in several different suits which have been commenced against patients at state hospitals and have also appeared in habeas corpus proceedings and there is one action pending for an injunction concerning alleged right of way through the Napa State Hospital grounds, and I am satisfied that this action can be successfully defended.

OPINIONS.

I have from time to time been called upon for opinions concerning various subjects pertaining to the conduct, operation and management of the state hospitals, and questions which have troubled the medical superintendents with reference to patients and property, debts and effects of patients, parole of patients, restrictions concerning cost of hospital buildings. I have also had to investigate alleged claims of infringements of patented process being used at some of the state hospitals.

INTERVIEWS AND CONFERENCES.

I maintain an office in the Bank of Italy Building in Oakland entirely at may own expense, with the exception of expenses for postage stamps and stationery and some long distance telephone calls. Many attorneys for estates of deceased patients, and many guardians and attorneys for guardians of patients, and many relatives and friends of patients call daily by appointment and otherwise to confer about patients, their condition, treatment and different problems in connection with their estates. I am called upon daily to acknowledge service of copies of court orders, petitions, accounts, notices, etc., and for advice and information concerning patients at the state hospitals, which I give freely. The financial agent of the department has taken up with this office for action, and has discussed with this office a great many claims and cases.

The secretary of the department and the financial agent, as well as the medical superintendents of the state hospitals have heartily cooperated with this office and this office has cooperated with them and this friendly cooperation has made possible the collection of large sums of money for the support of the state hospitals and has resulted in advantage to the state and to the patients, and has brought about a better understanding between the relatives of patients and the department.

Respectfully submitted,

(Signed) Earl D. White,
Attorney for the Department of Institutions of the State of California.

REPORT OF DEPARTMENT DENTIST.

MR. E. G. TWOGOOD,
Secretary and Acting Director,
Department of Institutions,
Sacramento, California.

DEAR SIR: I have the pleasure to submit herewith the following biennial report of dental services rendered by me during my visits to the following state institutions: Agnews State Hospital, Napa State Hospital, Mendocino State Hospital, Sonoma State Home, Industrial Farm for Women.

Extractions	4839
Deciduous extractions	341
Fillings	1844
Prophylactic treatments	655
Treatments	115

The above is the number of patients receiving treatment for pyorrhea, abscesses, stomatitis, nerves, etc.

Reset inlay	2
Reset crowns	37
Reset bridges	33
Temporary fillings	11
Reset pivot tooth	2
Removed growth from maxillary	1
Curetted inferior maxillary	2
Vulcanite dentures cleaned, polished	5
Ether administered	3

During the last six months Napa State Hospital has had a resident dentist added to its staff in the person of Dr. F. J. Colligan, who was assistant department dentist, visiting Norwalk State Hospital, California School for Girls and the Whittier State School.

Dr. George L. Bettencourt served for several months as assistant department dentist and later resigned. Dr. McMillan has been appointed to the vacancy.

On making my annual visit to the state institutions in southern California I examined the equipment and instruments of the Southern California State Hospital at Patton, Norwalk State Hospital, California School for Girls at Ventura and the Whittier State School, finding everything in a most sanitary condition.

The earnest and painstaking attention given by Dr. Thompson at Patton and the assistant department dentist, has, in my opinion, helped wonderfully in teaching the patients the absolute necessity of prophylactic care of the teeth.

As stated in my previous report I should like to see all the state institutions equipped with my sanitary tooth brush rack.

Since my last report the State Purchasing Department and myself have been fortunate in securing for the Napa State Hospital a complete outfit for operations at the chair and laboratory work. The Wilkerson chair and cuspidor we sold to the Sonoma State Home. We also pur-

chased for the Mendocino State Hospital a dental engine and an all-metal fountain cuspidor. The above were all slightly used but in first-class order and practically new.

I have submitted a list of instruments and equipment for the Yountville Soldiers' Home and will assist them in every way possible.

During my visit to the Mendocino State Hospital I examined all over seas soldier patients, giving first aid and advice regarding dental needs.

During my visit to the Agnews State Hospital I was called to attend a patient at the Old Ladies' Home, who were temporarily occupying a cottage loaned to them, their institution being lost through fire.

In conclusion I beg to express my appreciation for the hearty cooperation given me by the various superintendents of the institutions visited by me and also the members of the Department of Institutions.

Very truly yours,

LEO J. MCMAHON,
Department Dentist.

REPORT OF DEPORTATION AGENT.

MR. E. G. TWOGOOD,
Acting Director,
Department of Institutions.

DEAR SIR: Once again we are called upon to review the results of our labors, another biennium having passed us by. Without fear of contradiction we are of the opinion that the deportation of alien and nonresident public charges is a function that should be earnestly pursued.

While the accompanying tables supply the detail of our activities, it may be of interest to note that the deportation of aliens and nonresidents represents 15 per cent of the discharges of the hospitals for the insane and the feeble-minded.

ALIEN INSANE.

Notwithstanding the restrictive immigration laws passed by congress, we continue to receive the average number of mental defectives of Europe. We are making every effort to cooperate with the federal authorities in securing the deportation of the alien insane, as the benefits derived are twofold: they are removed for all time and at no expense to the state.

NONRESIDENT PUBLIC CHARGES.

During the past biennium we have maintained the number of deportations as set by the previous bienniums. However, we have added a new feature, that of returning to their homes in other states, inmates of the Preston School of Industry. In order to keep within the law it has been necessary to have these inmates adjudged as feeble-minded by our superior courts and regularly committed to the Sonoma State Home, from which institution we are authorized by law to deport. The procedure followed has been for the school psychologist to select the inmates whom it was believed were below par mentally and present them to the court for commitment. It would appear to be a good business proposition to deport these budding criminals before they can commit crimes which will necessitate their incarceration in our state prisons for indeterminate periods. While, on the other hand, it is hoped to salvage some by returning them to the home influence.

The following table shows the number of nonresidents deported from the several institutions:

Stockton State Hospital	93
Napa State Hospital	66
Agnews State Hospital	16
Mendocino State Hospital	19
Sonoma State Home	20
Southern California State Hospital	142
Norwalk State Hospital	17
Total	373

INCREASING POPULATION.

With the ambitious publicity campaign about to be launched by the civic bodies of northern California extolling the advantages of this section of the state, it is fair to presume we will be visited, in the near future, by a large number of "Easterners," some on pleasure bent and others who it is hoped will be a large majority, to become permanent settlers amongst us. Of those attracted to our wonderful state there will be many defectives who will require custodial care in our public institutions. This is not mere conjecture. Southern California has, for many years, been advertising its climate and resources, and the records of the psychopathic division of the Superior Court of Los Angeles County show an amazing number of defective nonresidents requiring care and treatment in public institutions. The county of Los Angeles, at large expense, maintains an efficient organization for the investigation, supervision and return of nonresident public charges, and due to the untiring efforts of Mrs. Jean G.McCracken, psychopathic parole officer, we are relieved of the care of many cases who would otherwise become inmates of our state hospitals. But notwithstanding the activity of Mrs. McCracken many nonresident public charges are committed to the state hospitals in Southern California, from whence we get 50 per cent of our deportees. With the intensive advertising campaign now on in northern and southern California, and the keen rivalry between the two sections, we fear not to predict a large increase in population during the next few years. With the many benefits derived from this advertising we must be prepared to write off to profit and loss the expense of caring for defectives, mental and otherwise, attracted to our commonwealth, and it appears to the writer we should take the proper precautions to protect our interests and lighten the burden of caring for the defectives as much as possible by returning them whence they belong.

ECONOMIC ADVANTAGE OF DEPORTING NONRESIDENTS.

It has been argued by well-meaning persons that there is no economy in returning nonresident public charges to the states of their legal settlement; that arrangements should be made whereby each state retain and care for these human derelicts, which, in the final analysis, would be equitable to all. Such might be the case were we situated differently and were it not for the fact so many persons are taking Horace Greeley's advice, "Go west, young man!" in response to the alluring advertisements now being broadcasted by the "Boosters" of southern and northern California. To these well-meaning persons let me state we have reciprocal agreements for the exchange of nonresident public charges with eleven states, to whom we returned one hundred and four patients and from whom we accepted forty residents of California. Of these forty cases accepted only twenty-one became inmates of our state hospitals. In addition to the one hundred and four patients above referred to, we deported two hundred and sixty-nine others to forty-six different states and foreign countries, from whom we accepted absolutely none. This data, in our opinion, proves the fallacy of the position of the well-meaning but uninformed persons who are opposed to the

deportation of nonresident public charges. The more populous and progressive states of the Union, like Massachusetts and New York for instance, maintain special departments to handle the deportation of nonresident and alien public charges, while on the Pacific Coast, the states of Oregon and Washington are alive to the menace and are safeguarding their interests. As a concrete example of the economy of deportations let us assume that it is costing us $250 per annum for the care and maintenance of an insane person, which is not very far off from the actual cost as shown by our statistics; that ten years is the average institutional life of an insane person (which is considered conservative); and we find it is costing us on the average about $2,500 for the care and maintenance of these unfortunates. If, by returning them to the states of their legal settlement, at a cost of $125 we can save $2,500, is it not a good business proposition to do so? In this connection let me quote from "The Sieve, or the Truth About American Immigration," by Feri Felix Weiss: "To keep an insane person for a week in a hospital costs at the very lowest five dollars, which makes two hundred and fifty dollars a year. If you figure that the average insane person lives to be about fourteen years in an institution, it costs at least $3,000 to support one of these foreign-born defectives or paupers who happened to pass without detection. That is an unfair burden upon the American taxpayer, the American workers. The most logical, the simplest way of reducing our hospital and insane asylum bills is by making the sieve tighter."

CHAS. F. WAYMIRE,
Deportation Agent.

TABLE NO. 1.

Nativity of Aliens Deported During the Biennium.

Argentine	1	Mexico	29
Austria	1	New Zealand	1
Canada	2	Portugal	3
Chile	1	Russia	1
England	5	Scotland	1
Finland	1	Serbia	1
France	4	Spain	5
Germany	7	Sweden	2
Greece	1	Switzerland	3
Ireland	2	Wales	1
Italy	14		
Japan	5	Total	91

TABLE NO. 2.

Time in the United States of Aliens Deported During the Biennium.

6 to 12 months	21	24 to 30 months	5
12 to 15 months	20	30 to 36 months	4
15 to 18 months	10	36 to 48 months	5
18 to 21 months	12	48 to 60 months	9
21 to 24 months	5		
		Total	91

TABLE NO. 3.

July 1, 1920, to June 30, 1922.

Deported on U. S. government warrants	83
Deported by relatives or friends	8
Cases held (Russian)	3
Cases under investigation	10
Cases with negative results	24
Total	1868

TABLE NO. 4.

Showing Deportation Since September, 1915.

Non-residents returned to their homes	987
Aliens deported by federal authorities	609
Chinese returned to China	201
Japanese returned to Japan	71
Total	1868

TABLE NO. 5.

Showing the Financial Benefit Derived by the State Through the Efforts of the Department of Institutions.

	Aliens deported and non-residents returned	Per capita cost of maintenance	Saving based on cost of maintenance	Per capita cost for construction, furnishing, etc.	Saving based on cost of construction, etc.	Total based on cost of maintenance, construction, etc.	Expense of deportation	Net saving to the state
1905	10	$156 37	$1,562 70	$550 00	$5,500 00	$7,062 70	$1,200 00	$5,862 70
1906	15	150 35	2,255 25	550 00	8,250 00	10,505 25	1,200 00	9,305 25
1907	8	162 32	1,298 56	550 00	4,400 00	5,698 56	1,200 00	4,498 56
1908	15	165 08	2,476 20	550 00	8,250 00	10,726 20	1,200 00	9,526 20
1909	27	163 03	4,401 81	750 00	20,250 00	24,651 81	1,200 00	23,451 81
1910	63	180 02	11,341 26	750 00	47,250 00	58,591 26	1,200 00	57,391 26
1911	63	176 50	11,119 50	750 00	47,250 00	58,369 50	1,200 00	57,169 50
1912	44	167 70	7,378 80	750 00	33,000 00	40,378 80	1,200 00	39,178 80
1913	39	177 24	4,912 36	750 00	29,250 00	34,162 36	1,200 00	32,962 36
1914	146	189 47	27,662 62	750 00	109,500 00	137,162 62	12,925 00	124,237 62
1915	27	189 59	5,118 93	750 00	20,250 00	25,368 93	1,200 00	24,168 93
1916	175	183 52	32,116 00	750 00	131,250 00	163,366 00	18,700 00	144,636 00
1917	123	198 87	24,461 01	750 00	92,250 00	116,711 01	13,500 00	103,211 01
1918	291	222 09	44,640 09	1,000 00	201,000 00	245,640 09	12,600 00	233,040 09
1919	144	257 40	37,065 60	1,000 00	144,000 00	181,065 60	12,600 00	168,465 60
1920	304	289 54	88,020 16	1,000 00	304,000 00	392,020 16	20,700 00	371,320 16
1921	198	303 20	60,033 60	750 00	148,500 00	208,533 60	20,700 00	187,833 60
1922	266	277 47	72,807 02	750 00	199,500 00	272,307 02	29,210 00	243,097 02
Totals	1,868		*$418,672 47		$1,553,069 00	$1,992,322 47	$152,935 00	$1,839,387 47

*This column merely shows the saving for one year. A conservative estimate of the average institutional life of an insane person is ten years; hence to arrive at the amount saved the total should be multiplied by ten.

REPORT OF AFTER-CARE PHYSICIAN.

To the Department of Institutions.

GENTLEMEN: The following is a summary of the work of the after-care department for the two years ending June 30, 1922:

	1920-21	1921-22	Total
Mental examinations made at psychiatric clinic in San Francisco	397	401	798
Mental examinations made at psychiatric clinic in Oakland	117	68	185
			973
Calls made at the office by patients on leave of absence from state hospitals and Sonoma Home	97	283	380
Calls made at office by relatives and friends of patients	153	232	385
Totals	764	984	1738
Calls made by physician at homes of patients			292
Inspection of private sanitaria throughout the state			81
Calls made by volunteer social workers			83
Calls made by Miss Margaretha Suermondt, social worker (August 24, 1921–June 30, 1922)			1008
Patients referred to social agencies			108
Homes found for patients in state hospitals and discharges and leave of absences arranged			20
Patients kept from returning to state hospitals			8

That the value of a psychiatric clinic is recognized by the community, is evidenced by the fact that patients have been referred to them by almost every charitable organization in San Francisco and Oakland, also by superior judges, police judges, juvenile and adult probation officers, the board of health and the board of education.

The cases that have come to the clinic for mental examination and advice might be divided into four classes:

First—Cases of feeblemindedness	15 per cent
Second—Cases of psycho-neurosis or other types of hysteria	30 per cent
Third—Cases where the mental symptoms had an organic basis, head injury, brain tumor or other disease of the brain, ductless gland cases, intoxication, etc.	21 per cent
Fourth—Early cases of epilepsy and definite mental disease	34 per cent

The first and second classes present great possibilities for social service work. The majority of these patients, if properly fitted to their sphere in life, would become assets instead of liabilities to the community as they are at present.

The third class can usually be given appropriate treatment at the various local clinics and hospitals.

For the fourth class, with the exception of the epileptics, there is no treatment available in San Francisco or Oakland. In the early stages of the disease, these cases are not, under the present law, eligible to treatment in a state hospital. They must, therefore, go untreated until they become "dangerous to health, person or property." It is to be hoped that San Francisco and Oakland will soon awake to the

possibilities of humane economy in the prevention of mental disease by early treatment, as carried on by other cities of the United States.

Since August, 1921, when Mr. Ralph T. Fisher, then director, provided for a regular paid social worker and adequate stenographic assistance, it has been possible for us to take out of the institutions twenty women, and to keep from returning thereto eight more. On these patients alone, the state is saving sufficient to pay the expense of the entire after-care department and several hundred dollars besides. With an adequate staff of social workers, a tremendous saving could be effected.

I desire to express my appreciation of the cooperation of the superintendents and assistant physicians of the state hospitals and the Sonoma State Home, also of the work of Dr. Henry S. Whisman, who has devoted his weekly holiday to work in the clinic.

Respectfully submitted,

Eva Charlotte Reid,
After-Care Physician.

REPORT OF STERILIZATIONS.

The good work of sterilization is still going on. I say it is good work because the records show that a large number have either been discharged or allowed to go home on leave of absence after sterilization.

Below are records of sterilizations done at the various hospitals during the biennium:

Stockton	84
Napa (discharged 27; leave of absence 19; at hospital 13)	59
Agnews (thirteen of this number are getting along well outside the hospital)	17
Mendocino (all discharged)	7
Southern California	33
Sonoma (all show great improvement)	236
Norwalk (showed mental and physical improvement after operation)	70
	506

F. W. Hatch,
Consulting Psychiatrist.

REPORT OF MEDICAL SUPERINTENDENT, AGNEWS STATE HOSPITAL.

To the Director, Department of Institutions.

DEAR SIR: To attempt to review the life, activities and accomplishments of this hospital for the biennial period just closed and to discuss its needs and our plans to enable it to function to its greatest efficiency and accomplish the highest humanitarian work, would make a longer statement than would be fitting for a report such as your department will issue.

I believe this hospital has done good and earnest work since our last report of two years ago and has advanced in methods and efficiency. Our medical staff has been increased, a pathologist added and is now composed of a body of earnest workers who are doing real and advanced psychiatrical work. Our nursing force, too, which suffered during the war, has been recruited and improved and is doing earnestly and well its difficult work. The medical and nursing forces are the real nucleus of the hospital and what the accomplishments shall be in the real purposes for which the hospital exists, depends upon the character and efficiency of these bodies. The various other departments, necessary and contributory to the real work of the hospital, have worked in harmonious coordination and in an efficient manner so that the whole hospital has worked together for the good of those entrusted to us and to accomplish this good in as economical a manner as possible.

The tables herewith attached give the movement of population and show the number passing through the hospital, which indicates the volume of work done. The greater number of patients treated with the least increase in population, shows the efficiency of the hospital and is its credit. It is also its real measure of economy to the state, though this does not appear to those considering only the per capita cost, without the results accomplished. It is much more economical, as well as greater humanity, to spend more money to restore, rather than to provide for those detained for custodial care. There are now many in our state hospitals, an accumulation of the lack of proper treatment of many years ago, who, under modern methods, would not have continued all these years a burden upon the state. We have changed our asylums to hospitals and are accomplishing much more for humanity and for the state than not many years ago, but, still, real psychiatry is but young, has great possibilities and will accomplish much more, if given the proper financial assistance and opportunity.

What we have done and are doing, is not well understood by the people nor even by the general medical profession, except by a comparatively few who have come in closer contact with the state hospitals and their work. Still less do they understand the possibilities, as those of us engaged in the work understand them, and, consequently, we receive neither the sympathetic understanding and cooperation nor the financial help to provide either the necessary trained workers or the facilities with which to work and do the things we feel are possible and

that would give big returns to the state, both financially and humanitarianly. To give the state hospitals merely enough to live on, is not economy. And, after all, the additional expenditure necessary to enable them to do the work they desire, in not only actual care and treatment, but also in investigation and research work, would not be great.

I am sure the people would approve it and I trust that, with the cooperation of your department, the representatives of the people who control the finances will be able to understand, give us the necessary funds and cooperate with us in our efforts for the far greater restoration of the unfortunate mentally sick.

Respectfully submitted,

LEONARD STOCKING,
Medical Superintendent.

August 1, 1922.

REPORT OF SUPERINTENDENT OF THE CALIFORNIA SCHOOL FOR GIRLS.

To the Department of Institutions,
Sacramento, California.

GENTLEMEN: The biennium ending June 30, 1922, has witnessed many changes in the California School for Girls.

In April, 1921, the present superintendent assumed control, and therefore the following report must of necessity deal chiefly with the period following the above mentioned date.

In view of the recent unsettled conditions, no real progress was possible until the fundamental principles of respect for law and order had been thoroughly reestablished.

The present responsive attitude of cooperation on the part of the student body marks the progress of that achievement. At the close of this biennium 160 girls, with few exceptions, are performing their respective duties willingly and cheerfully. A rebellious attitude has become decidedly unpopular among the girls themselves and a girl who reflects discredit upon her cottage by unbecoming conduct is no longer looked upon with sympathy by other girls.

Many factors have entered into the attainment of the present high standards of conduct. Eternal vigilance in checking up minor offenses, that tend to create an element of unrest if allowed to grow, has preserved a peaceful and quiet atmosphere of contentment.

Officers established with a greater degree of permanency and adjustment of teachers salaries to insure teachers of greater efficiency and who possess a tactful sympathetic understanding of the individual problems of the institution, have all helped in establishing this foundation work.

New opportunities of vocational work, a carefully organized program that provides a well rounded day of work, study and recreation, eliminates much unrest.

A consistent effort has been made to establish confidence in plans for the future. The placing of girls in various positions on probation, as soon as training and conduct justifies such action, creates a vision of future hopes and a conviction that only conscientious effort will be rewarded by opportunity.

MEDICAL DEPARTMENT.

This department is under the direction of a competent woman physician, who has a registered nurse and four pupil nurses from the student body as her assistants.

The hospital which will accommodate about forty girls is provided with a modern operating room and sterilizing plant, a dental equipment of a late type, and recently there has been added a laboratory for general work.

There are two small dormitories in this building and many small rooms, which are used for sick girls and for segregation.

The new girls are isolated for a sufficient time to insure freedom from infectious or contagious disease. At the end of this time, they are allowed to come into the family group, which is supervised by a housemother, until further examination and study can be made of them, and not until pronounced free from disease are they allowed to go into a home cottage.

A clinic is held every morning, when all sick girls are treated, special attention being given to venereal disease, which is treated by the most modern and approved methods.

A competent dentist visits the school every three months and does all necessary work for all girls who can not afford to have their work done privately.

The resident physician has general supervision of the hygiene of the girls and also is the sanitary inspector for the school.

It is necessary to receive her approval of the detail sheet of every girl in the school, so that no girl will be given a task which she is not physically able to perform.

The school is very fortunate in being entirely free from epidemic during the two-year period just past, and there have been no deaths.

DEPARTMENT OF EDUCATION.

The department of education supervised by the director of education embraces, through the various departments of the institution: Academic work, home making, vocational training, physical education and religious activities.

While each of these departments serves a distinct purpose, the ultimate result is brought about by correlation and cooperation of all departments in such a way as to build a foundation for general education, establish a sense of civic and moral responsibility, promote appreciation and understanding of home life, and at the same time acquire skill in one or more lines of work that will serve as a basis for a vocation, and above all to give such physical attention and training as will insure a sound body with a lasting respect and appreciation for clean living and wholesome recreation.

In order to facilitate the work of the institution while the training is in progress, classes or details are arranged for minimum periods of three months of concentrated effort in one or more lines of work, according to the time required for daily execution of the work involved. These details are so arranged that the required course of training may be completed in a minimum of time in order that some line of special training may be pursued upon request of the pupil.

Academic Work.

During the year of 1921, the entire plan of schoolroom activities was reorganized upon the following basis: Girls under 16 years of age, not holding eighth grade diplomas, are required to attend school five hours daily for nine months of the year. Girls over 16, not having finished the eighth grade work, attend school two hours daily. In these two-hour classes, essentials in penmanship, English, mathematics and civics are stressed.

In every case as a matter of course necessary exceptions are made for physical or psychological reasons.

That this reorganization is a marked step in advance was emphatically demonstrated by the enthusiasm of the entire school over the graduation of the first eighth grade class in June, 1922, and by the impetus given to the school work generally.

Perhaps an even keener insight into the real worth of the plan is evidenced by the pride of the older girls in this opportunity that is given to the younger members of the school. The willingness with which they carry the burden of the routine work that this plan may be made effective indicates the girls' own valuation of the plan.

Along with this reorganization developed the need of some arrangement whereby proper credentials for entering high school could be given upon the completion of eighth grade work. Although the course of study of Ventura County schools was strictly adhered to, no provision was made by which diplomas could be granted. By the untiring efforts of the county superintendent of schools, cooperating with the department of education in the school and in the county, this obstacle also was surmounted and of the original class of fourteen girls, doing eighth grade work, thirteen received the diplomas granted by the county.

DEPARTMENT OF HOUSEHOLD ARTS.

"There is no excellence without great labor."

COURSE OF STUDY.

Elementary sewing.—Time, three-hour period daily with six months as a minimum term.

Dressmaking.—Time, one or two three-hour periods daily. Length of course indefinite as privilege of specializing is given to pupils after all other detail work has been finished.

Weaving.—Time, two-hour period daily. Three months as minimum term.

Basketry.—Time, two-hour periods supplementing regular grade work in school.

The Department of Household Arts serves three outstanding purposes.

First, Educational.

Training in technique and appreciation of such work as tends to promote interest and efficiency in home making.

Development of speed and accuracy in work which may serve as a basis for a vocation.

Second, Utilitarian.

The making of all garments, household linens, rugs and baskets used in the institution.

Third, Commercial Value.

Adding to contingent fund receipts from work of the various branches of the department.

The department of weaving, established in a large, well-lighted room, with four excellent looms, a small Barbon loom, a dyeing room equipped with electric plate and sink has made satisfactory progress.

In addition to furnishing all cottages with rugs and baskets as they have been needed, it has been possible to fill a number of outside orders for weaving. Also a few baskets have been sold. At present the commercial side of this work is entirely supplementary to the educational work.

With adequate room and equipment and the improved organization of the school in general, this department is looking forward to the realization of a long felt need, namely the establishment of a sales department. This department to be a specialty of the California School for Girls and will consist of a weaving department for sales and outside orders for weaving, also a special line of ready to wear garments, such as children's and infants' wear. The sales will be supplemented by the work of the dressmaking class and the sale of all articles of handwork made as practice work in branches of the department, but having no definite use in the institution. The sales department will also provide for the sale of articles made by the pupils during recreation time.

There is also opportunity for progress in all lines of work that tend to promote appreciation and interest in home making, such as house planning, interior decorating and design as applied to house furnishing and needle decoration.

To realize these achievements, to enlarge the vision of opportunity of the pupils, to provide a quality of work that will strengthen the moral fibre of the institution and establish a lasting respect and appreciation of work well done is the aspiration of the department of household arts.

Commercial Work.

Applicants for the privilege of the commercial course must present eighth grade diplomas, or pass a satisfactory examination in eighth grade English and mathematics together with satisfactory evidence of good faith, stability and willingness to complete the course as prescribed in the course of study. This department has been vastly improved by additional equipment in the way of a number of new typewriters, a comptometer and a mimeograph. Much of the stenographic work of the institution is accomplished in this department.

This course is a very popular one. That it is also attended by a fair degree of success is demonstrated by the fact that a number of girls, who have completed the course, are doing satisfactory work in responsible positions.

Domestic Science or Home Training.

Training in this department is accomplished in the respective home cottages. Cookery and serving, including care of kitchen and dining room and supplies, is taught by matron in charge of kitchen under the direct supervision of the dietitian. The preparation of three meals daily, together with the care of kitchen and food supplies, furnishes a very practical training to the group of girls detailed to this work.

Each kitchen is visited daily by the dietitian, who approves or corrects menus, to insure well-balanced meals, provides recipes and gives such instructions as may be required to provide wholesome and appetizing

food, observes the service and care of dining room and generally directs and advises in the matter of food preparation and supplies.

In addition to this, refrigerators are inspected daily for cleanliness and store rooms are observed to see that all vegetables, fruits and other supplies are being properly cared for and used as supplied by commissary department.

The canning of fruit and vegetables is also directed by dietitian.

In addition to this training in kitchens, which involves cooking in greater quantities, two small kitchens, in superintendent's apartment and Household Arts building, furnish training for girls who have finished required work and are given an opportunity for care and management of kitchen for a small group, as represented in the average family.

The details of the care of the home are under direct supervision of the housemother, care of bedrooms and living rooms, arrangement and care of furnishings, arrangement of decoration, flowers and pictures, practical laundry work and care of grounds in immediate conjunction with the cottage home from the basis of training that develops efficiency and appreciation of domestic training, whether applied to home life or domestic service.

With marriage and home life as possible future before every girl and domestic service as the most available vocation, or source of income, the training in this department is of vital importance.

Nursing.

The hospital, in charge of the resident physician and a registered nurse, provides excellent training for student nurses. Four girls are always in training in this department. Such girls as show an inclination of pursuing this work as a vocation, and are recommended by physician and nurse as being temperamentally and physically fitted for the work, are given every opportunity to prepare for regular hospital training. Required academic work is prescribed and arranged, professional literature provided and professional ethics instilled. When satisfactory evidence of ability and good faith are assured, application for training is made in a hospital of established reputation. A number of girls, who have availed themselves of this opportunity, are making excellent records in their training.

Physical Education and Recreation.

Gymnasium work and physical training along with well directed recreation play a big part in the physical, moral and aesthetic development of the girls.

Every girl, unless excused by the resident physician, is enrolled in the regular classes in gymnasium work and physical training. These classes assemble daily during the school week, and are so arranged as to provide for three periods weekly in gymnasium and two periods of out of door sports.

Individual attention is given to correction of posture, correct walking, etc. Physical training and exercise is amply provided in the

gymnasium course which includes military and fancy marching, free arm exercises, Swedish gymnastics, Indian clubs, dumb bells and wands. Apparatus work, such as stall bars, flying rings, ropes, poles and swings, form a part of the equipment. Volley ball and other indoor games are also included.

In addition to the activities of the regularly organized departments of physical education, recreation is provided in the cottages by the use of piano, victrola, games and reading matter.

The library of the school affiliates with the Ventura County library, by which means an abundance of wholesome reading matter is placed at the disposal of each cottage.

A camping trip of two weeks vacation, which included the entire honor cottage of nineteen girls and two matrons, represents the latest innovation in recreation. This trip, which was a success in every respect, furnished additional evidence of stability on the part of the girls who were the recipients of this privilege and immense satisfaction on the part of all other girls that such privileges are possible to members of the institution.

A motion picture is the crowning event in the weekly program of recreation.

Practical Agriculture.

This course is part of the required training of the institution. Unless excused by the resident physician, at some time during her stay in the school, each girl is detailed for the usual three month period to garden work, where she receives practical instruction in the raising of vegetables.

Noticeable improvement in physical condition, a healthy coat of tan and an abundant supply of fresh vegetables are sufficient proof of the success of the department.

Another group of girls for whom a lighter form of outdoor work is desirable, attends to the raising of flowers and beautifying the grounds. This work is under the direction of the Landscape Gardener, supplemented by the farm department when help is required for heavy work. The results have been most gratifying. An unsightly hole, left as a result of grading for the construction of the auditorium, was less than two years ago in the center of the main approach to the institution. In its place is now a beautiful sunken garden with velvety green lawn and a lily and fish pool, constructed of cobble stones, while artistic steps of rugged stone lead the way into this inviting spot.

The planting of seeds in boxes, the propagation of plants from cuttings, the transplanting of plants into permanent flower beds, the joy in the growing green things as a result of their own efforts, has helped many girls to throw aside the feeling of homesickness and rebellion of her first weeks in a new institution. The result of this work has added much to the landscape in the way of plants, shrubs and vines.

Through the kindness and generosity of Mr. Alexander Waldie, noted dahlia grower of Santa Paula, a wonderful bed of dahlias is the crowning achievement in floriculture. Many prize winners and choicest of plants were among Mr. Waldie's contribution.

Religious Instruction.

The religious activities of the school consist of chapel exercises each morning in the respective cottages, Sunday School on Sunday mornings and a service on Sunday afternoons, conducted by a minister from Ventura or adjoining towns.

All protestant girls are required to attend the afternoon services. Attendance at Sunday School on Sunday morning is purely voluntary. Programs are varied by special music from the different cottages, an enthusiastic "sing" by the entire assembly, responsive readings, drill and memory work.

Services for Catholic girls consist of early mass on every Sunday morning and instruction on Sunday afternoons. Renewed interest in these Catholic services has been aroused by the arrival of the Sisters in charge of the new Mission School in Ventura.

Psychological Work at the California School for Girls.

The psychological work of the school has been continued by the California Bureau of Juvenile Research. All examinations were made by Miss Julia Mathews. The Stanford Revision of the Binet-Simon Scale for Measuring Intelligence has been used in all cases. Since June, 1921, Kohs Block Design Test has also been given in addition to the Binet. Following the usual procedure of the bureau as described in the last report, a careful summary of test findings and all available supplementary data is prepared for each girl soon after her entrance.

During the present biennium the chronological ages of the 208 girls examined ranged from 13 to 21 years, with an average of 17. The mental ages ranged from 8 to 17, with an average of 12 years. The highest intelligence quotient was 106, the lowest 51.

Classification by social intelligence groups is as follows:

Superior	0
Average normal	33 or 15.9 per cent
Dull normal	49 or 23.5 per cent
Borderline	67 or 32.2 per cent
Moron	59 or 28.4 per cent

This classification is based on the intelligence quotient interpreted in all cases with due regard to supplementary facts concerning temperament, other mental conditions, conduct response and environmental factors. Not one girl was found during this period who seemed entitled to rank in the superior group. In the present instance the *average normal* group includes girls testing from 91 to 106; the *dull normal* group includes girls testing from 81 to 92; the *borderline* group includes girls testing from 67 to 86; the *feeble-minded* group includes girls testing from 51 to 79. The median intelligence quotient is 80, which is three points lower than for the 92 girls tested by the same examiner between January and July, 1920, and two points lower than the median found by the same examiner for the group of 329 entering boys at Whittier State School during the present biennium.

Permanent Improvements.

During the biennium just past, two new buildings have been added to the group—a cottage to house returned parole girls and a schoolhouse.

The buildings are being painted on the outside and necessary redecorating has been done inside.

In addition to the above, the Department of Public Works has made the following improvements: A farrowing shed; two cement manure pits; additional cement walks; pipe lines for irrigating young orchards and berries; alterations of septic tank.

No new cottage for inmates has been built as the school has been able to receive all girls as requested by the courts. The hospital, which is our receiving building, has been very crowded at times and this has caused us to ask a county occasionally to keep a girl for a short time, but at the close of the year, there is no waiting list.

The greatest improvement in equipment has been the changing from coal to gas as fuel. The old coal ranges have been replaced by new modern gas ranges and gas is used as fuel in the furnaces and water heaters as well.

The grounds around the buildings have been very much improved such as leveling, filling in washes and getting the terraces ready for planting. Many untidy places have been made into beautiful garden spots, and the sunken garden is an example of what can be done in the way of permanent improvements.

Farm.

The farm consists of 125 acres, part of which is hillside land. The 70 acres capable of cultivation are planted to fruit trees, berries and vegetables, and a small portion to hay. About 1100 fruit trees and 1200 berry vines were planted during the biennium. The young orchard will eventually supply the school with an abundance of fruit.

The orchard, berries and stock are cared for by the farmers. The pupils of the school raise all the vegetables under the direction of women gardeners.

Dairy and Piggery.

The time of one man is given to these two departments. The dairy of Holsteins consists of ten high grade cows, nine heifer calves and a recently purchased thoroughbred bull. The piggery of thoroughbred Berkshires has supplied us with plenty of fresh pork and some bacon, ham and lard. A recently completed building in this department will add to its efficiency.

Apiary.

The apiary has been increased to 37 colonies; 1041 pounds of honey have been extracted the last year. A new honey house has been completed, for the extracting of honey and storage of bee keeping equipment and tools.

Movement of Population for Year Ending June 30, 1921.

Statement of actual population in institution.

In institution at midnight June 30, 1920		149
Received during year July 1, 1920, to June 30, 1921:		
By new commitments	78	
By return from parole	19	
By return from furlough	11	
By return from escape	35	
By transfers	0	
By voluntary admissions	0	
Total received		143
In institution during year		292
Passed out during year:		
By discharge	11	
By expiration of commitment	5	
By parole	54	
By furlough	25	
By escape	41	
By transfer	4	
By death	0	
Total passed out		140
Total population at end of year		152

Statement of paroles.

On parole at midnight June 30, 1920	61	
Paroled during the year	54	
Total on parole during year		115
Discharged from parole	9	
Term expired on parole	21	
Returned from parole	19	
Died on parole	1	
Removed from parole	0	
Total		50
On parole at end of year		65

Statement of furloughs.

On furlough at midnight June 30, 1920	3	
Furloughed during the year	25	
Total on furlough during year		28
Discharged from furlough	0	
Returned from furlough	11	
Died on furlough	0	
Term expired on furlough	0	
Removed from furlough	7	
Total removed from furlough during year		18
On furlough at end of year		10

Movement of Population for Year Ending June 30, 1922.

Statement of actual population in institution.

In institution at midnight June 30, 1921		152
Received during year July 1, 1921, to June 30, 1922:		
By new commitments	76	
By return from parole	27	
By return from furlough	3	
By return from escape	15	
By transfers	3	
By voluntary admissions	0	
Total received		124
In institution during year		276
Passed out during year:		
By discharge	12	
By expiration of commitment	5	
By parole	71	
By remand to court	3	
By furlough	2	
By escape	21	
By transfer	2	
By death	0	
Total passed out		116
Total population at end of year		160

Statement of paroles.

On parole at midnight June 30, 1921	65	
Paroled during the year	71	
Transferred from furlough to parole	5	
Total on parole during year		141
Discharged from parole	11	
Term expired on parole	18	
Returned from parole	27	
Died on parole	0	
Removed from parole	0	
Total		56
On parole at end of year		85

Statement of furloughs.

On furlough at midnight June 30, 1921	10	
Furloughed during the year	8	
Total on furlough during the year		18
Discharged from furlough	5	
Returned from furlough	3	
Died on furlough	0	
Term expired on furlough	0	
Removed from furlough	5	
Total removed from furlough during year		13
On furlough at end of year		5

Cause of Commitment.

Immorality	75	Assault	1
Dependency	36	Felony	1
Delinquency	12	Grand larceny	2
Incorrigible	20	Adultery	1
Immorality and stealing	7		
Immorality and forgery	4	Total	160
Second degree burglary	1		

Ages When Committed.

12 years	1	18 years	18
13 years	5	19 years	13
14 years	17	20 years	6
15 years	26		
16 years	36	Total	160
17 years	38		

Religion.

Catholic	36
Jews	3
Protestant	121
	160

Girls in institution, 141 white; 11 colored; 8 Mexican; total 160.

Girls Present June 30, 1922.

COUNTIES.

Alameda	6	San Bernardino	8
Butte	2	San Diego	16
Fresno	3	San Francisco	22
Humboldt	13	San Joaquin	3
Imperial	1	San Luis Obispo	1
Kern	10	San Mateo	2
Los Angeles	33	Santa Barbara	4
Madera	1	Santa Clara	2
Marin	1	Solano	2
Merced	2	Sonoma	1
Monterey	2	Stanislaus	2
Orange	6	Tulare	3
Placer	1	Yuba	1
Riverside	4		
Sacramento	8	Total	160

Parole.

Although most of the girls are committed to the school until their twenty-first birthday, many of them are allowed to leave on parole before that time.

No girl is considered for parole until she has been here sufficient time to prepare herself to re-enter society. She must be free from disease; she must be prepared to earn her living at some honorable employment, and most of all, she must be prepared to cope successfully with the problems and temptations of everyday life outside.

On June 30, 1922, there were eighty-five girls on parole. The average length of time spent in the school for this group was a small fraction over two years.

A girl is placed by the school after careful consideration of the prospective home. It is very important that the investigator not only visit the home and inquire into the character and reputation of the family, but she must obtain some idea of the temperament and personality of the woman who will supervise the girl in the home.

After the investigation has been made, care is exercised, also, in selecting a girl who will fit into the home in question.

The girls who are on parole are responsible directly to one of the two women officers who have charge of the work. It is the duty of the Parole Officers to help the girls in every possible way to become established. This is an easy task in many cases, but very difficult in others. There is every chance given the girl to do what is right and, after repeated trials, if she still is restless and does not seem to realize what clean honest living means, she is returned to the school for further training.

The following represents the disposition of those on parole June 30, 1922:

Number doing housework	29
Number in offices	4
Number doing factory work	4
Number training for nurses	2
Number in high school outside	7
Number married	27

Of the eighty-five, sixteen were allowed to return to the home of their parents and eleven were returned to the community from which they came.

The number doing housework may seem large in comparison to the other occupations. This is due to the fact that close supervision is needed in many cases, and also by consulting the table of mentalities given elsewhere in this report, one can readily understand that it is impossible to make other arrangement for a large number.

As a rule girls do not succeed if returned to their parents if they have failed with them. There are instances, however, where the home has changed during the residence of the girl at the school. The financial condition may have improved so that the mother no longer has to go to work every day, and can now care for her children properly, or the personnel may have changed so there is better discipline in the home than formerly.

The most difficult problem in the parole work is to provide the proper recreation for the girls. They must have some outlet for thir emotions, yet, most of the forms of amusement which are open to the parole girls are fraught with danger.

Conclusion.

While the foregoing report deals chiefly with the material accomplishments of the school, such as improvements in buildings and grounds, increased facilities for recreation, with a department of education, efficiently organized, the Superintendent feels that when all facts have been considered, there has been real progress in the work directly connected with the welfare and advancement of the girls themselves.

Many of the girls are sent to the California School for Girls as a last resort, after having been tried out in every possible condition and having failed repeatedly. Many are utterly lacking in training and in self control.

Misfits in the educational system of the public schools having no conception of the home life that is the rightful heritage of every child, they are victims of circumstances and environment. Seventy percent are suffering from venereal diseases. Untrained, suspicious, emotional to a greater degree than the ordinary adolescent child, a raw product

is presented from which the school attempts in a minimum of time to evolve a citizen, capable of economic independence and acceptable to society.

The physical condition must be built up by medical attention and suitable exercise. Vocational training must be given that will enable the girl to earn a livelihood, while a sense of civic and moral responsibility must be established, to insure effectiveness and stability to such training.

In every activity of work and play, influence must be brought to bear that will unconsciously create a desire for higher standards of living in order to eliminate the tendency to return to old habits and environments as soon as the restrictions of the school have been removed.

The measure of success that has been attained should not be reckoned in dollars and cents, but only in the improved standards of young womanhood of the girls themselves.

Some have failed, others have been accounted as failures, who have taken their "fling" at independence from restraint upon reaching their majority and have afterward turned again to a life of usefulness with grateful acknowledgment for the helpful influence of the school in establishing a new vision of moral integrity.

While the failures are usually heralded, the public knows very little of the many girls who are quietly taking their places in society, holding positions of trust and responsibility. The number of girls who are returned for violation of parole is small in comparison with the number who are making satisfactory records on the outside.

In every case, the final arrival at the goal of upright womanhood is vastly more important than the number of mistakes and failures that have attended their upward steps.

The problem of the final disposal of the psychopathic and feeble minded delinquent still remains unsolved. The limited training that the school can give these girls is accomplished at a great expense of time and energy that should be utilized in the regular channels of the educational department. In the case of the psychopathic, real detriment to the stability of the group with whom she is housed is the inevitable result. After years of residence in the school, unable to hold a position, immorally irresponsible, she returns to society with practically the same limitations that marked her original commitment to the school.

Another problem is that of the older girl whose early habits have become so firmly established in vice and immorality that she remains unresponsive to any influence of moral integrity and arrives at her majority with a clean bill of health to her credit, but otherwise is the same menace to society she was at time of entrance to the school.

Provision for the solution of these problems must be satisfactorily made before the school can achieve its greatest usefulness to the State.

The relation of material progress to the fundamental purpose of the school, which is character building, is indicatd by a responsive attitude of appreciation on the part of the student body as a whole, and we enter the new biennium with a hopeful outlook for the future.

Respectfully submitted,

OLIVE P. WALTON, M. D.
Superintendent.

REPORT OF SUPERINTENDENT OF INDUSTRIAL FARM FOR WOMEN.

To the Director of Institutions of the State of California,
Sacramento, California.

Sir: I have the honor herewith to submit to you the report of the Industrial Farm for Women, for the period ending June 30, 1922.

In October, 1920, the Board of Trustees of the Industrial Farm for Women purchased, for the State of California, 680 acres, known as the Henry Cailleaud place, one and one-half miles northeast of Sonoma City, Sonoma County.

The site was selected as suitable for the institution, on account of its location being off the main traveled roads and yet accessible, in an even, temperate climate zone, with rich soil, abundant water supply, of rare natural and cultivated beauty, and carrying improvements consisting of a thirty-six room house, large stone building in fair repair, small stone building in no repair save the walls, small horse barn and small dairy barn.

The Engineering Department was called upon to put the house in condition to house the institution—administration and living quarters for the staff and inmates; to bring light and power to the place; build a septic tank and piping for sewerage disposal; construct a dam to impound a water supply; to make plans for building a hospital; to have made a complete survey and contour map of the property.

Professor Gregg, of the University of California, was invited to plot a plan for the future development of the property, which work was well under way when illness held it up until Mr. Gregg shall return from an enforced vacation. In January, 1922, the institution announced itself in readiness to receive wards. To July 1st, there had been received four alcoholics, thirteen drug addicts and seven vagrants, or a total of twenty-four women. Shortly after the institution opened, the construction of the hospital was begun, and is rapidly approaching completion; the small stone building has been roofed and is now in use as a cannery, and work is about to be begun on the large building to convert it into an industrial workroom.

The response of the wards to the environment of the farm has been better than the most sanguine friends of the institution had expected. They have a large share in running the place, their acitivities consisting in housework, laundering, dining-room service, nursing, small animal husbandry, goat dairying, vegetable gardening, fruit picking and preserving, care of the two acre lawns and ornamental gardening, sewing, needlework, weaving, and office work involving typewriting and stenography. Their interest and efficiency have enabled the management to keep the employees engaged in the actual care of the wards, down to a minimum. Their attitude to the place is that of a member of a family to the home, and it is the purpose and hope of the superintendent to preserve that attitude in them in order that, through wholesome living and thinking, they may be returned as self-respecting members of normal society.

Blanche Morse,
Superintendent.

REPORT OF SUPERINTENDENT OF INDUSTRIAL HOME FOR THE ADULT BLIND.

To the Board of Directors
Industrial Home for the Adult Blind,
Oakland, California.

Gentlemen: I have the honor to submit herewith my report for the year ending June 30, 1921, with statements showing receipts and disbursements during the period, and other data required by the act establishing the home.

The expenditures out of the appropriations for salaries and support were as follows:

Salaries and wages	$20,383 15
Material and supplies	25,771 92
Service and expense	7,926 09
Property and equipment	1,300 49
Total	$55,381 65

As the average attendance during the year was 135, the per capita cost of maintenance was $410.25. This was $36.90 more than was spent the previous year and is accounted for by an increase both in salaries and cost of supplies.

Taking into consideration the depression following the war period, which was particularly noticeable during the spring of the year, and the consequent drop in prices, we have reason to be pleased with the volume of business done in the broom and other shops.

On completion of the new shop building provided for by the legislature we shall be able to give employment to more of the blind and further increase the earning capacity of the home. The building referred to will contain departments for chair-caning, basket-making, rug weaving and provide room for other activities.

I wish to express my appreciation to the members of the board of their unflagging interest in, and devotion to, the affairs of the home. The experience gained in their long service to the blind of the state as directors of the institution was of inestimable value to the executive officer in carrying on the work of the home.

Respectfully submitted,

DOUGLAS KEITH,
Superintendent.

FINANCIAL STATEMENT.

Year ending June 30, 1921.

Expenditures—State appropriations.

Salaries and wages	$20,383 15
Material and supplies	25,771 92
Service and expenses	7,926 09
Property and equipment	1,300 49
Total	$55,381 65

Adult Blind Fund.

Expenditures.

Wages	$20,211 50
Supplies	36,833 11
Service and expense	2,624 48
Total	$59,669 09
Receipts	$63,038 05

Sales.

Broom shop	$54,911 46
Chair Shop	2,514 63
Basket shop	2,827 56
Total	$60,253 65
Contingent receipts	$1,560 93

Assets.

Material in stock	$8,297 14
Material issued and on hand	4,389 50
Manufactured stock on hand	3,162 02
Accounts receivable	3,846 06
Cash on hand	12,046 36
Total	$31,741 08

DR. JOHN A. REILY.

Director Department of Institutions,
Sacramento, California.

DEAR SIR: I have the honor to submit herewith my report, a statement of moneys received and disbursed during the year ending June 30, 1922, and such other information as is required by the act establishing the home.

The expenditures on account of the appropriations for salaries and support were $50,900.10. This is $4,981.55 less than was expended in the previous fiscal year.

As the average number in attendance was 128 the per capita cost for each inmate was $397.66.

The sum of $15,691.10 was spent for groceries and provisions, and as the population of the home, including inmates and employees, was 156, the cost of food for each person was $100.58 a year or $8.38 a month.

The general depression in the business world which has prevailed during the period under review necessarily affected the broom trade. Many broom factories throughout the country were shut down entirely while others operated with much reduced forces. We, however, were able to keep the shop running as usual without reducing the wages of the blind workers. Although the aggregate of receipts fell about twelve per cent below those of the previous year, this decrease was due to a drop in prices obtained for brooms and other commodities rather than to lessened output. A total of $16,274.08 was paid to blind workers during the year.

The institution being crowded and upwards of sixty applications for admission being on file, it is necessary to ask from the legislature about to convene an appropriation for a new dormitory. The cost of a building with furnishings such as we require has been estimated at $97,500. An appropriation also is needed for remodeling the kitchen and dining rooms and installing modern sanitary equipment in this department.

With the installation of these improvements and those provided for at the last session of the legislature the pressing need of the institution will be overcome.

The object of the home is, primarily, to teach trades to the blind so that they may be able to return to the communities from which they came and be self-supporting. This much-desired object is not always attainable, owing to the severe handicap of blindness and other conditions. Advancing years or lack of ability to adapt one's self to change of employment makes it impossible for a great number to earn a living. The institution, therefore, provides a home for those who wish to remain and work in the shops. Wages are paid to all workers. Applicants for admission must be bona fide residents of the state, in reasonably good health and in such physical and mental condition as will enable them to profit by instruction in the shops.

Respectfully submitted.

DOUGLAS KEITH,
Superintendent.

FINANCIAL STATEMENT.

Year ending June 30, 1922.

Expenditures—State appropriations.

Salaries and wages	$21,290 30
Material and supplies	19,045 13
Service and expense	8,915 38
Property and equipment	1,649 29
Total	$50,900 10

Adult Blind Fund.

Expenditures.

Wages	$18,832 47
Supplies	24,469 23
Service and expense	3,684 19
Total	$46,985 89
Receipts	$51,377 32

Sales.

Broom shop	$47,446 42
Chair shop	2,822 41
Basket shop	2,184 22
Total	$52,453 05
Contingent receipts	$1,022 11

Assets.

Material in stock	$6,827 91
Material issued and on hand	1,732 68
Manufactured stock on hand	1,903 67
Accounts receivable	4,632 95
Cash on hand	18,002 67
Total	$33,099 88

REPORT OF MEDICAL SUPERINTENDENT, MENDOCINO STATE HOSPITAL.

DR. J. A. REILY,
Director, Department of Institutions.

DEAR DOCTOR: I herewith present my biennial report for the period ended June 30, 1922:

GENERAL TOPICS.

The male tubercular cottage which was partially constructed at the end of the biennial period June 30, 1920, has been fully completed and is now occupied by male tubercular patients.

A complete X-ray equipment has been installed, thus enabling the hospital to determine at once the extent and character of fractures and other pathological conditions and treatment of same. The character of uncertain lung condition can also in many instances now be determined promptly. Again, this apparatus is of great aid to the dental surgeon in determining the condition of the teeth and alveolar process.

Our laboratory has been equipped and the hospital is now in position to do all forms of analysis of water, milk and foods, together with the usual forms of clinical examination.

A gas and oxygen anesthetic apparatus has been installed. This now enables us to do a number of small minor operations requiring only a few minutes actual time. Under former conditions we were required, in order to do the minor operations, to give a general anesthetic requiring from twenty minutes to one-half hour to render the patient anesthetic, with a consequent unpleasant recovery period necessitating constant watching. This apparatus also shortens the time consumed in major operations, and will also be available for dental work of a painful nature, alleviating a great deal of unnecessary pain and discomfort, and make it possible to do better dental work.

The dental department has now been fully equipped.

New quarters for the art department have been furnished, where operations can be extended.

It is intended to manufacture more clothing by patient industry.

Shoe repairing machinery has been installed, thus enabling the shoemaker to triple his output of repaired shoes, and forming basis for manufacturing shoes, which will be shortly begun.

A plant for the manufacture of brick, partition tile, roof tile and drain tile has been installed at the hospital; and it is expected this plant will be in operation by September 1, 1922. It is expected that a sufficient quantity of brick will be manufactured during the fall to cover all requirements in the construction of our receiving building, employees' building and such other hospital buildings as are at present under consideration for construction.

A fire escape has been constructed to enable the quick evacuation of wards 5 and 6, which prior to this had to be evacuated through the center of the administration building.

A momentous event during the last biennial period was the fire of July 8, 1921, which totally destroyed ward 3 and badly damaged wards 2 and 1. The fire originated in the immediate vicinity of ward 3 storeroom. It started at approximately 12.30 a.m. on Friday morning, July 8, 1921. Every employee worked as if he were in an organized fire department. By flooding with water ward 3 floor, the fire was confined to ward 3. This enabled us to make use of streams from standpipes erected in this building. The fire was completely under control at about 2 a.m. and at 3 a.m. it was smoldering only in a few places. About 1.15 a.m. we received voluntary assistance from the citizens in Ukiah who sent over 400 feet of hose. They did good work. Just praise should also be given to some of the patients who worked with the employees in a laudable manner. No one was injured, and the fourteen patients who escaped were all apprehended and returned. Wards 3 and 2 have been completely reconstructed, and it is expected that ward 1 will be completed within the next sixty days.

The electric wires in the amusement hall and assembly building, which were heretofore exposed, have now been placed in metal conduits, eliminating fire hazard.

In order to reduce the chances of patients escaping from the front parole grounds to a minimum a chicken wire fence has been constructed around both the male and female front parole grounds and thus far has been a success, there having been so far no further escapes in this direction. Vines and roses have been planted along this fence, which will add attractions to parole area.

The plumbing shop, which was formerly located in the basement of the main building directly under ward 1, has been removed to a building located next to the engine and boiler house.

The main kitchen is now being remodeled and it is expected that this work will be completed about October 15, 1922.

The plastering throughout the entire hospital has been repaired and is now in good shape.

The orchards have never produced fruit, aside from ample quantities of pears for canning, and a few prunes, for table consumption. It is proposed to set orchards this season with this in view.

The vegetable production, while adequate in the past, will be greatly improved in variety and quality by transferring vegetable gardens to soil better adapted for vegetable raising.

Improved farm products in general are expected by instituting modern methods and systems, including modern irrigation systems. A fire trail to protect water supply is being surveyed.

A metal pipe line from reservoir to service tank, replacing inadequate and unsatisfactory wooden line, will be installed.

General improvements of landscape conditions are under way, but require time for completion.

Plans for new Imhoff septic tank are being completed by engineering department.

The occupational therapy and the physio-therapy departments conducted here under the Veterans' Bureau for treatment of the soldier patients have demonstrated the value of that work in the restoration of the soldiers to health. The admissions of 517 since July 1, 1918, and

the discharge of 163 recovered and 58 as improved show the percentage of recoveries much larger than is found where that kind of treatment is not available to patients.

The choice of occupation being carefully made to harmonize not only with the physical conditions of the patient and his mental response, but suited to his former experiences in life, enlists his own effort to regain his normalcy. Thus every patient becomes an individual study for the physicians and the aids. The enlargement of this successful addition to other curative forces for this class of patients can not be too strongly urged upon those who have the responsibility for the success of these institutions.

Below is table showing the movement of U. S. Veterans' Bureau patients since the first admission, July 11, 1918, to June 30, 1922.

U. S. VETERANS' BUREAU PATIENTS.

Admissions since July 11, 1918		517
Discharged, died, escaped and paroled:		
Recovered	163	
Improved	58	
Unimproved	41	
Not insane	9	
Escapes	10	
Died	21	
Paroled	7	
		309
Remaining June 30, 1922		208

PERSONNEL.

Dr. Robert Lewis Richards was removed from his position as medical superintendent on May 31, 1921, and Dr. Donald R. Smith was appointed as medical superintendent.

Dr. A. M. McIntire, third assistant physician, resigned on August 1, 1921.

Dr. A. A. Thurlow was appointed second assistant physician on August 1, 1921, and resigned on June 1, 1922, to engage in private practice.

Dr. A. S. Cutler was appointed woman physician on October 22, 1921.

Dr. F. A. Irmen was appointed interne on November 24, 1921, and promoted to assistant physician on March 1, 1922.

Dr. R. O. LeBaron was appointed assistant physician on June 1, 1922.

N. S. Burge resigned his position as business manager on May 1, 1922.

J. F. Trivett was appointed acting business manager May 1, 1922.

Mrs. Ada G. Morton resigned as matron on July 1, 1921.

Mrs. J. G. Potter was appointed matron August 1, 1921, and granted leave of absence on June 1, 1922.

Mrs. S. Satchell was appointed matron on June 1, 1922.

J. H. Laughlin was appointed assistant supervisor, male service, August 1, 1921. None prior to that date.

In general the personnel has been raised so that efficiency can be demanded and expected.

APPROPRIATION FOR SALARIES AND SUPPORT.

We will require for salaries for the biennial period, July 1, 1923, to June 30, 1925, $389,710. The increase in salary appropriation asked for is owing to the increase in the personnel when the receiving building and two convalescent cottages have been completed, which should be within the next biennial period. This increase amounts to a total of $1,696.67 per month.

We will require for support during the biennial period, July 1, 1923, to June 30, 1925, $434,346.

SPECIAL APPROPRIATIONS.

Building and Reconstruction Program of Mendocino State Hospital for Year of 1923-1924.

New buildings:

1.	Two cottages for convalescents, 75 beds each, $52,500	$105,000 00
2.	Two nightwatch cottages, brick, 6 rooms each, and 2 bathrooms, 2 toilets	12,600 00
3.	One cottage for assistant physician, brick, 6 rooms, baths	7,500 00
4.	One petty officers' building, 12 2-room and bath apartments	32,400 00
5.	Industrial building	15,000 00
		$172,500 00

Reconstruction and repairs:

6.	Female T.B. cottage, new roof	$456 00
7.	Ranch foreman's cottage, reconstruction and repairs	2,750 00
8.	Paint shop, new, 25 feet by 40 feet, brick building	3,500 00
9.	Carpenter shop moved and reconstructed with addition 30 feet by 30 feet	2,200 00
10.	Replaster ranch ward, and paint same	3,700 00
11.	Replaster assembly hall, remove stage and put down hardwood floor	4,127 00
12.	Remodeling wards A, B, C and 4, 5, 6, as per wards 2 and 3	45,000 00
		$61,733 00
	Total	$234,233 00

Explanatory notes for special appropriations.

1. Cottages for Convalescents. In order to relieve the congested conditions at the Mendocino State Hospital, and as there appears to be but little likelihood of slowing up of admissions, it seems very essential that additional patients' cottages be provided for by the coming legislature. In addition to the receiving building provided for by the legislature of 1921, accommodating 120 patients, two convalescent cottages, one female and one for male patients, each of 75 beds capacity, should be provided for by the coming legislature.

2. Night Watch Cottages. No provision has ever been made at this institution for the housing of its attendants except such quarters as were built in the original buildings, which have long since become inadequate. The night watches are now scattered over various portions of the building, and some use their own quarters off the hospital grounds. It is essential that the night watches obtain a maximum amount of sleep and quiet during the day, and it is impossible under present conditions to give them either. It is intended to build these cottages at some distance from the main building, where quiet may be obtained; and an appropriation is requested for two brick buildings of 6 rooms each and 2 bathrooms and toilets.

3. Cottage for Assistant Physician. As we have increased the medical staff of this hospital one member, owing to increase in population, we have not at present the proper housing facility for this additional increase.

4. Petty Officers' Building. This building is intended for the use of medical and other officers, as the same conditions exist in their cases as that of other employees.

5. Industrial Building. This is intended to house the various industries now carrying on with the assistance of patients. This will include the sewing room,

shoemaking department, needle art department, carpenter shop, and also a space for the manufacture of brooms and brushes, also a tailoring department. At the present time the quarters used for these various industries in the hospital are inadequate in size, lighting and sanitation.

6. New Roof for Female Tubercular Cottage. The original roof on this cottage is composed of ordinary roofing paper which has outlived its usefulness.

7. Ranch Foreman's Cottage. The foundations of this cottage have given away in several places and the cottage itself requires replastering and a portion of it should be removed. It is an old cottage, poorly built and not adapted for the purpose for which it is at present used.

8. Paint Shop. This building has become inadequate for the needs of the institution, and the present construction consists of a temporary frame building and is a fire menace.

9. Carpenter Shop. Owing to the installation of modern machinery, there is at present insufficient room in the present structure for the housing of same.

10. Replastering and Painting Ranch Ward. This ward must be plastered, as the original interior finish was of beaver board, which has separated and should be removed and the cottage plastered. It is intended to replaster this cottage on metal lath, with cement wainscoating and hard wall finish on the walls above the wainscoating. This will also require painting when completed.

11. Replastering Assembly Hall, Removing Stage and Putting Down Hardwood Floor. The assembly hall as it now stands is inadequate in size, owing to the increase in population of the hospital since this hall was built. It is contemplated to remove the stage, which is of no value, and replaster the entire hall, as the old plaster has cracked in many places and is entirely off the laths. Metal lath, cement wainscoting and hard wall should replace the wooden lath and common plaster. There are two reasons for this change in plaster: first, as a fire protection; second, its durability. The floor on the assembly hall is badly worn in many places and should be replaced by a hardwood floor.

12. Remodeling Female Wards A, B, C, and Male Wards 4, 5, 6. It is intended to reconstruct these wards in the same manner as male wards 2 and 3 have been reconstructed since the fire of July 8, 1921. This is also necessary as no repair work of any moment has been done on these wards since they were originally constructed in 1893. It is intended to use the metal type of lath where lathing is necessary, cement wainscoting and hard wall elsewhere. It is also intended to put down hardwood floors and make such other repairs as are deemed essential for the proper care of patients held thereon. These repairs will make these wards as modern and up-to-date as it is possible to make this form of contruction. It will at least make them clean and attractive, as they will then be much lighter than formerly.

Plans are now under way for the construction of an employees' building to house 58 single employees or 29 married couples, together with quarters for the matron and supervisor, a number of whom are now being paid a cash maintenance at the rate of $11 per month on account of being compelled to seek quarters outside the hospital. It is intended to construct this building from the Contingent Fund now available at a maximum cost of $60,000. The present payment of cash allowance in lieu of room paid employees by this hospital amounts to $650 per month, or 12½ per cent interest on the amount required for this construction at $60,000.

Respectfully submitted,

DONALD R. SMITH,
Medical Superintendent.

REPORT OF THE MEDICAL SUPERINTENDENT, NAPA STATE HOSPITAL.

Imola, Napa County, California.
June 30, 1922.

To JOHN A. REILY, M. D.,
Director State Department of Institutions,
Sacramento, California.

DEAR SIR: In compliance with the requirements of the law, the biennial report of the operation of the Napa State Hospital for the seventy-second and seventy-third fiscal years ending June 30, 1922, is respectfully submitted:

STAFF MEETINGS.

The superintendent, and in his absence the first assistant, holds regular meetings with the members of the medical staff on three afternoons each week; namely Tuesday, Wednesday and Thursday from 2.30 to 4.30 p. m. Tuesdays and Thursdays are devoted largely to presentation of cases for diagnoses, and Wednesdays for leaves of absence and discharges. Other routine business regarding hospital administration, care of cases, etc., are discussed at these meetings. Definite instructions to the medical staff are outlined, and a copy of these instructions is given to each member of the staff for filing and future reference. Cases in which the diagnoses are doubtful are presented to the Conference a second time in about a month's time. In this manner our diagnoses are kept up to date at all times.

CHANGES IN PERSONNEL OF THE MEDICAL STAFF.

Died:

Dr. A. W. Hoisholt, medical superintendent, December 17, 1920.

Promotions:

Dr. A. C. Matthews, first assistant physician to medical superintendent, January 4, 1921.
Dr. G. W. Ogden, assistant physician to first assistant physician, January 4, 1921.

Leave of absence:

Dr. Lena G. Miller, October 31, 1920.

Resignations:

Dr. Ethel Dale Owen, March 31, 1921.
Dr. G. B. Fain, June 1, 1921.
Dr. Baylis H. Earle, August 1, 1921.

Reinstatement:

Dr. Lena G. Miller, April 1, 1921.

Appointments:

Dr. Eva Rawlings, November 1, 1920.
Dr. W. F. Pritchard, July 1, 1921.
Dr. R. B. Kershaw, August 1, 1921.

HYDROTHERAPY.

This hospital is very well equipped with apparatus for giving the various kinds of hydrotherapy. In one building we have a large hydro room with control table and the various sprays; and adjacent to this are two rooms, one for men and one for women, with pack tables and steam and electric cabinets.

In addition to the above, we have tubs for continuous baths on four different wards; two of these wards, one for men and one for women, care for the new quiet but restless and nervous cases; the other two, one each for men and women, care for the acutely disturbed cases.

During the two-year period ending June 30, 1922, the following number of packs and continuous baths were given:

	Men	Women
Packs	12,480	13,715
Continuous baths	732	2,210

X-RAY DEPARTMENT.

The following is a report of the work done in the X-Ray department during the two-year period ending June 30, 1922. The number of pictures taken are as follows:

Hands	57	Spine	3
Wrist and forearm	26	Chest	17
Elbow	22	Thigh and hip	25
Arm and shoulder	24	Pelvis	7
Knee	9	Head and neck	9
Leg	29	Teeth	45
Foot	22		
Face	5	Total	300

MEDICAL WORK.

During the past two years the medical work of this Hospital has continued to improve and has now assumed a very satisfactory standard. The several wards of the hospital have been reorganized into seven medical services of 400 to 600 or more patients each. The purpose has been to bring about a more uniform classification of the patients into administrative and medical units, each of which is in charge of an assistant physician with two medical internes as assistants. The special hospital services have been organized to care for those patients who are physically ill and who are in need of special medical and surgical treatment. Acute cases and those patients who will probably make prompt adjustments are cared for on special wards as far as possible.

Our laboratory report shows that 10.11 per cent of all admissions are infected with syphilis. An effort is made to give all incoming cases of syphilis some specific treatment. Cases of advanced paresis are treated only a month, promising early paretics are treated longer. Other cases are treated intensively and persistently. The drug and intemperance cases do not remain long enough to derive much benefit.

The treatment consists of neo-salvarsan 0.9 gram intravenously weekly in courses of four to eight weeks, with rest periods of one month. Mercury bichloride in 0.5 grain doses intramuscularly twice weekly for the same periods; and potassium iodide, grains 60, by mouth daily

Internes administer the treatment under supervision. During the second year, a total of 862 doses of salvarsan were given, a weekly average of 19 doses; 37 cases have shown negative tests to date, from this year's treatments; 219 cases of lues have been handled in the past year. This includes some old cases checked over. No per cent of cures is intended to be drawn from these figures.

Early in 1921 a new outline was formulated for the mental examination of cases. With this new outline the physicians are able to work up their cases from a mental standpoint more easily and with less confusion than before. By placing in the mental summary only those facts indicating insanity, the conference work has been expedited. Now all cases are presented to conference on time, and the diagnoses and classification are kept up to date at all times.

The internes and all assistant physicians, except the first assistant, assist in the examination of cases, and presentation of cases at conference. This plan keeps all of them interested in the acute psychiatric work of the hospital and the conference meeting.

A great improvement was instituted in the medical service by the appointment of a local dentist. He is now caring for all the routine dental work of the hospital, emergency work, dental prophylaxis, and examination of all new cases for their dental needs.

Early in 1921, rules and regulations for the conduct of employees in caring for the insane were formulated and printed for use at this hospital. Every new employee is required to study these rules carefully so as to familiarize himself fully with hospital requirements.

SURGICAL REPORT.

To promote efficiency, one member of the hospital staff, namely, Dr. W. F. Pritchard, who had previously shown his ability in surgery, was asked to take charge of the surgical work of the hospital. The internes, of whom there are always two, from Stanford Medical School, San Francisco, and who serve for a period of two months each, assist at all major operations, give anaesthetics, and perform many minor operations under supervision. The nursing staff consists of a very capable surgical nurse and a corps of assistants. The amount of surgical work has increased until there are now three operating days each week.

The surgical plant is thoroughly equipped and furnished with materials of the first grade. The equipment of instruments is quite complete for a small surgery. During the past year, noteworthy additions have been a Buerger operating cystoscope and a Heidbrink gas anaesthetic machine.

Emergencies excepted, patients are not operated upon without the written consent of responsible relatives; and in cases for sterilization, without the added sanction of the State Director of Institutions. In emergencies, the superintendent authorizes the procedure. The essential points of the operation are recorded in a day book, and then copied into the individual patient's progress notes, and into an operation record kept alphabetically according to the patients' names. Emergency and accident cases are recorded in a separate book.

OCCUPATIONAL THERAPY.

Difficulties, financial and otherwise, have heretofore prevented the hospital from taking full advantage of the great opportunity offered for helping patients by occupational therapy. Every person, sane or insane, is much better off if provided with some suitable occupation. This is particularly true of the insane, who, if not occupied, will sit or stand about idle, and brood over their various delusions and hallucinations.

Aside from the ordinary industries, the farm, dairy, laundry, paint shop, machine shop, lawns, gardening etc., we have had for some time past an arts and crafts class under the supervision of a director and an assistant. This class now includes about forty patients who are employed chiefly at embroidery, crocheting, weaving, basketry and metal work.

In addition, rug making was started last November in the women's wards. To June 30, 1922, 121 rugs have been made. A. Q. H. 1 (male ward) began work in February, 1922, first with the hand looms, and then cutting and raveling the old carpets for the art class. Later, they took up, under the director, basketry and metal work. Splendid work has been done here, considering the constant changing of patients.

On May 1, 1922, Mr. Thomas Menchion was appointed director of industries. Inside of thirty days he had installed a new, fully equipped shoe plant. We are now doing all our repair work, and manufacturing all the men's shoes. We will start the manufacturing of women's shoes sometime in August. We plan in the near future to supply our needs in the way of slippers for men and women. New equipment has been ordered for making patients' hosiery, and shoe strings. We have also started to manufacture toys.

EX-SERVICE MEN.

There have been cared for during the past two years, a total of 130 ex-service men who were here under the jurisdiction of the Veterans' Bureau. On June 30, 1922, we were caring for 65 ex-service men, many of whom are receiving compensation. Claims have been made for all of them, but some will not be compensable owing to the fact that undoubtedly their disability is not of service origin.

The greater part of the detail work connected with the ex-service men is cared for by a representative of the Veterans' Bureau who is employed as a stenographer at this institution. The Bureau pays her salary, and the hospital boards and maintains her for some extra work that she does for the hospital. This stenographer has facilitated very much the proper handling of ex-service cases, inasmuch as she is held responsible for all details.

In addition to the ex-service men, there were on our books at the close of the fiscal year, 14 navy cases and 12 marines.

IMPROVEMENTS, JULY 1, 1920, TO JUNE 30, 1922.

Instituted religious services for our patients.

Revised, condensed and made practical the method of mental examination of patients. With this system the diagnoses are kept up to date at all times.

Established a system of taking notes on all chronic cases every three months.

Renovated center offices and placed modern electrical fixtures therein.

Eliminated the necessity of a new administration building by changing location of bookkeepers, stenographers, and physicians.

Installed a large vault.

Arranged for an open ward (doors unlocked) on "O" ward for paroled patients—the first of its kind for female patients.

Formulated and published in pamphlet form rules and regulations governing conduct of employees in caring for patients.

Arranged at a minimum cost to care for one hundred more patients at the Dozier Cottages to relieve temporarily the overcrowding in main building.

Phonographs and records have been added to several of the wards.

Arranged a system and printed proper outline for forwarding requests for private clothing.

Installed thermometers on all wards.

Instituted motion pictures twice weekly instead of once a week.

Sewingroom: Added four power machines, and a machine for darning hose.

Tailor shop: Added electric cloth cutter; machines for sewing on buttons and making buttonholes, and a garment press.

Established a plant for repair and manufacture of patients' shoes and slippers.

Started a small toy-making industry.

Provided heat for all the Dozier cottages.

Established a central butter room. Here the butter for all the wards is cut in a large machine in equal and uniform size for all patients.

Established a diet kitchen.

Instituted the manufacture of beds.

Altered first assistant physician's residence, making larger sitting and dining rooms.

New reading room for employees on long hall.

Drug store remodeled.

Record room remodeled.

New steam line run to fuel-oil storage tank.

New joists and maple floors laid in parole cottage No. 2.

McCurry cottage removed from Lake Marie and rebuilt.

New yard built at male acute disturbed cottage for disturbed patients.

One thousand feet of sidewalk built along highway.

New deep well bored, No. 3, 448 feet.

New pump house constructed.

New floor laid in female attendants' dining room.

New joists and floor laid in parole cottage No. 6.

New line of electroliers installed on north side of front avenue.

New yard constructed at female acute disturbed cottage for disturbed patients

Orchardist's cottage remodeled.

Three additional storerooms fitted up for storekeeper.

Thirty-two new garages built for employees.

New wire fence completed along highway at Smith-Brown ranch.

Twenty-four acres of young orchard planted at Smith-Brown ranch.

Seventy acres additional bottom land put under cultivation.

Two feeding sheds at dairy remodeled and enlarged.

New bull pen built at dairy.

New wood shed built at dairy.

Four buildings removed from Smith-Brown to Spencer ranch for poultry.

One new brooder house built at Spencer ranch for poultry.

New 2500-barrel fuel-oil storage tank, and barge landing at river.

Six new poultry houses built at poultry ranch.

New storehouse for feeds built at hog ranch.

New Dodge light delivery car purchased for use of engineer.

New White truck purchased for hauling store supplies.

Renovation of engineer's office: Instituted a system for records, added a typewriter, etc., and cabinet for maps.

IMPROVEMENTS UNDER WAY, JUNE 30, 1922.

Electric system: Placing cables under ground, removing transformers to a central station, and metering all current used at one central point.

Installation of new air compressor.

Superintendent's residence, addition of porch.

Manor house: Remodeling for a home for physicians, pathologist, and dentist.

New septic tank at Smith-Brown ranch.

New workers' cottage (to accommodate 124 patients) under construction.

Laundry: Altering and adding new equipment to eliminate

1. Open air drying.
2. Old dryroom separated from laundry.
3. Officers' laundry.
4. Basement route of collecting and distributing laundry.

Hosiery and shoe-string machines. This equipment will soon be installed for making all hosiery and shoe-strings used by the hospital.

Purchase of gas from Pacific Gas and Electric Company, Napa.

Respectfully submitted.

A. C. Matthews,
Medical Superintendent.

REPORT OF THE MEDICAL SUPERINTENDENT, NORWALK STATE HOSPITAL.

July 1, 1922.

DEPARTMENT OF INSTITUTIONS,
Sacramento, California.

GENTLEMEN: The movement of population in this institution for the biennial period ending June 30, 1922, shows there were admitted 650 patients; the number discharged was 239; the number died 197; there were 140 patients on parole June 30, 1922, and the number remaining in this hospital at the end of the last biennial period was 386 males and 254 females, a total of 640 patients.

The movement of population shows a very large number of admissions for this small institution. It is expected that during the coming biennial period there will be a still larger number of admissions because of the over-crowded condition of the institution at Patton and the rapidly increasing population of southern California.

Our death rate has been high because of the many old patients and the many cases of general paresis and bedridden and sick patients admitted here because of the danger in taking these patients to the Patton institution, it being some distance away.

Our records show a very large number of cases of paresis admitted to this institution. These are difficult and expensive patients to care for because of their destructive habits, and it requires a larger number of attendants to care for them, as they are ill and bedridden the greater part of the time.

We look forward with increasing interest to the time when we will have our receiving and treatment building. It is my understanding that a contract for this building will be let soon and that we may have the use of it sometime during the first year of the coming biennial period. Our facilities for the proper care of our acute and sick patients are inadequate, and we very much need a receiving and treatment building.

The needs of this institution in the way of appropriations for the coming biennial period are as follows:

One cottage for 100 old women patients and a cottage for 100 old men patients. The cost of these two cottages would be $140,000. We need additional room and a place where we can isolate the old men and the old women that are admitted to this institution.

We need one isolation cottage for 50 tubercular patients. At present we have no building that we could use for this purpose for the women patients. With the increased capacity, we will be able to use one of our present frame cottages for 50 men patients, but we need an isolation cottage for 50 tubercular women patients. The cost of this building will be $35,000.

This institution is very much in need of an auditorium building, as we have no place for holding church services or giving any entertainments for our patients. I would recommend that a congregate dining-

room and auditorium building be erected, the lower story for a congregate dining-room accommodating 650 patients at meals and the upper story for an auditorium or entertainment hall. This would give increased capacity in some of our custodial buildings, as we could convert the dining-rooms into dormitories and the patients from these buildings could take their meals in the congregate dining-room. The cost of this building would $175,000.

We must have increased capacity for nurses, as no provision has been made for them; however, three new buildings have been planned and are being erected for the care of patients. I would recommend that a companion building to the administration building be erected and used for a library, recreation room and a home for 50 additional nurses. It is imperative that we have a building for nurses. This building will cost $45,000.

We must also have additional room for nightwatches. The old building in which the nightwatches are now housed is beyond repair and unsanitary, the rooms are small, and some of the nightwatches are compelled to room on wards where there are noisy patients, because there are not other rooms for them. We are very much in need of a nightwatch cottage. The cost of the same would be $15,000.

Our physicians at present are living in small two-room bungalows, and one physician and his wife live in one room. We need two additional cottages for assistant physicians. The cost of these would be $14,000.

Our secretary and his wife live in one small two-room cottage. It is very desirable that we have a cottage for the secretary. The cost of the same will be $6,500.

We have not been able to get a competent farmer to operate our farm, for the reason we have no house in which his family could live. In fact, there is no farmhouse on our hospital farm. I would recommend that we have a cottage for the farmer. The cost will be $5,000.

The industrial work in our institutions should be encouraged, and at present we are very much cramped for room. We have a small shed-like building in which considerable industrial work is being done; however, if we had a larger and more suitable building, it would be much to the advantage of the state. An industrial building and carpenter shop combined will cost $35,000.

On account of the increase in the number of buildings, we will need an additional boiler, boiler setting and engine room equipment, connections, etc. These will cost $30,000.

We also need an addition to the boiler room for a work shop; also a new smokestack. The cost of these will be $12,500.

The hospital grounds are in a crude and unfinished condition, and much propagating of shrubbery, trees, etc., should be done, in order to save buying these expensive necessities at our neighboring greenhouses. I would recommend that a lattice house and propagating greenhouse be built. The cost of the same will be $6,500.

There is much improvement of grounds, road grading and the building of sidewalks and curbing necessary about this institution. To do this, an appropriation of at least $30,000 will be needed.

Our institution is growing rapidly and needing additional laundry machinery. The cost of this will be $10,000.

Our hospital grounds and our hospital farm are in an unfinished condition and we need a new tractor and a new truck. The cost of these will be $6,500.

Much irrigation pipe, farm machinery, farm improvements, live stock, etc., are needed. The cost of the same will be $25,000.

As the institution grows, we will need during the coming biennial period an addition to our sewage plant and new sewers. The cost of these will be at least $10,000.

The following is a recapitulation of the appropriations needed:

1 cottage for 100 old women, and 1 cottage for 100 old men patients	$140,000 00
1 isolation cottage for 50 tubercular patients	35,000 00
1 congregate dining-room and auditorium building accommodating 650 patients at meals and entertainments	175,000 00
1 companion building to the administration building, to be used for library, recreation room and a home for 50 additional nurses	45,000 00
1 nightwatch cottage	15,000 00
2 cottages for assistant physicians	14,000 00
1 cottage for the secretary	6,500 00
1 cottage for the farmer	5,000 00
Industrial building and carpenter shop	35,000 00
1 boiler, boiler setting and engine room equipment, connections, etc.	30,000 00
Addition to the boiler room for workshop, and new smokestack	12,500 00
Lattice house and propagating greenhouse	6,000 00
Improvement of grounds, roadgrading and the building of sidewalks and curbing, and for trees and shrubbery	30,000 00
Additional laundry machinery	10,000 00
1 tractor and 1 truck	6,500 00
Irrigation pipe, farm machinery, live stock, farm improvements	25,000 00
Addition to the sewage disposal plant, and new sewers	10,000 00
	$600,500 00

I can not too strongly urge upon your department the great necessity of insisting that our coming legislature provide for ample and suitable accommodations for our patients and employees. This seems to me to be imperative, owing to the great demands for admissions; and this will continue in this rapidly-growing section of southern California.

Respectfully submitted,

C. F. Applegate,
Medical Superintendent.

REPORT OF SUPERINTENDENT, PACIFIC COLONY.

WALNUT, California, July 1, 1922.

JNO. A. REILY, M. D., *Director,*
Department of Institutions,
Sacramento, California.

DEAR SIR: I submit herewith the following biennial report of the Pacific Colony, covering the period ending June 30, 1922.

Pacific Colony was opened for patients March 20, 1921, when 19 patients were transferred from the Sonoma State Home. There have been admitted 29 patients since the opening of the institution, none have died, 2 were discharged and 3 were transferred to other hospitals, leaving 41 inmates on June 30, 1922.

I assumed the duties of acting superintendent May 26, 1922, at which time there were 33 patients and 14 employes. The expense of running a small institution of this kind has been large and I believe that it can be greatly reduced.

The growth of the Pacific Colony has been slow. One custodial building was completed in 1920. Since that time there has been no building, although the legislature appropriated $120,000 for building. However, this was not to be used until it was sure that our water supply was adequate and at the present time it appears that we have very little water for irrigation purposes on the 800-acre ranch. On the 200-acre ranch there is a sufficient supply of water, but if this was to be carried to the 800 acres, the cost would be exorbitant.

The location of the present colony buildings makes it very inaccessible as it is one and six-tenths miles from the boulevard and all freight has to be hauled about three miles. It would be a great expense to put in a railroad track to these buildings.

I would suggest the buying of the Hartig ranch of 41 acres, which joins the 200-acre tract and a building program be started at once upon this 240-acre tract, which has an abundance of water, is well located on the boulevard and can be reached by two spurs, from the Southern Pacific and Union Pacific Railroads, which border the property.

There is a crying need for an institution of this kind in southern California as reports show that there are about 900 patients waiting for admission.

Respectfully submitted,

C. E. SISSON,
Acting Superintendent.

TABLE NO. 1.

Movement of Patients for the Year Ending June 30, 1921.

	Male	Female	Total
Number of patients June 30, 1920	0	0	0
Number admitted to June 30, 1921	29	0	29
Number remaining June 30, 1921	29	0	29

TABLE NO. 2.

Movement of Patients for the Year Ending June 30, 1922.

	Male	Female	Total
Number of patients June 30, 1921	29	0	29
Number admitted tot June 30, 1922	20	0	20
Number returned escapes	1	0	1
Number under care and treatment	50	0	50
Number discharged unimproved	2	0	2
Number transferred to other hospitals	3	0	3
Number escaped	4	0	4
Total discharged, escaped and transferred	9	0	4
Number remaining June 30, 1922	41	0	41

TABLE NO. 3.

Showing Counties from Which the Patients Were Received During the Biennial Period Ending June 30, 1922.

Counties	June 30, 1921	June 30, 1922
Fresno	0	2
Los Angeles	20	16
Orange	1	0
Riverside	2	0
San Bernardino	1	1
San Diego	5	1
Totals	29	20

TABLE NO. 4.

Nativity of Patients Admitted During the Biennial Period Ending June 30, 1922.

State or Country	June 30, 1921	June 30, 1922
California	10	8
Illinois	1	1
Iowa	1	1
Kansas	1	1
Maine	1	1
Minnesota	2	0
Missouri	1	1
North Carolina	0	1
Nebraska	0	1
New Mexico	1	0
Ohio	2	0
Oregon	1	0
Pennsylvania	1	0
Virginia	1	0
Wisconsin	0	2

unable to understand. Indeed, if the truth were told, no one else was able to understand it either; the only reason for its continuance was tradition and the fact that the law required it.

This unsatisfactory condition of affairs was one of the important reasons for reorganization of, and inclusion of these grades in the more elastic junior high school. The course of study for this new type of school is, according to the new law, to be subject to the approval of the State Board of Education, and is to be "designed to fit the needs of pupils of the seventh, eighth and ninth grades, or of the seventh, eighth, ninth and tenth grades."

In the reorganized curriculum, each teacher is, theoretically, especially prepared to teach one or two subjects, or has had conspicuous success in the teaching of such subjects. They are expected to become salesmen of these subjects in that they make clear how they will function in the near as well as in the more distant future. Courses are introduced to describe occupations and to inform children as to the knowledge necessary to fit for each vocation.

"Try-out," or exploratory courses, are introduced which will enable students to test their conjectured individual preferences and abilities for certain future vocations.

The great importance of pleasant physical surroundings as an aid in the holding power of schools could be readily established. A beautiful building, surrounded by artistically planned grounds, may be taken as the index of the spirit of a community, and an invitation to home-seekers to settle there. To supply a growing need, Mr. and Mrs. Howard Gilkey of Oakland were invited to prepare a bulletin on the landscaping of school grounds. Mr. Gilkey has since been chosen as the landscape architect of the city of Oakland. The bulletin has been issued by authority of the State Board of Education. It has met a real practical need and has been enthusiastically received. It is a, strictly California manual prepared after years of experience with plant material which thrives in the State.

It has been conclusively demonstrated that children vary greatly and that individual differences are especially apparent as adolescence approaches. The old attempt to make every one do the same work and at the same rate has been discarded by progressive teachers. The speed with which students acquire information and gain power to use that information varies as widely as the speed at which they can walk or run. Where numbers permit, groupings are made of those who can proceed at somewhere near the same pace. Perhaps an even greater wrong is being committed against those whose possible rate of progress is being slowed up to the uniform rate demanded as against those whose mental processes are slow but who are continually being compelled to try to advance at a faster rate than that at which they are able to do.

One prominent educator for years kept the records of the boys who had graduated from the large high school of which he was the principal. He found that boys of supernormal ability in school were as a rule less successful than normal boys and often less successful than those who were slightly subnormal. They had acquired in school the habit of laziness and of working below the rate at which they might normally have proceeded. After leaving school the bad habit thus formed persisted with disastrous effects both to themselves and to their communities. They might have become wise and able leaders. Instead they

dropped back and ceased to do even that which the average students accomplished.

Citizenship is being taught in progressive junior high schools and high schools in California today by encouraging pupils to participate in the school government—in the government of themselves.

The organization of junior high schools would be greatly stimulated by a law providing State and county aid on the same basis as for the regular high schools. The last high school principals' convention urged the enactment of such a law.

Co-ordinate power is given to junior high school principals and to the superintendents having jurisdiction over their schools to admit the pupils aged thirteen or over to the junior high school. A little more frequent use of this power would open the way to remove stumbling blocks from the path of many a discouraged over-age child. Another element of discouragement would be removed for eighth grade pupils in regions where the junior high school does not exist if county boards of education were to take advantage of the power which is theirs under the law to accredit the work of teachers of ability by removing the requirement of the final examination for graduation.

Indeed, more attention to the entire subject of examinations both below and in the high school could profitably be given. Much of the labor on the part of both teacher and pupil should be avoided. The testing of pupils who have demonstrated superior ability and superior accomplishment is unnecessary and a pure waste of time and energy.

Most of the examinations given also are mere tests of memory. They are closed-book tests. After graduation, the real test of one's knowledge is the ability to know how and where to obtain quickly certain needed facts. A much higher type of examination than the memory test would be that which would test the individual's power to apply knowledge obtained from the open book or to assemble facts from various books or from various parts of a textbook.

In one high school recently visited, several whole days were devoted at the end of the term to long examinations while the pupils marked time or crammed facts in preparation for the ordeal of memory testing.

The case of the geometry examination paper submitted to a large group of mathematics teachers for grading is a familiar one. The work of the student was graded all the way from 29% to 92%. Evidently each of the various teachers maintained his own individual standard. According to his varying stages of physical and mental poise, each teacher is doubtless (for examination-grading purposes) a whole group of individuals. Yet, if examinations are to be given, whether to test memory or growth in power, questions may often be arranged somewhat in the fashion of the ordinary intelligence tests. Short, simple answers may be required, the grading of which admits of only one possibility.

As already stated the testing of pupils whose ability and performance from day to day is already known is an enormous waste of time both for pupil and teacher. Usually only those need to be tested who have done poor work or who wish to demonstrate that their ability is greater than that indicated by their daily work.

A committee authorized by the State Board of Education has been appointed by the commissioner of secondary schools to investigate and to report upon the aims, objectives and course of study of the junior high school.

confidence in the school. It has been the endeavor of those dealing with the boys to awaken their interest in something, and to instill in them a desire to improve their time while in the school.

It would be folly to attempt to convey the impression that the discipline problem has been solved at Preston, and that there are no longer any difficulties or dangers from infractions of discipline. The problem will always remain and can be handled properly only by a vigilant staff, and through sensible and constant supervision.

The result of the efforts during the past biennial period has been a decrease in the numbers of attempts to escape, much fewer discipline slips for minor offenses, and a greatly increased loyalty to the school. Consequently, the boys are making much better use of their time while here, and the school is functioning much more nearly as an educational institution than merely as a custodial institution.

CLASSROOM AND VOCATIONAL INSTRUCTION.

An educational director was placed in charge of the classroom and vocational instruction in 1920, and has since been gradually reorganizing the work.

During the biennial period, the entire classroom teaching staff has been changed with but one exception. A salary increase received in 1921 has made it possible to secure first-class teachers. Teachers have been encouraged to make special studies in connection with their work.

Instruction in both the trades and the classrooms is on an individual basis. Each boy may make progress under this method according to his ability.

Practical instruction is given, ranging from first grade work through to instruction equivalent to tenth grade work in mathematics, history and civics, and composition and English. A half-day commercial class is maintained, and a class of boys given instruction in mechanical drawing two hours and a half daily. The library and mail censoring are also under the supervision of the educational director, and are conducted as a regular school department.

Classroom instruction and vocational training is closely correlated. Whenever it is thought advisable, boys discontinue attendance for classroom instruction and work at their trades a full day.

The following are supervised by instructors holding a state vocational teacher's certificate: printing, plumbing and sheet metalwork, cabinet and woodwork, and band instrument instruction. Other trades at which boys may work and receive instruction are: auto mechanics, blacksmithing, shoemaking, tailoring, baking, meat cutting and butchering, cooking, laundering, plastering and concrete work, electrical work, boiler firing, steamfitting, brickmaking, and farming which includes dairying, poultry raising, hog raising, gardening, and general farming.

Each boy in either classroom or trade is graded according to his work performance, and general attitude and conduct. Poor work means a longer stay at the institution. A quarterly report is sent to parents. A certificate of training is given each boy when he is paroled or discharged. Credit is given in the public schools for work completed

PSYCHOLOGICAL RESEARCH.

A laboratory of the California Bureau of Juvenile Research is maintained at the Preston School of Industry with two workers. Each boy is given a psychological examination, and as much social data recorded about his case as can be ascertained.

According to the reports of the resident psychologist, the boys rate as follows:

Superiors	3.5 per cent
Average normals	22.5 per cent
Dull normals	21.5 per cent
Borderlines	22.5 per cent
Morons	30 per cent

It will be noticed that out of a group of 450 boys, half of the group range from dull normal to superior. It means that the institution has over 200 boys capable of perfecting themselves in skilled trades. It is, therefore, the duty of the state to maintain first rate trade and class instruction for this group, and to train the remainder in the simpler occupations where they are most adapted.

PHYSICAL EDUCATION.

The Preston School of Industry is proud of the athletic record made by the boys during the fifteenth biennial period. A competent athletic instructor was employed in 1920. It has been his aim to interest as many boys as possible in competitive games. Inter-company competition in baseball, track, basketball, and football brings into games nearly all of the boys of the school. From five to eight games in each of the above named sports, except track and field sports, are played with neighboring schools. Athletics, besides being of inestimable value in the development of physique and character, give the boys a wholesome topic of conversation. During the two-year period the athletic director has not had a single serious breach of discipline among the boys on the athletic field either at home or when making trips.

PAROLE AND PLACEMENT.

In promoting the parole and placement work of the Preston School of Industry, it is the policy of the school to treat the wards of the state, who come under its jurisdiction, as individual human beings possessing ambitions, longings, personal traits, and abilities. The parole department endeavors to approach their problems in a helpful and encouraging way, cooperating with them, and also with their parents and friends on the outside, in arranging suitable employment and congenial environment.

Incentive, rather than restraint or fear, is the central idea of the parole and placement system. There are two incentives emphasized:

First, the importance and value of becoming established in a good and useful occupation that will insure a satisfactory outlook for the future by the time the boy is twenty-one years of age. To accomplish

supplemented by encouragement through personal interest and commendation are strong incentives in holding youths to a definite program of rehabilitation.

Second, the awarding of a diploma of honor, signed by the Governor of the state, the superintendent, and the board of trustees of the school, to the youth who makes good and maintains a 100 per cent record of conduct during the period of his parole. The object of this diploma of honor is to give each youth an opportunity to regain his self-respect by having removed the stigma brought upon his name and reputation due to the fact he has been haled before a court of justice, and committed to a state institution for correction.

In accepting this program for establishing himself as a good citizen and erasing the stigma upon his name and reputation, the youth signs a written agreement as follows:

1. That I will recognize the parole officer as the official representative of the Preston School of Industry, and I will properly fill out and mail a vocational report to his office regularly the first of each month, using the regulation "Monthly Vocational Report" blanks furnished for that purpose; and I further agree to notify the said parole officer immediately of any change in my address.

2. Knowing that the object for which I am being released on parole is to give me an opportunity to learn a trade or become established in some good and useful occupation that will give me a good start in life by the time I am twenty-one years of age I hereby agree to use my best energies to make good in my employment and earn a reputation for honesty, faithfulness and industry.

3. I agree to save money from my earnings regularly and will start and maintain a savings account in some bank as soon as possible after my release and during the period of my parole.

4. Believing that my future success and happiness depend upon the way I conduct myself in society, in business and in my home, I agree to refrain from evil practices, such as late hours at night, smoking cigarettes, deception and other influences detrimental to my best interests and welfare and will keep my general conduct record satisfactory and my habits good.

5. I agree to keep out of trouble in the future, that I will avoid such companionships as I have reason to believe would not be approved by the school authorities, knowing that if I associate with evil companions I will be tempted to loiter around pool and billiard halls, dance halls, cigar stores, prize fights, and other questionable resorts and in doing these things would be inviting trouble.

The Board of Parole Commissioners meets the first of each month to pass upon the applications of all boys who are ready for parole. Each boy comes personally before the Parole Commissioners for advice and encouragement, to receive instructions regarding employment, and what will be expected of him. At the close of this meeting with the Parole Commissioners, a banquet is held in the superintendent's apartments for all successful candidates, usually from fifteen to twenty-five.

Each one leaving the school is made to feel that he amounts to something, that his life is worth while, and his progress and achievement will be carefully checked up and recognized.

The following is a summary of the number of youths paroled from the Preston School of Industry during the two years from July 1, 1920, to June 30, 1922:

Number of youths on parole July 1, 1920	293
Number paroled from July 1, 1920, to June 30, 1922	394
Total	

Discharges from parole were issued as follows:

Diplomas of honor:		
July 1, 1920, to June 30, 1921	21	
July 1, 1921, to June 30, 1922	19	
	—	40
Honorably discharged:		
July 1, 1920, to June 30, 1921	59	
July 1, 1921, to June 30, 1922	96	
	—	155
Ordinary releases:		
July 1, 1920, to June 30, 1921	44	
July 1, 1921, to June 30, 1922	66	
	—	110
Parole violators:		
July 1, 1920, to June 30, 1921	37	
July 1, 1921, to June 30, 1922	13	
	—	50
In jail or prison:		
July 1, 1920, to June 30, 1922	7	
July 1, 1921, to June 30, 1922	12	
	—	19
Total		374
Number on parole June 30, 1922		313

For convenience the state is divided into districts, and it is interesting to note the number of youths on parole in each district:

San Francisco, Oakland and Berkeley	82	
Sacramento Valley and north	45	
Santa Clara and Salinas valleys	16	
San Joaquin Valley	46	
	—	189
Los Angeles, Pasadena and vicinity	69	
Southern California outside of Los Angeles district	42	
	—	111
Outside of the State of California		13
Total		313

REPAIRS AND NEW CONSTRUCTIONS.

On account of the neglect of the repair work during and immediately after the world war and because of the fact that many of the buildings are old, Preston found itself in a dilapidated condition calling for immediate attention at the beginning of the fifteenth biennial period.

As soon as money became available, August 1, 1921, repair work was started, and has continued throughout the past year. Funds available will not be sufficient to put the institution in first-class repair and further appropriations will be necessary.

A boys' cottage, which has stood for several years unfinished, was completed in June, 1922, and is now occupied.

Approximately $9,000 was spent on enlarging and repairing the upper ditch on the water system. A new Imhoff septic tank has practically been completed.

Plans are drawn for the construction of a machine shop, a laundry building, and two officers' cottages, all of which should be completed

Work has been started on the raising of the dam of the Henderson reservoir, and in connection with this work the leaky portions of the lower ditch are to be concreted. Many other minor improvements and repairs are being made, most important of which is the complete overhauling of the main kitchens and cold storage plant.

THE FARM.

The farm improvements deserve special mention. Ninety-four acres of additional land have been purchased. Forty acres of this land is rich alluvial bottom soil adapted to garden culture.

Approximately thirty acres of fruit trees and vines have been planted during the past biennial period. Much of the land has been leveled, reditched and drained.

The poultry department has been greatly improved by the reconstruction of the buildings and the addition of some new stock. The growing of rabbits and ducks was found unprofitable and both have been discontinued.

The dairy herd has been improved through the segregation of all tubercular cattle from the uninfected members of the herd. Special care is being taken to prevent the spread of infection in order that ultimately the school may have a herd entirely free from tuberculosis infection. All milk is pasteurized.

NEEDS OF THE INSTITUTION.

In planning for the future of the Preston School of Industry, the fact should ever be kept in mind that it is primarily an educational institution where unfortunate delinquent youths between the age of sixteen and twenty-one are sent with the hope that their anti-social tendencies may be checked, and their minds and hearts fired with an ambition for useful citizenship. As is shown by the mental ratings of the boys, more than 200 are of such mental caliber as to profit from classroom and skilled trade instruction.

The school needs to continue endeavoring to raise the standard of trade instruction until it is the equal of any trade school in the state. The salaries of certificated trade instructors should be commensurate with salaries paid in the public schools of the state. Also, less demands should be made upon trades instructors for custodial duty. A trades instructor should not be required to do company duty except in cases of emergency.

A school building is needed to house the classroom work and the library. At the present time the school work is scattered in four places, and the rooms used are not well adapted for school work. The present rooms can be very well used for additional boys and officers' quarters.

A building to house the sewing room and tailor shop, to be built adjacent to the new laundry building, should be provided for in the next biennial budget. The present space used is not well adapted for shop purposes. It is badly in need of repairs and can best be utilized for additional boys and officers' quarters.

An act was passed at the last legislature providing for the establish-

legislature.) Freedom of transfer would exist to this department from the main institution and vice versa.

This school is now receiving some boys who are not by their character and disposition entitled to the privileges of the school. They only impede the progress of other boys desirous of making use of the opportunities. Such boys are more expensive to keep, as they require close guarding. Occasionally, it is found necessary to return a few of them to court for further court action.

A separate division, or reformatory department, built on land now owned by the school about a quarter of a mile from the present institution, so constructed as to minimize the possibilities of escape, would be advantageous for the following reasons:

1. It would simplify the problem of discipline at Preston and make the correctional work easier and more effective.

2. It would tend to decrease the per capita cost by decreasing the amount of officers necessary to keep the unresponsive boys in the institution.

3. By establishing a brick and tile industry at the Reformatory Department, the labor of the boys could be utilized more profitably than at present.

4. Some first time offenders under the age of twenty-one now being committed to the state penitentiary could be received by the Preston School where the chances of reform, without the stigma of a prison, could be given.

The work of improving the farm should be continued until all of the tillable land is brought to a high state of cultivation. It is recommended that property now owned by the Philadelphia Quartz Company, lying between the school's present holdings, be purchased. This property can be farmed to an advantage by the school. This purchase would add about 150 acres more to the Preston farm, which now consists of 717.17 acres.

The repair work on the old buildings should be continued until all buildings are placed in first-class condition. The main drives need a new coat of macadam. Repairs to the motors and the electrical equipment of the school are also quite essential.

STATISTICAL DATA.

The following tables contain statistical data on the population during the fifteenth biennial period:

Enrollment Statement.

	June 30, 1921	June 30, 1922
Enrollment at midnight	383	396
Those on parole	293	342
Those on furlough	25	27
Escapes at large	35	59
Total	736	824
Added to rolls during year:		
New commitments	299	390
Transferred from Whittier	12	11

Enrollment Statement—Concluded.

Removed from rolls during year:		
Discharged from institution	43	48
Discharged from parole	61	105
Released, order of court	15	53
Expiration of term on parole	52	77
Expiration of term on escape	16	25
Discharged from furlough		6
Died in institution	2	3
Returned to court	21	35
Discharged from escape account prison sentence	2	3
Discharged from parole account prison sentence	4	15
Term expired on furlough	2	4
Released order of court from furlough	1	1
Discharged from furlough account prison sentence	4	2
Total passed out	223	374
Total enrollment at end of year	824	851

Statement of Actual Population in Institution.

	June 30, 1921	June 30, 1922
In institution at midnight	383	396
Received during month:		
By new commitments	299	390
By commitment (re) from parole	12	9
By return from parole	30	18
By return from furlough	12	15
By return from escape	16	14
By recommitment from escape	1	2
By transfer from Whittier	12	11
	382	459
In institution during year	765	855
Passed out during year:		
By discharge	43	48
By order of court	15	53
By parole	208	202
By furlough	17	35
By return to court	21	35
By escape	58	32
By death	2	3
By deportation	1	
By transfer to Whittier	4	
Total passed out	369	408
Total population at end of year	396	447

Statement of Paroles.

On parole at midnight	293	342
Paroled during year	208	202
Paroled from furlough	2	2
	503	546
Discharged from parole	61	105
Term expired on parole	52	77
Returned from parole	30	18
Recommitted from parole	12	9
Died on parole	2	
Discharged from parole account prison sentence	4	15

Statement of Furloughs.

	June 30, 1921	June 30, 1922
On furlough at midnight	25	27
Furloughed during year	17	35
Total	42	62
Discharged from furlough		6
Returned from furlough	12	15
Term expired on furlough		1
Order of court from furlough		1
Paroled from furlough	2	2
Escaped from furlough	1	
Discharged from furlough account prison sentence		2
Total	15	27
On furlough at end of year	27	35

Statement of Escapes.

Escapes at large at midnight	35	59
Escaped during year	58	32
Escaped from furlough	1	
Total	94	91
Captured	16	14
Term expired	16	25
Discharged account prison sentence	2	3
Recommitted from escape	1	2
Total	35	44
Total escapes at large at end of year	59	47

Respectfully submitted.

O. H. Close,
Superintendent.

REPORT OF MEDICAL SUPERINTENDENT OF THE SONOMA STATE HOME.

DR. JOHN A. REILY.

Director, Department of Institutions,
Sacramento, California.

SIR: I have the honor to submit herewith the following biennial report of the Sonoma State Home covering the period ending June 30, 1922.

During the past two years we have received 795 new applications. During this same period we have admitted 601 cases, leaving a total waiting list of 976 on June 30, 1922. I am sure we would have received many times this number of applications had the public felt there was a possibility of having the cases admitted, but they know we are crowded to the utmost at all times and can receive only the most urgent cases.

Housing facilities, equipment, etc. should be added as rapidly as funds will permit to make it possible for the many awaiting admission to be sent here. Some cases only need to come for a short time—as it has been fairly well demonstrated that the average moron, without natural vicious tendencies, who has been properly trained in habits of obedience and industry, and who is protected from temptation and evil associations during childhood can, in the majority of instances, be safely returned to the community after having passed adolescence providing their families or trained workers can give them the proper supervision.

At the present time we have nearly 300 patients receiving extra-institutional care with good results and with very little expense to the institution.

Those defectives whose tendencies are such as to make them undesirable members of the community should be permanently segregated in the institution. The defectives who are capable of propogating, especially the hereditary class, and we know this class predominates, should first be asexualized before leaving the institution as we are now doing. We receive a great many each year just for sterilization alone and return them to their respective communities without training, some being discharged, others remaining on parole.

We now have two field workers in the institution supervising our parole cases and obtaining family histories, as well as two part-time workers in San Francisco and Alameda counties.

Religious services, moving pictures, entertainments, etc., have been maintained throughout the biennial period with the usual degree of success.

Owing to the demands of the public we have extended our community service clinics to two afternoons each month in Santa Rosa, one afternoon in Petaluma, and one in Healdsburg.

Medical and Surgical Care: The general health in the institution for the past two years had been good with the exception of an epidemic of

The number of cases transferred to the infirmary for medical and surgical care for the two years was 1158; the number treated for various conditions at the daily clinic was 22219. We performed 373 operations of which 241 were for sterilization. Autopsies were performed on 101 cases, or 71 per cent of those having died during the biennial period.

School Department: During the past biennial period the average monthly attendance in the various classes was 623. While this department has progressed very nicely we hope to do even better when we have the added facilities which our new school building will afford.

I wish to express my appreciation to all officers, attendants and employees in the service who have been loyal and helpful throughout the past biennial period.

Respectfully submitted.

F. O. Butler,
Medical Superintendent.

TABLE NO. 1.

Population Report, July 1, 1920, to June 30, 1921.

	Male	Female	Total
Poulation July 1, 1920	794	743	1,537
Admissions	141	139	280
Returned elopers	8	----	8
Total receiving care and treatment	943	882	1,825
Number out:			
Improved	22	13	35
Unimproved	8	4	12
Transfer to other hospitals	20	3	23
Died	23	25	48
Eloped	20		20
Totals	93	45	138
Population July 1, 1921	850	837	1,687
On leave	86	77	163
Actual population end of year	764	760	1,524

TABLE NO. 2.

Population Report, July 1, 1921, to June 30, 1922.

	Male	Female	Total
Population July 1, 1921	850	837	1,687
Admissions	164	157	321
Returned elopers	21	----	21
Total receiving care and treatment	1,035	994	2,029
Number out:			
Improved	14	19	33
Unimproved	31	4	35
Transfer to other hospitals	5	10	15
Died	46	48	94
Eloped	44	----	44
Totals	140	81	221
Population July 1, 1922	895	913	1,808
On leave	104	134	238

TABLE NO. 3.

Showing Counties From Which the Patients Were Received During the Biennial Period Ending June 30, 1922.

Counties	June 30, 1921	June 30, 1922
Alameda	52	45
Butte	—	2
Contra Costa	3	7
El Dorado	—	2
Fresno	7	18
Glenn	—	2
Humboldt	3	1
Imperial	3	3
Inyo	4	2
Kern	4	4
Kings	2	3
Lake	—	1
Lassen	—	1
Los Angeles	34	35
Madera	1	1
Marin	3	1
Mendocino	1	—
Modoc	—	1
Monterey	5	3
Napa	4	1
Nevada	—	2
Orange	4	4
Placer	1	1
Riverside	2	2
Sacramento	7	12
San Benito	1	—
San Bernardino	4	5
San Diego	8	14
San Francisco	54	73
San Joaquin	12	5
San Luis Obispo	5	1
San Mateo	3	8
Santa Barbara	11	12
Santa Clara	7	32
Santa Cruz	1	1
Shasta	3	2
Siskiyou	—	2
Solano	2	2
Sonoma	15	9
Stanislaus	4	1
Tehama	—	1
Tulare	3	6
Tuolumne	1	—
Ventura	2	1
Yolo	1	2
Yuba	3	—
Totals	280	321

TABLE NO. 4.

Showing Age at Time of Admission of Patients for the Biennial Period Ending June 30, 1922.

Age	June 30,1921	June 30,1922
Between 1 and 10 years	70	55
Between 10 and 20 years	132	190
Between 20 and 30 years	43	41
Between 30 and 40 years	17	21
Between 40 and 50 years	14	10
Between 50 and 60 years	3	3
Between 60 and 70 years	1	1
Totals	280	321

TABLE NO. 5.

Showing the Civil Condition of Patients Admitted During the Biennial Period Ending June 30, 1922.

Civil condition	June 30, 1921	June 30, 1922
Married	18	20
Divorced	1	1
Single	260	299
Widowed	1	1
Totals	280	321

TABLE NO. 6.

Form of Defect in Patients Admitted During the Biennial Period Ending June 30, 1922.

Form of defect	Male	Female	Total
Idiots	29	42	71
Imbeciles	102	107	209
Morons and dull normals	144	149	293
Admitted but died or deported before examination			28
	275	298	601

(Of the 601 admissions 68 were epileptic).

TABLE NO. 7.

Showing Primary Cause of Death of Patients Who Died During the Biennial Period Ending June 30, 1922.

Cause of death	1920-1921 Male	1920-1921 Female	1921-1922 Male	1921-1922 Female
Mumps	1	0	0	0
Chronic epilepsy	2	10	13	9
Chronic Hydrocephalus	1	3	2	4
Pulmonary tuberculosis	4	3	7	9
Sub-acute endometritis	0	1	0	0
Chronic meningitis	3	0	0	3
Broncho-pneumonia	1	3	3	1
Chronic meningo encephalitis	1	0	0	0
Cardiovascular renal disease	0	1	0	0
Cerebral hemorrhage	2	0	0	0
Syphilis of brain, aorta, liver	1	0	0	0
Chronic valvular heart disease	1	2	3	2
Acute rheumatic fever	2	0	0	0
Neurosyphilis	1	0	0	0
Pernicious anaemia	1	0	0	0
Carcinoma of colon	0	1	0	0
Measles	1	0	0	0
Chronic interstitial nephritis	1	0	1	0
Acute mastoiditis	0	0	1	0
Chronic myocarditis	0	0	1	0
General peritonitis	0	1	0	0
Dementia praecox	0	0	0	1
Acute cellulitis of thigh	0	0	1	0
Mongolian idocy	0	0	4	0
Erysipelas	0	0	1	0
Myerocephalus	0	0	0	1
Pericarditis with effusion	0	0	1	0
Chronic endocarditis	0	0	0	1
Cerebro spinal lues	0	0	1	0
Lobar pneumonia	0	0	1	4
Pertussis	0	0	0	4
Chronic chorea	0	0	0	1
Spanish influenza	0	0	5	3
Pyonephritis	0	0	1	0
Brain tumor	0	0	0	1
Acute enteritis	0	0	0	1
Gangrene of hips and toes	0	0	0	1
Addison's disease	0	0	0	1
Carcinoma of uterus	0	0	0	1
Totals	23	25	46	48

Sum totals, 142.

REPORT OF THE MEDICAL SUPERINTENDENT, SOUTHERN CALIFORNIA STATE HOSPITAL.

E. G. Twogood,
Acting Director, State Department of Institutions,
Sacramento, California.

Dear Sir: I have the honor to submit herewith the following biennial report of the Southern California State Hospital covering the period ending June 30, 1922:

MOVEMENT OF POPULATION.

A synopsis and analysis of some of the more important tables which are appended hereto will show that our total admissions for the period were 1496; our deaths were 369; discharges 869 and escapes 236. The percentage of deaths to the total number treated is five and one-half per cent and percentage of recoveries to admissions was thirty-one per cent. Our admissions for the year ending June 30, 1922, were 777, which is the largest annual admission during the past five years.

It is evident from these figures that in spite of the fact that during the past six years there have been two institutions for insane in Southern California instead of one, as was the case prior to that period, our admissions do not decrease in numbers but on the contrary seem to show a definite increase from year to year. This is undoubtedly the result of the very remarkable increase in general population of the southern part of the state. Confronted with this fact we must continue to construct additional housing facilities to meet this constant increase in population of this institution.

BUILDINGS AND IMPROVEMENTS.

During the biennial period we have remodeled and reconstructed our entire refrigerating and ice-making plant and now have an equipment which is quite adequate to meet our present needs.

The 1921 legislature appropriated $90,000 for housing and training of patients and by the free use of patients' and employees' labor and the proper conservation of materials, we have constructed out of this fund two patients' cottages with a capacity of 75 beds each, one patients' cottage with a capacity of 5 beds, remodeled the farm cottage on the Taylor ranch, providing for 35 beds, and have left in the original $90,000 appropriation approximately $5,000 with which to purchase materials for the construction of an industrial building where our present furniture and toy factory may be more satisfactorily housed.

OPERATING COSTS.

Our daily per capita cost for the biennial period was $0.7089. Our per capita cost was $0.7675 for the seventy-second fiscal year and for

and supplies, together with a greater production of home-grown foodstuffs and feedstuffs, which are used to take the place of purchased supplies.

OCCUPATIONAL TRAINING.

Our occupational departments have made a steady growth since this work was inaugurated in 1909, until the cash receipts from the various occupational departments showed a total of $5,249.02 for the calendar year ending December 31, 1921. This only includes the cash sales and does not include the value of several thousand dollars worth of brooms, brushes, rugs, furniture, fabrics, shoes, etc., which are only manufactured for hospital consumption.

This aspect of our hospital activities has developed to the point where we compare favorably with the best organized occupational work being done in any institution in the country. With the money derived from the sales of occupational products we are able to do many worth while things for the entertainment, pleasure and comfort of our patients, which could not be done otherwise. For instance, we have purchased from this fund fifteen pianos and player pianos and twenty-five graphophones for the patients' wards and cottages. Nothing which has been inaugurated in this institution in recent years has done so much to improve the hospital condition of the chronic, deteriorated class by interesting them in some form of normal, wholesome activities and thus leading them away from the inactive, monotonous life which they would otherwise lead.

CHANGES IN MEDICAL STAFF.

During the biennial period we have to report the following changes in our medical staff: Additions, Dr. S. B. Pond, Dr. P. S. Waters and Dr. H. Forman. These additions were made necessary by the resignation of Dr. Victor Parkin, the leave of absence of Dr. Jno. A. Reily and the loss by death of Dr. Jessie H. Simpson.

On October 3, 1920, Dr. Jessie H. Simpson died of acute pulmonary tuberculosis of brief duration. She served this institution faithfully for over fourteen years and performed her duties in a manner which won the admiration and affection of her associates in the hospital service, of the patients who partook of her excellent care, and of the public and profession at large. Much of the good reputation which has been achieved by this institution in the care of her unfortunate wards can with good grace be placed to the credit of Dr. Simpson, whose faithfulness to her duties served as an inspiration to others associated with her in her good work. Many of the pleasures of life, which appeal to most good women were brushed aside by Dr. Simpson in order that they might not interfere with the great service to humanity which she had set as her goal. Those of us who so fortunately knew her as a most lovable woman, a most eminent physician and surgeon and a most charming and faithful friend, will cherish her memory with infinite pride and affection. It seems strange that while yet in the bloom of middle age and on what seemed to be the very threshold of her greatest achievement, she should so suddenly approach the sunset of

that radiates from the crown that glorifies a life of faithful service to humanity, and in the future when the story of this institution has been written the self-sacrifice and service of Dr. Simpson will stand out far and above those who have gone before or who may come after.

INSTITUTIONAL NEEDS.

Based upon our past performances this hospital will require additional housing facilities of 250 beds for the next biennial period in order to avoid a state of greater overcrowding than exists today. We are, therefore, asking the next legislature for an appropriation of $50,000 for two additional patients' cottages for the custodial type, with a total housing facility of 130 beds. We are also asking for a receiving and treatment building at a total cost of $150,000 with a capacity of 120 beds. Our facilities for the care and treatment of newly admitted cases are very inadequate. Our present receiving building was constructed thirteen years ago when such modern methods as are now employed were little understood. The result was that the entire building and equipment were not properly planned for the proper care and treatment of the patients admitted to our custody. The building contains only eight single rooms whereas the proper care of acute cases requires a much larger percentage of single rooms. The present building can be admirably adapted to use as an infirmary which is also badly needed in this institution.

We have also asked for $37,000 for the purchase of the Shay ranch, which is now under lease with a purchase option; $25,000 for the construction and equipment of a dairy and piggery, the same to be moved from the main hospital property to the Shay ranch; $50,000 for the construction and equipment of an amusement hall and chapel, which is greatly needed; $30,000 for new flooring and repairs on the old building in which are found wards 2, 3, 4, 5, 6 and 7 and $60,000 for the purchase of additional land adjacent to the Taylor ranch. All of these appropriations requested seem extremely necessary for the proper development of this hospital.

Respectfully submitted.

JNO. A. REILY,
Medical Superintendent.

REPORT OF MEDICAL SUPERINTENDENT, STOCKTON STATE HOSPITAL.

Stockton, California, December 27, 1922.

MR. E. G. TWOGOOD,
Acting Director, Department of Institutions,
Sacramento, California.

DEAR SIR: I hereby submit to you my report of the movement of patients, moneys received and expended, and other business transacted at the Stockton State Hospital.

IMPROVEMENTS.

During the past year we have opened and are now occupying two new cottages; one for the women patients who are suffering from tuberculosis, the other for the semi-acute cases. These buildings are very satisfactory, especially the one for the tubercular cases, as it gives us the proper segregation.

NEW APPROPRIATIONS TO BE ASKED FOR.

At the coming session of the legislature, we are going to ask for appropriations to construct three reinforced concrete buildings at the farm, and also a hospital building to be erected on the hospital grounds. The cottages at the farm are to be used for our men patients who are now occupying an old building erected in 1852. This building is old and is not the proper place to keep the patients who are now occupying it. We are asking for additional equipments for the engine room and also an appropriation to enlarge our water supply and to convey the same through new pipes about the hospital grounds.

WORK THERAPY.

We now have five special teachers in this department. Three working with the women patients and two with the men. This work has been very satisfactory, not alone occupying the attention of the patients, which is very beneficial to their mental condition, but also making quite a saving through the articles manufactured by them.

STERILIZATION AND OTHER SURGERY.

We have sterilized quite a number of patients during the past year, both men and women. In many of the men, we have noticed very marked improvement in their mental condition after they have been sterilized. In the women, it has prevented a recurrence of their mental trouble where it was due to childbirth. We feel that this operation should be performed on all cases where there is a prospect of their recovery or of their leaving the hospital on parole.

FARM.

The farm has been very productive the past year. The lower portion is well drained through a system of ditches. These ditches are not only used for irrigating, but also for drainage. We have planted a new orchard and vineyard. This new work, with our present orchard and vineyard, will soon give sufficient fruit for all the patients.

CREMATORY.

We are still disposing of the remains of patients whose friends do not call for them, by cremation. It was thought at first that there might be considerable objection to cremation, but we have only had three requests for burial since the crematory was established three years ago.

Respectfully submitted.

FRED P. CLARK,
Medical Superintendent.

REPORT OF THE WHITTIER STATE SCHOOL FOR THE BIENNIAL PERIOD ENDING JUNE 30, 1922.

The organization and administration of Whittier State School at the present time are directed toward the development of character in boys. The revised Whittier Act, approved in 1921, states the purpose of the school to be "education, training, care, supervision and moral development." The act establishes the school as a strictly "educational institution," the main objective of which is the formation of character.

Probably the most significant development of the school during the past two years is the further progress made in the application of the policy relative to the type of boy eligible for admission who can be most efficiently educated in accordance with the foregoing moral objective. In previous biennial reports, the problem of effective segregation incident to the miscellaneous character of admissions has been presented at length.

Boys referred to as juvenile delinquents may be divided into three groups—one, the feeble-minded, with delinquency more or less incidental to the low level of intelligence; another, the wilful offenders to whom waywardness has become rather habitual, boys with false ideals who are consistent in wrong doing, believing there is something admirable or heroic in violating the law. In the third group would be placed the boys of sound mind who have been denied their fair chance in life, victims of circumstances, boys who are willing to quit wrong practices and give up bad habits when their need for special care and training is fairly met. These last are for the most part the younger and the most promising of all. Formerly it was the practice of the court to commit to Whittier, boys from all three of these groups.

The group first mentioned, can be cared for and trained at much less expense to the state if placed in an institution equipped and conducted for the feeble-minded. At this lower per capita cost they will also derive more individual benefit. Being segregated from the others also means that they are happier and the children of normal intelligence make more satisfactory progress.

Under the various revisions of the Juvenile Court Law, and the Preston School and Whittier Acts, the second group of older boys, more confirmed in misconduct and needing more of correctional discipline, are provided for at the Preston School. The excellent educational program being developed there by Superintendent O. H. Close has meant an ever increasing percentage of reformation and establishment as law-abiding citizens from among this group.

The younger boys who comprise the third group are of compulsory school age. They are essentially problems in education. They should be so regarded and the Whittier State School, designated to meet their need, should be under the State Department of Education, as a special school. The Director of State Institutions approved the transfer of Whittier into the Department of Education and the State Superinten-

dent of Public Instruction has stated there would not be any objection made by his department to such a transfer. Similar sentiments were expressed by the Director of the Division of Special Schools.

Recent advances bid fair to assist greatly in the solution of the problem represented by these boys. Reference has been made to the action of the last session of the Legislature in declaring the Whittier State School to be distinctly "educational" in character, with emphasis on the moral development of boys. The law not only provides that at the time of commitment boys over 16 years of age shall go to Preston and only boys not yet sixteen years old may be sent to Whittier, but it further provides that any boy failing to make a satisfactory response to the educational opportunity presented at Whittier, may be transferred to the northern institution.

Under special legislative provision, the court may now place boys in Whittier on probation, without commitment; and a new door of opportunity was opened by a further provision that boys in need of the training provided by the state at the Whittier School may be accepted on agreement without becoming wards of the court at all.

The new provision for transfers between this school and the Preston School of Industry, for older boys, has resulted in the more logical assignment of certain boys who need the type of training and discipline for which that institution is equipped. These improvements in segregation have been of the utmost importance. In addition to the benefit to the individual boys concerned in such transfers, it has left this school a better opportunity than ever before offered, to concentrate on the development of moral character in boys who have the capacity and inclination to become socially and vocationally rehabilitated.

That the placement supervisor is able to report at this time more than 80 per cent of the boys on placement "doing very well" is one of the most gratifying indications of the change which has been effected by the policy under which the school is now operating.

Conceiving the problem as an educational one, and having overcome some of the difficulties incident to the former practice of mixed and unclassified admission, have justified the replacement of the old forms of custody, punishment, military discipline and congregate housing which grew as logically out of the old attitude of the state as the present methods have grown out of the new attitude. The school is no longer an "institution" in the traditional sense; it is not custodial; there is no corporal punishment, nor is there need for it; military discipline has been replaced by the spirit of the Boy Scout organization and it is not without significance that the site and the memory of the old five-story main building are being rather effectively obliterated by two new "home cottages" now in process of construction. We believe that the state can never lose the contribution which the experimental efforts at Whittier have produced; we believe that never again at this institution will young boys be crowded together in a congregate building; that the cottage system has come to stay; and with it, expressive of the same helpful desire of a benevolent state to develop the maximum number of worthy citizens, has also come to stay the scientific study of the problem.

DEVELOPMENTS IN SUPERVISION.

A major problem of Whittier State School has been that of efficient classification. This the legislature has wisely seen, and each session has produced laws which facilitate the placing of individual state wards where they can be most effectively trained. Originally this school housed both boys and girls; the creation of the California School for Girls and its subsequent location at Ventura were among the first steps in the direction of segregation. These were followed by the acts providing for a division of the Whittier and Preston admissions at the age of 16, Whittier being assigned the younger boys. The Pacific Colony Act was directed toward the care of the feeble-minded group.

Even in the group remaining, however, the widely varying individual differences in the boys admitted to Whittier made *supervision* of first consideration. The school aims to place every boy under conditions in which he can make the most effective response, with particular reference to the improvement in his point of view—the creation of right ideals. This purpose is maintained, even at the risk, in certain instances, of sacrificing a portion of formal schooling or industrial training. Fortunately the part which character plays in vocational efficiency can be made so evident in most cases that schooling and vocational training can be effectively combined with social and moral development. Character training is regarded as the main objective—the matter for first consideration.

The unit of supervision is the cottage group. Under the guidance of the house father and mother, groups of boys live in surroundings which approximate those of good homes; and which, for some of the boys, are better than any home they have ever known. We believe that wholesome influences exerted during the adolescent period can not fail to contribute to the development of the manly qualities which any person may feel justly proud to possess.

The new cottages have proved their value. One of these, the Boy Scout Home Cottage, houses 27 boys who, after being recommended by not less than five employees and upon oath of allegiance and the passing of examinations given by the local Scout executive, have been admitted to the organization. The significance of the cottage ideals in relation to the scout organization aims are indicated in numerous parts of the Scoutcraft Handbook.

On account of the importance attached by the school to the development of moral qualities, assignments for vocational training are made with the character objective foremost. The "placement committee," which acts in all matters of assignment, makes recommendations on the basis of *personality*, rather than upon vocational choice or even special aptitude. This means that if a boy wishes to be a carpenter, and he has the capacity to progress in that line, an effort will be made to place him in the woodworking shop as soon as possible; but that, first of all, he must be assigned to duties whether in this or some other shop, which are best suited to the development of the right point of view, and he has an opportunity to come into association with the men who are best fitted to understand his moral needs.

Although this is a public school, it differs from the common public

entire twenty-four hours of the day. It is necessary that each boy be responsible *to* some one, and that some one be responsible *for* him, for every hour and minute. Moreover, this supervision must have continuity, so that the same high ideals may be kept before the boy at all times, whether he is on the playground, in the school, in the shop, at the cottage fireside, or in the Chapel. Obviously, such organization, to be effective, requires an unusual type of employee. Our chief difficulty is to secure and hold the men and women possessing these requirements. Not infrequently we are led to feel that ours is a problem of employees rather than of boys. We are fortunate to have seen a marked improvement in the supervisory personnel during the past two years and thanks to the loyal devotion of men and women in this department, supervisory conditions have never been better. The department of supervision is under the direction of Mr. Lowry S. Howard, A.M., assistant superintendent.

The educational plan of the school has been so organized that we are approaching a balanced system of school and shop training. Special attention is being given to this phase of work by assistant superintendent, Karl M. Cowdery, A.M., who is also Director of Education. New boys arriving at the school and completing the week of hospital inspection are assigned to the receiving cottage. Here, completely segregated from the other boys, each day is divided between formal schooling and out-of-door work. When ready for the change, each boy is individually assigned by the placement committee to a cottage group, a shop group, and to a school class. In the light of the findings of the research staff, the observation of various supervisors and instructors and of all the information obtainable, a judgment is formed and an effort is made to give him a course of training based upon his needs. The past two years have brought greatly improved facilities for both industrial and school training.

New shops of modern design have added greatly to the value of the trades training. Some good equipment has been installed, but much more is needed. The carpenter shop is now able to manufacture all the furniture for the school and teach the boys the use of modern machinery. The print shop has its linotype for the more advanced students. As one instance of needed modernizing of our shops, the bakery still uses an old type oven installed some 20 years ago. The products of the shop are excellent but it is unfair to the boys who strive earnestly to become proficient not to have any knowledge at all regarding modern ovens and baking processes.

The proposed auto shops, when erected, will enable us to give training in a line of work intensely interesting to many boys and there is a demand for such trained helpers when they are ready to leave the school.

The classroom section of the new school building has partially filled one of our greatest needs. The building is splendidly adapted to its purpose. It was planned to harmonize with the requirements of the Columbia standard. The classrooms are light, well ventilated and accommodate only a limited number of boys—for individual instruction is imperative with most of them. By adopting the platoon system, however, the room serves a large number each day. All teachers hold

SCIENTIFIC RESEARCH.

The last session of the legislature authorized the use of the name California Bureau of Juvenile Research for our Research Department and made provision for a further expansion of its activities. J. Harold Williams, Ph. D., the Director of the Bureau and editor of the *Journal of Delinquency*, has continuously and very ably filled these positions since the creation of the department and the launching of the Journal. It is the purpose of the bureau to "carry on research into the causes and consequences of juvenile delinquency, mental deficiency, and related problems." The present organization centralizes the psychological and sociological work of all state institutions caring for children, thereby eleminating the necessity for separate laboratories, reducing the expenses of investigation, and providing for uniform procedure throughout the State. The importance of delinquency as a social problem is such that the unifomity of study and standardization of procedure are self-evident.

The work of the bureau during the past two years has taken the following lines of activity:

1. The making of psychological tests of persons committed to the care of the state.

2. Supplementing the tests with sociological investigation of individual cases.

3. The development, at Whittier State School, of an experimental ungraded room for the instruction of a special group of boys who are not adapted to regular public school work.

4. Cooperation in the solution of institution problems, including vocational training, school instruction, supervision, discipline, and placement.

5. The study of original problems in the fields of mental deficiency and juvenile delinquency.

6. The publication of investigations in bulletins and in the *Journal of Delinquency*. This journal is the leading periodical in its field, and has an international circulation. The subscription price is $1.25 per year.

7. The development of a research library, comprising the principal newer books and periodicals devoted to the study of juvenile problems. These books and nearly all of the periodicals have been obtained without cost, through editorial arrangements made though the *Journal of Delinquency*.

8. The training of university students in psychological and social investigation.

In all of this work special care has been given to the practical aspects of the problems with which the state has to deal. Investigations have been limited to individual cases, each of which has been as thoroughly studied as our facilities permit.

The psychological work at Whittier State School included the making of 329 individual examinations of new boys. The following table shows the results in brief:

Lowest and highest ages	9-18
Lowest and highest mental ages	5-17
Lowest and highest I. Q.	48-114

Average mental age	12
Average I. Q.	82
Per cent superior	0.3
Per cent average-normal	23.4
Per cent dull-normal	23.7
Per cent borderline	26.8
Per cent feeble-minded	25.8

Careful retests including 166 cases substantiated the foregoing findings and validate the entrance examination method. That the I. Q. remains practically constant during the average stay of two years is an important consideration in vocational and social training. By reason of this fact we can predict at entrance, within reasonable limits, the probable future success of individual boys.

The proportion of feeble-minded boys at Whittier is being gradually reduced, the proportions for the past four biennial periods being as follows:

Percentage for 1914–16	30.0
Percentage for 1916–18	29.9
Percentage for 1918–20	28.3
Percentage for 1920–22	25.8

This reduction in the proportion of low-grade cases has helped to improve the general efficiency of the School and its development as a vocational training center for normal boys. Feeble-minded boys cannot be relied upon to become independently successful after leaving the School, although in many instances they have been trained to do efficient manual work.

The sociological work of the Bureau has been improved and standardized during the past two years, without increasing the field staff. The results of this improvement are set forth in Bulletin No. 11, entitled "The Whittier Social Case History Manual." This manual is one of the first attempts to develop a uniform system of individual social study and has been favorably commented upon by investigators in many states. The bulletin is sold for 25 cents to cover the cost of printing.

The experimental ungraded room, under the direction of a highly trained special teacher, has brought about some marked improvement in individual cases. The curriculum departs radically from the regular public school course of study, and is based upon the methods used in leading school systems for the training of exceptional children. Emphasis is placed upon manual work, correlated with practical training in reading, writing, and the fundamental operations of arithmetic. All equipment, including tables, work benches, desks, etc., was produced by the boys in the carpenter shop of the main School.

In addition to the work at the central laboratory at Whittier State School, the bureau has developed work in other institutions as follows: At the California School for Girls, psychological examinations are made of all entering girls; at Preston School of Industry, a psychological examiner and one assistant devote full time to supplemental examinations; at Sonoma State Home, two social case investigators, trained at the Whittier laboratory, devote full time to investigative and parole work; at Pacific Colony, examinations were made preparatory to the

Among the special contributions of members of the bureau staff during the past two years are the following:

Success Records of Prisoners and Delinquents, by W. W. Clark.
Home Conditions and Native Intelligence, by W. W. Clark.
Supervised Conduct—Response of Delinquent Boys, by W. W. Clark.
Irregularity in Intelligence Tests of Delinquents, by Julia Mathews.
The "Will-Profile" of Delinquent Boys, by Edythe K. Bryant.
Whittier Scale for Grading Juvenile Offenses, by W. W. Clark.
Whittier Social Case History Manual, by the staff.

RECREATION AND ENTERTAINMENT.

Every Thursday evening a varied program of entertainment is provided for the boys. The best in moving pictures is secured. The boys contribute special numbers and friends of the school add to the entertainment with readings and musical selections.

Competitive athletics are indulged in daily and the boys are continuously engaged in organized or free play on their separate grounds during all spare periods. Ample time is allowed in which to work off surplus energy and to enjoy themselves as growing children should.

The hospital is well organized and health supervision is provided under the direction of the school physician, Dr. Herbert Tebbetts. Two registered nurses are employed and are on duty day and night.

Most gratifying to the administration was the statement made by Dr. Herbert Stolz, in his official report on the Whittier State School recently filed in Sacramento. Dr. Stolz is the Director of Physical Education in the State Department of Education. As a trained physician, Rhodes scholar, Oxford graduate, Director Physical Education at Stanford, and man among men in his overseas service in the medical corps, Dr. Stolz has had unequalled opportunity for study and observation. We quote a concluding paragraph from his report: "The successful leadership of the superintendent in utilizing physical training activities to build up an intense loyalty to the school and through that to develop in his boys habits of clean living, self-control and self-respect together with ideals of social responsibility, is perhaps the most outstanding feature of the school and is reflected in the loyal and intelligent cooperation of the staff to secure these ends. It is my opinion that any careful study will show that in the achievement of the primary ends of physical education, viz: good health and good citizenship, Whittier State School stands pre-eminent among the schools of California."

Considerable improvement has been brought about in the past two years in the method of selecting boys for placement and supervising them after they leave the school. The former term, "parole" has been abandoned. The work is carried on in accordance with the principle of vocational guidance, and hence the term, "placement supervision" seems to better express the ideals of the school. At the end of about two years' stay in the school, each boy's case is taken under advisement by the placement committee. A member of the research staff is invited to sit with the committee, and the report of the bureau of research is given careful consideration. If more information is needed, such may be the recommendation. If it is deemed advisable to send the boy to his home, or to some other especially suitable place, such a recom-

a part of it, and still responsible for maintaining its ideals. The placement supervisor, Mr. C. K. Berger, A. B., visits each boy as often as practicable and maintains regular correspondence with him. In case the placement adjustment is unsatisfactory, the boy is extended the privilege of returning to the school for further training or for another placement opportunity.

The increasing success of the placement work is indicated by the ratio of success. In the biennial report for 1916-18 a special study was made by the sociological division of the research staff concerning the after-success of boys who were then "on parole." The method of classification used in that report has been adopted for regular use, and the superintendent now receives a report from the placement supervisor each month. The following is compiled from a typical monthly report:

Number of boys on Placement	170	
Number "Doing Well"	138	81 per cent
Number "Doing Fairly Well"	15	9 per cent
Number "Doing Poorly"	17	10 per cent

These figures indicate that the ratio of success maintained during this biennial period is higher than for any period in the history of the school. Unfortunately we have no means of obtaining reliable data of this kind prior to 1916, but there is reason to feel proud of the record now being made by Whittier boys.

Lack of space precludes the possibility of citing any of the numberless instances of complete readjustment—boys who have gained inches in height, unbelievably in weight, moved forward in class room work till they were more than up to grade and from reckless, heedless, truant and wayward boys, developed traits of character that gave assurance of a well controlled, well directed, wholesome life. Tax makers converted into tax payers—a liability transformed into an asset.

The fact that we are able to secure and hold men and women of larger experience and training combined with better buildings and equipment with which to carry on the work, is reflected in increased efficiency. This, with a lower cost of commodities has enabled us to operate with a decreased net outlay. We are caring for more boys with fewer employees at less cost. As business manager, Mr. W. A. Smith, A. B., has earnestly endeavored to see that this result was accomplished.

Statistical tables are presented by the secretary, Mr. Elmer E. Knox. It will be noted that some boys still absent themselves without leave, but this does not represent an "escape" from intolerable conditions. Wanderlust, homesickness, boyish impulse, may occasionally take a boy away, but the spirit of the school is strongly against a lapse of this kind. It is not considered heroic but is regarded by the boys as evidencing a regretable form of weakness.

We gratefully acknowledge indebtedness to all our friends, to every board and commission in the state service, to our trustees for the time they have given and the interest they have manifested. We look forward with anticipation to receiving generous support and to a new biennium of greater service.

STATISTICAL TABLES.

Whittier State School, Biennial Period July 1, 1920, to June 30, 1921, and July 1, 1921, to June 30, 1922.

Table number

1. Pupils Received by Commitment 1891-1922.
2. Statement of Actual Population in Institution.
3. Statement of Placements.
4. Statement of Approved Absences with Leave.
5. Statement of Absences Without Leave.
6. Ages at Commitment, Admitted July 1, 1891, to June 30, 1922.
7. Race Distribution of Boys Admitted July 1, 1891, to June 30, 1922.
8. Religious Affiliations of Boys Admitted July 1, 1912, to June 30, 1922.

TABLE No. 1.

Pupils Received by Commitment, 1891-1922.

Year	Boys	Girls	Total	Biennium
1891-92	253	58	311	311
1892-93	202	39	241	
1893-94	180	33	213	454
1894-95	128	24	152	
1895-96	125	27	152	304
1896-97	60	28	88	
1897-98	61	18	79	167
1898-99	94	21	115	
1899-00	76	14	90	205
1900-01	55	13	68	
1901-02	65	19	84	152
1902-03	81	23	104	
1903-04	125	19	144	248
1904-05	98	12	110	
1905-06	96	16	112	222
1906-07	85	21	106	
1907-08	87	36	123	229
1908-09	91	39	130	
1909-10	96	46	142	272
1910-11	100	40	140	
1911-12	105	39	144	284
1912-13	85	46	131	
1913-14	44	2*	46	177
1914-15	81		81	
1915-16	98		98	179
1916-17	96		96	
1917-18	167		167	263
1918-19	167		167	
1919-20	126		126	293
1920-21	168		168	
1921-22	147		147	315
Totals	3,442	633	4,075	4,075

*By act of legislature June 14, 1913, the Girls' Department of Whittier State School ceased to exist, and became the California School for Girls, now located at Ventura.

TABLE No. 2.

Statement of Actual Population in Institution.

	June 30, 1920	June 30, 1921
In institution at midnight	267	282
Received during year:		
By new commitments	165	145
Returned from placement	17	36
Returned from furlough	3	2
By return from A. W. O. L.	17	13
By transfers	4	----
By voluntary admissions	1	2
Total received	207	198
In institution during year	474	480
Passed out during year:		
By discharge	1	10
By order of court	26	29
By placement	97	94
By furlough	22	11
By expiration of term of commitment	3	----
By A. W. O. L.	19	14
By death	1	----
By transfer	19	17
By release from remaining voluntarily	4	----
Total passed out	192	175
Total population at end of year	282	305

TABLE No. 3.

Statement of Placements.

	June 30, 1920	June 30, 1921
On placement at midnight	97	178
Placed during year	97	94
Transferred from furlough to placement	11	2
Totals	205	274
Discharged from placement	3	68
Term expired on placement	4	11
Returned from placement	17	36
Died on placement	----	2
Removed from placement	3	----
Totals	27	117
On placement at end of year	178	157

TABLE No. 4.

Statement of Approved Absences with Leave.

	June 30, 1920	June 30, 1921
Absent with leave at midnight	10	7
Absent with leave during year	22	11
Totals	32	18
Discharged while absent with leave	9	2
Discharged by order of court	2	1
Returned from absence with leave	3	2
Transferred from absence with leave to placement	11	2
Totals	25	7
Absent with leave at end of year	7	11

TABLE No. 5.

Statement of Absence Without Permission and Overstayed Leave.

	June 30, 1920	June 30, 1921
Absent without permission and on overstayed leave at midnight	14	12
Absent without permission and on overstayed leave during the year	23	14
Totals	37	26
Returned from absence without permission and overstayed leave	21	13
Term expired while absent without permission and on overstayed leave	3	....
Discharged while absent without permission and on overstayed leave	1	1
Totals	25	14
Total absent without permission and on overstayed leave at end of year	12	12

NOTE.—This includes every boy who was off the premises without permission regardless of the length of time away.

TABLE No. 6.

Ages at Commitment, July 1, 1891, to June 30, 1922.

Age of commitment	1921 and 1922	1891-1920	Per cent	1891-1922	Per cent
Seven	....	2	.064	2	.065
Eight	2	20	.639	22	.539
Nine	2	45	1.439	47	1.365
Ten	10	87	2.782	97	2.891
Eleven	13	143	4.572	156	4.533
Twelve	34	283	9.049	317	9.210
Thirteen	55	380	12.152	435	12.641
Fourteen	84	561	17.941	646	18.715
Fifteen	102	658	21.050	760	22.086
Sixteen	7	467	14.932	474	13.775
Seventeen	4	381	12.184	385	11.188
Eighteen	2	60	1.918	62	1.881
Nineteen	....	29	.927	29	.842
Twenty	....	11	.351	11	.319
Totals					

TABLE No. 7.

Race Distribution of Boys Admitted July 1, 1891, to June 30, 1922.

Race	1921 and 1922	1891-1920	Per cent	1891-1922	Per cent
White	266	2,790	89.224	3,056	88.782
Negro	16	243	7.770	259	7.527
*Mexican-Indian	31	87	2.782	118	3.429
Chinese	2	7	.224	9	.262
Totals	315	3,127	100.000	3,442	100.000

*Previous to July 1, 1914, no distinction made of Mexican-Indian race.

TABLE No. 8.

Religious Affiliations of Boys Admitted July 1, 1912, to June 30, 1922.

	1921 and 1922	1912-1920	Per cent	1912-1922	Per cent
Catholic	103	285	33.101	388	33.042
Jewish	4	19	2.207	23	1.959
Protestant	170	453	52.613	623	52.967
Not stated	38	104	12.078	142	12.052
Totals	315	861	100.000	1,176	100.000

This table begun July 1, 1912.

APPENDIX

STATISTICS OF STATE HOSPITALS

TABLE No. 1.

Movement of Patients for Year Ending June 30, 1921.

INSANE	Stockton			Napa			Agnews			Mendocino			Southern California			Norwalk			Totals		
	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.
Number of patients June 30, 1920	1,414	1,014	2,428	1,392	1,175	2,567	856	779	1,635	903	359	1,262	1,245	1,070	2,315	325	240	565	6,135	4,637	10,772
Number received to June 30, 1921	453	211	664	380	254	634	263	197	460	276	55	331	385	233	618	155	114	269	1,912	1,064	2,976
Number returned escapes	134	2	136	72	11	83	31	.....	31	45	.....	45	75	1	76	55	1	56	412	15	427
Number under care and treatment	2,001	1,227	3,228	1,824	1,440	3,201	1,150	976	2,126	1,224	414	1,638	1,705	1,304	3,009	535	355	890	8,439	5,716	14,155
Number discharged—recovered	68	44	112	49	67	116	53	66	119	96	15	111	106	53	159	7	11	18	379	256	635
Number discharged—improved	71	35	106	110	50	160	45	24	69	40	10	50	93	54	147	43	36	79	405	209	614
Number discharged—unimproved	20	2	22	4	4	8	7	5	12	13	3	16	12	4	16	8	2	10	64	20	84
Number discharged—not insane	7	2	9	3	4	7	7	3	10	5	.....	5	3	.....	3	2	.....	2	27	9	36
Number discharged by order of court	.....	.....	.....	1	1	2	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	2	1	3
Number transferred to other hospitals	.....	.....	.....	4	3	7	1	2	3	11	1	12	1	2	3	2	1	3	19	9	28
Number died	193	80	273	114	80	194	88	69	157	60	19	79	109	43	152	63	26	89	627	317	944
Number escaped	136	2	138	92	9	101	24	.....	24	49	.....	49	75	3	78	61	2	63	437	16	453
Discharged, died, escaped	498	165	663	377	218	595	225	169	394	275	48	323	399	159	558	186	78	264	1,960	837	2,797
Number of patients remaining	1,503	1,062	2,575	1,447	1,222	2,669	925	807	1,732	939	366	1,305	1,306	1,145	2,451	349	277	626	6,479	4,879	11,358
Number on parole	57	80	137	102	106	208	32	58	90	57	36	73	47	85	132	34	51	85	309	416	725
Actual number in hospital	1,456	982	2,438	1,345	1,116	2,461	893	749	1,642	902	330	1,232	1,259	1,060	2,319	315	226	541	6,170	4,463	10,633
ALCOHOLICS																					
Number of patients June 30, 1920	.....	.....	.....	9	2	11	.....	1	1	7	8	15	7	1	8	1	.....	1	24	12	36
Number received to June 30, 1921	6	.....	6	10	4	14	1	1	2	3	4	7	19	2	21	1	.....	1	40	11	51
Number returned escapes	.....	.....	.....	1	.....	1	.....	.....	.....	1	.....	1	7	.....	7	2	.....	2	11	.....	11
Number under care and treatment	6	.....	6	20	6	26	1	2	3	11	12	23	33	3	36	4	.....	4	75	23	98

nber discharged—recovered				6	1	7				2	3	5	17	1	18				17	1	18
nber discharged—term expired													1	1	2				9	5	14
nber discharged—further treat-																					
ent not beneficial	1		1	8	1	9		2	2	3	2	5	2		2	3		3	17	5	22
nber died				1		1													1		1
nber escaped	1		1	1		1				1		1	6		6	1		1	10		10
Discharged, died, escaped	2		2	16	2	18		2	2	6	5	11	26	2	28	4		4	54	11	65
nber of patients remaining	4		4	4	4	8	1		1	5	7	12	7	1	8				21	12	33
nber on parole				2		2	1		1	5	4	9	2		2				10	4	14
Actual number in hospital	4		4	2	4	6					3	3	5	1	6				11	8	19
DRUG ADDICTS																					
nber of patients June 30, 1920	4	4	8	4	6	10	1		1	10	12	22	9	5	14		2	2	28	29	57
nber received to June 30, 1921	46	14	60	44	14	58	13	6	19	34	14	48	37	8	45	9	2	11	183	58	241
nber returned escapes	26		26	32	4	36	2		2	13	2	15	31		31	9	1	10	113	7	120
Number under care and treat- ment	76	18	94	80	24	104	16	6	22	57	28	85	77	13	90	18	5	23	324	94	418
nber discharged—recovered										1		1	13	11	24	2	2	4	16	13	29
nber discharger—term expired		3	3	3	7	10	4		4		3	3	3		3				10	13	23
nber discharged—further treat-																					
ent not beneficial	37	10	47	33	7	40	6	3	9	17	6	23	28		28	7	1	8	128	27	155
nber discharged—illegal com-																					
nitment	3	1	4										1		1				4	1	5
nber escaped	27		27	29	3	32	2		2	22	2	24	25		25	8		8	113	5	118
Number discharged, escaped	67	14	81	65	17	82	12	3	15	40	11	51	70	11	81	17	3	20	271	59	330
nber of patients remaining	9	4	13	15	7	22	4	3	7	17	17	34	7	2	9	1	2	3	53	35	88
nber on parole	5	2	7	2	1	3		1	1	2	11	13		1	1	1	1	2	10	17	27
Actual number in hospital	4	2	6	13	6	19	4	2	6	15	6	21	7	1	8		1	1	43	18	61
VOLUNTARY																					
nber of patients June 30, 1920	17	44	61	17	14	31	26	32	58	3	2	5	19	21	40	8	1	9	90	114	204
nber received to June 30, 1921	26	26	52	36	18	54	31	36	67	6	2	8	27	8	35	1		1	127	90	217

TABLE NO. 1—Continued.

Movement of Patients for Year Ending June 30, 1921.

VOLUNTARY—Continued	Stockton			Napa			Agnews			Mendocino			Southern California			Norwalk			Totals		
	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.
Number returned escapes	5		5	2	1	3										2		2	9	1	10
Number under care and treatment	48	70	118	55	33	88	57	68	125	9	4	13	46	29	75	11	1	12	226	205	431
Number discharged	16	19	35	25	18	43	18	25	43	3		3	20	9	29	4		4	86	71	157
Number died	2	6	8	1	1	2	2	4	6		1	1	3	2	5				8	14	22
Number escaped	6		6	2	1	3				1		1				1		1	10	1	11
Discharged, died, escaped	24	25	49	28	20	48	20	29	49	4	1	5	23	11	34	5		5	104	86	190
Number of patients remaining	24	45	69	27	13	40	37	39	76	5	3	8	23	18	41	6	1	7	122	119	241
Number on parole	1	3	4				1	1	2								1	1	2	5	7
Actual number in hospital	23	42	65	27	13	40	36	38	74	5	3	8	23	18	41	6		6	120	114	234
RECAPITULATION																					
Same	1,456	982	2,438	1,345	1,116	2,461	893	749	1,642	902	330	1,232	1,259	1,060	2,319	315	226	541	6,170	4,463	10,633
Alcoholics	4		4	2	4	6					3	3	5	1	6				11	8	19
Drug addicts	4	2	6	13	6	19	4	2	6	15	6	21	7	1	8		1	1	43	18	61
Voluntary	23	42	65	27	13	40	36	38	74	5	3	8	23	18	41	6		6	120	114	234
Total actual number in hospital June 30, 1921	1,487	1,026	2,513	1,387	1,139	2,526	933	789	1,722	922	342	1,264	1,294	1,080	2,374	321	227	548	6,344	4,603	10,947

Movement of Patients for Year Ending June 30, 1922.

INSANE	Stockton			Napa			Agnews			Mendocino			Southern California			Norwalk			Totals		
	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.
mber of patients June 30, 1921	1,513	1,062	2,575	1,447	1,222	2,669	925	807	1,732	939	365	1,305	1,306	1,145	2,451	349	277	626	6,479	4,879	11,358
mber received to June 30, 1922	506	260	766	399	208	607	319	230	549	169	37	206	359	274	633	238	122	360	1,990	1,131	3,121
mber returned escapes	112	8	120	96	3	99	22	1	23	27	1	28	94	2	96	64	4	68	415	19	434
Number under care and treatment	2,131	1,330	3,461	1,942	1,433	3,375	1,266	1,038	2,304	1,135	404	1,539	1,759	1,421	3,180	651	403	1,054	8,884	6,029	14,913
mber discharged—recovered	71	65	136	120	74	194	68	63	131	69	19	79	92	88	180	22	17	39	433	326	759
mber discharged—improved	114	58	172	137	59	196	53	48	101	54	9	63	81	56	137	25	21	46	464	251	715
mber discharged—unimproved	26	5	31	28	4	32	6	10	16	25	2	27	10	1	11	5	2	7	100	24	124
mber discharged—not insane	7	1	8	8	5	13	15	4	19	4	-----	4	1	-----	1	5	-----	5	40	10	50
mber discharged by order of ourt	-----	-----	-----	3	1	4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	3	1	4
mber transferred to other hos-itals	4	1	5	6	7	13	1	-----	1	4	-----	4	3	-----	3	1	-----	1	19	8	27
mber died	226	103	329	128	72	200	125	97	222	49	23	72	130	77	207	79	29	108	737	401	1,138
mber escaped	127	5	132	65	2	68	24	1	25	30	1	31	95	1	96	72	4	76	414	14	428
Discharged, died, escaped	575	238	813	496	224	720	292	223	515	225	54	280	412	223	635	209	73	282	2,210	1,035	3,245
mber of patients remaining	1,556	1,092	2,648	1,446	1,209	2,655	974	815	1,789	909	350	1,259	1,347	1,198	2,545	442	330	772	6,674	4,994	11,668
mber on parole	68	79	147	73	83	156	40	61	101	38	31	69	54	87	141	63	76	139	336	417	753
Actual number in hospital	1,488	1,013	2,501	1,373	1,126	2,499	934	754	1,688	871	319	1,190	1,293	1,111	2,404	379	254	633	6,338	4,577	10,915
ALCOHOLICS																					
mber of patients June 30, 1921	4	-----	4	4	4	8	1	-----	1	5	7	12	7	1	8	-----	-----	-----	21	12	33
mber received to June 30, 1922	8	2	10	14	4	18	21	1	22	20	5	25	27	-----	27	2	-----	2	92	12	104
mber returned escapes	-----	-----	-----	2	-----	2	-----	-----	-----	3	-----	3	11	-----	11	-----	-----	-----	16	-----	16
Number under care and treatment	12	2	14	20	8	28	22	1	23	28	12	40	45	1	46	2	-----	2	129	24	153

TABLE NO. 1—Continued.
Movement of Patients for Year Ending June 30, 1922.

	Stockton			Napa			Agnews			Mendocino			Southern California			Norwalk			Totals		
ALCOHOLICS—Continued.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.	Men.	Women.	Total.
mber discharged—recovered													11	1	15	1		1	15	1	16
mber discharged—term expired				6		6	7		7	5	5	10	1		1				19	5	24
mber discharged—further treat																					
ent not beneficial	7		7	5	5	10	8		8	3	1	4	9		9				32	6	38
mber died					1	1	1		1										1	1	2
mber escaped				2		2				5		5	11		11	1		1	19		19
Discharged, died, escaped	7		7	13	6	19	16		16	13	6	19	35	1	36	2		2	86	13	99
mber of patients remaining	5	2	7	7	2	9	6	1	7	15	6	21	10		10				43	11	54
mber on parole	1	2	3	2		2				3	1	4	1		1				7	3	10
Actual number in hospital	4		4	5	2	7	6	1	7	12	5	17	9		9				36	8	44
DRUG ADDICTS																					
mber of patients June 30, 1921	9	4	13	15	7	22	4	3	7	17	17	34	7	2	9	1	2	3	53	35	88
mber received to June 30, 1922	84	16	100	45	12	57	34	3	37	17	11	28	56	19	75	4		4	240	61	301
mber returned escapes	32		32	26	2	28	3		3	16	1	17	18		18	4		4	99	3	102
Number under care and treatment	125	20	145	86	21	107	41	6	47	50	29	79	81	21	102	9	2	11	392	99	491
mber discharged—recovered													18	6	24		1	1	18	7	25
mber discharged—term expired	4		4	5	4	9	10	2	12	2	8	10	2		3				24	14	38
mber discharged—further treat																					
ent not beneficial	54	9	63	50	9	59	17	4	21	21	9	30	17	2	19	4	1	5	163	34	197
mber discharged—illegal com-																					
itment	16	3	19										1		1				17	3	20
mber died	1	1	2				1		1		1	1	2		2				4	2	6
mber escaped	30		30	24	2	26	5		5	15	1	16	20		20	3		3	97	3	100
Discharged, died, escaped	105	13	118	79	15	94	33	6	39	38	19	57	61	8	69	7	2	9	323	63	386

ber of patients remaining	20	7	27	7	6	13	8	------	8	12	10	22	20	13	33	2	------	2	69	36	105
ber on parole	5	2	7	1	------	1	1	------	1	1	2	3	2	4	6	------	------	------	10	8	18
ctual number in hospital	15	5	20	6	6	12	7	------	7	11	8	19	18	9	27	2	------	2	59	28	87
VOLUNTARY																					
ber of patients June 30, 1921	24	45	61	27	13	40	37	39	76	5	3	8	23	18	41	6	1	7	122	119	241
ber received to June 30, 1922	25	25	50	36	11	47	36	55	91	4	2	6	23	19	42	1	1	2	125	113	238
ber returned escapes	3	1	4	3	------	3	------	------	------	------	------	------	------	------	------	------	------	------	6	1	7
umber under care and treatment	52	71	123	66	24	90	73	94	167	9	5	14	46	37	83	7	2	9	253	233	486
ber discharged	20	16	36	26	9	45	37	48	85	4	1	5	20	10	30	2	1	3	119	85	204
ber died	1	3	4	4	1	5	3	3	6	------	------	------	2	1	3	------	------	------	10	8	18
ber escaped	3	1	4	3	------	3	------	------	------	1	------	1	------	------	------	------	------	------	7	1	8
ischarged, died, escaped	24	20	44	43	10	53	40	51	91	5	1	6	22	11	33	2	1	3	136	94	230
ber of patients remaining	28	51	79	23	14	37	33	43	76	4	4	8	24	26	50	5	1	6	117	139	256
ber on parole	2	6	8	------	------	------	------	1	1	------	1	1	------	------	------	------	1	1	2	9	11
Actual number in hospital	26	45	71	23	14	37	33	42	75	4	3	7	24	26	50	5	------	5	115	130	245
RECAPITULATION																					
ne	1,488	1,013	2,501	1,373	1,126	2,499	934	754	1,688	871	319	1,190	1,293	1,111	2,404	379	254	633	6,338	4,577	10,915
holics	4	------	4	5	2	7	6	1	7	12	5	17	9	------	9	------	------	------	36	8	44
g addicts	15	5	20	6	6	12	7	------	7	11	8	19	18	9	27	2	------	2	59	28	87
ntary	26	45	71	23	14	37	33	42	75	4	3	7	24	26	50	5	------	5	115	130	245
Total actual number in hospital June 30, 1922	1,533	1,063	2,596	1,407	1,148	2,555	980	797	1,777	898	335	1,233	1,344	1,146	2,490	386	254	640	6,548	4,743	11,291

TABLE No. 2.

Nativity of First Admissions for the Biennial Period Ended June 30, 1922.

Nativity	Stockton		Napa		Agnews		Mendocino		Southern California		Norwalk		Total.
	1921.	1922.	1921.	1922.	1921.	1922.	1921.	1922.	1921.	1922.	1921.	1922.	
United States	284	347	295	308	258	325	161	106	318	458	150	159	3,172
Africa		1											1
*Asia		4							2		2	1	9
Australia		2	3	1	2	2		1	2			6	19
Austria	15	13	13	7	5	4	4	3	6	2	2	1	75
Belgium						1	1		1				3
†Canada	12	10	10	11	14	13	7		18	18	3	8	124
Central America				2		1				1			4
China	9	18	4	1		1	3		1	1		1	42
Czecho-Slovakia				2					1			2	5
Cuba				1						2			3
Denmark	6	6	7	5	4	3	1	2	4	4			42
England	11	15	16	12	11	17	6	5	16	10	4	9	132
*Europe	3								1			1	5
Finland	2	5	4	2	4	4	2	4	3	2		1	33
France	5	5	6	2	6	4	4	2	5	1	1	2	43
Germany	22	19	27	19	16	21	4	4	16	13	5	7	173
Greece	6	12	4	4	1	1	1	2	1	2	1	2	37
Holland	1		1				1			1			4
Hungary	1		1	2	1	1			2	2	2	1	13
India				1					1				2
Ireland	17	21	19	25	17	17	13	3	5	14	5	4	160
Italy	52	33	34	30	14	25	26	6	6	7	6	7	246
Japan	14	14	2	5	2	3	1	2	4	9	1	4	61
Jugo-Slavia		9				2							11
Mexico	13	23	6	7	2	3	4	2	35	39	19	22	176
Norway	3	5	4	4	2	4	3		2	2	1	1	31
Philippine Islands	1	3	9	3	3		1	2		2			24
Poland	2	2	2	3	1	1	3	2	1	5	1	1	24
Porto Rico			1						1				2
Portugal	11	7	9	7	2	3	2	1			1		46
Roumania	2		1							1		2	6
Russia	3	4	8	2	5	4	6	6	7	5	4	5	59
Scotland	2	4	6	4	2	5	2		4	3	1	2	35
South America			2										2
Spain	12	8	2	5		3	3	1	3	1	1	4	43
Sweden	13	11	11	6	3	6	3	2	5	4	2	1	67
Switzerland	5	7	10	5	3	6	3	4	3	4	3	2	55
Turkey in Asia		1	1	2	1			1		1			7
Turkey in Europe	1								1				2
Wales	1						1		2		1	1	6
‡West Indies				2	1					1	1		5
Other countries	12	11		3	3				5	5	1		40
Unascertained	14	17	5	3	9	12	7	6	9	25	4	19	130
Totals	555	637	523	499	392	495	276	168	491	645	222	276	5,179

*Not otherwise specified.
†Includes Newfoundland.
‡Except Cuba and Porto Rico.

TABLE No. 3.

Citizenship of First Admissions for the Biennial Period Ended June 30, 1922.

	Stockton		Napa		Agnews		Mendocino		Southern California		Norwalk		Total.
	1921.	1922.	1921.	1922.	1921.	1922.	1921.	1922.	1921.	1922.	1921.	1922.	
Citizens by birth	320	347	295	311	258	325	167	110	318	458	153	159	3,221
Citizens by naturalization	6	62	14	63	------	------	27	13	------	------	22	21	228
Aliens	22	155	42	105	------	------	10	24	------	------	20	13	391
Citizenship unascertained	207	73	172	20	134	170	72	21	173	187	27	83	1,339
Totals	555	637	523	499	392	495	276	168	491	645	222	276	5,179

TABLE No. 4.

Psychoses of First Admissions for the Biennial Period Ended June 30, 1922.

Psychoses	Stockton		Napa		Agnews		Mendocino		Southern California		Norwalk		Total
	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	
Somatic psychoses	5	5	1	3	1		12		1	4			32
Toxic psychoses	53	54	37	34	32	26		7	44	42	21	20	370
Psychoses with cerebral arteriosclerosis	25	72	35	44	44	62	9	7	24	17	1	4	345
General paralysis	65	69	63	52	46	59	40	16	97	101	34	59	701
Psychoses with cerebral syphilis	9	8	5	2		1	1	3	1	2			32
Psychoses with Huntington's chorea		2	1		1				1				6
Psychoses with brain tumor				1							1	1	3
Psychoses with other brain or nervous diseases	4	7	1	1	2	5	1			3	1	3	28
Manic Psychoses	31	50	45	38	2	4	15	10	16	14	1	3	229
Psychoses due to drugs and other exogenous toxins	2	2	2	2	3	1	1		2	1			19
Psychoses with pellagra		1		3	2		1						7
Psychoses with other somatic diseases	32	39	9	9	2	5	4	5	15	15	1	2	138
Manic-depressive psychoses	14	57	106	102	62	74	46	31	137	179	42	58	908
Involution melancholia	14	18	2	15	16	23		1	9	3	10	5	116
Dementia praecox	142	115	115	129	101	111	62	46	96	101	86	109	1,213
Senile and paranoid conditions		1	31	20	18	11	5	1	1	6	5		102
Epileptic psychoses	17	18	18	13	7	16	4	3	14	19	10	7	146
Psychoneuroses and neuroses	5	4	14	6	17	14	16	7	4	8			95
Psychoses with constitutional psychopathic inferiority	19	13	7	4	1	1	20	12	2	7	1		87
Psychoses with mental deficiency	12	21	8	6	8	7	23	9	21	20	2	2	139
Undiagnosed psychoses	15	76	10	2	14	58			3	4	3	2	187
Without insane:													
Epilepsy without psychosis	2	2	4		1	1	2						12
Alcoholism without psychosis	3	1	1	3						23			31
Drug addiction without psychosis	49		2			4	3			70			128
Constitutional psychopathic inferiority without psychosis	2	1	1	3		4	5	2		1			19
Mental deficiency without psychosis	3	1		2	2	6	6	5		1	1		27
Others	2		1	4	10	2		3	3	1	2	1	29
Totals	555	637	529	499	392	495	276	168	491	645	222	276	5,179

TABLE No. 5.

Age of First Admissions for the Biennial Period Ended June 30, 1922.

Age	Stockton		Napa		Agnews		Mendocino		Southern California		Norwalk		Total
	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	
Under 15 years	1	2	1	4	3				1	1			13
15-19 years	14	21	8	16	11	20	8	2	12	18	11	12	153
20-24 years	26	43	48	49	28	42	41	25	45	62	19	29	457
25-29 years	61	56	72	55	43	43	58	34	50	78	31	38	619
30-34 years	74	94	66	60	39	49	60	36	50	79	22	29	658
35-39 years	71	88	73	60	43	55	33	11	74	81	29	27	645
40-44 years	53	58	56	53	35	55	14	24	58	93	28	35	562
45-49 years	61	58	52	49	35	42	17	6	57	65	16	29	487
50-54 years	30	54	32	37	36	43	8	10	30	52	16	14	362
55-59 years	36	33	25	28	27	30	9	3	23	40	14	15	283
60-64 years	28	37	27	29	19	32	9	3	22	20	6	13	245
65-69 years	31	26	12	21	19	20	5	4	19	14	7	7	185
70 years and over	52	54	42	38	51	47	8	9	30	27	16	15	389
Unascertained	17	13	9		3	17	6	1	20	15	7	13	121
Totals	555	637	523	499	392	495	276	168	491	645	222	276	5,179

TABLE No. 6.

Degree of Education of First Admissions for the Biennial Period Ended June 30, 1922.

Education	Stockton		Napa		Agnews		Mendocino		Southern California		Norwalk		Total
	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	
Illiterate	34	55	46	41	14	13	11	8	30	28	12	12	304
Reads and writes	49	52	44	42	16	19	89	65	16	30	30	38	490
Common school	400	443	343	332	238	306	133	68	294	385	118	142	3,202
High school	14	27	43	52	34	59	13	7	48	87	33	26	423
College	8	12	30	24	19	12	8	7	36	57	12	8	233
Unascertained	50	48	17	8	71	106	22	13	67	58	17	50	527
Totals	555	637	523	499	392	495	276	168	491	645	222	276	5,179

TABLE No. 7.

Environment of First Admissions for the Biennial Period Ended June 30, 1922.

Environment	Stockton		Napa		Agnews		Mendocino		Southern California		Norwalk		Total
	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	
Urban	321	371	436	398	224	362	192	125	367	477	147	229	3,649
Rural	147	180	87	99	135	115	79	41	105	85	51	26	1,150
Unascertained	87	86		2	33	18	5	2	19	83	24	21	380
Totals	555	637	523	499	392	495	276	168	491	645	222	276	5,179

TABLE No. 8.

Economic Condition of First Admissions for the Biennial Period Ended June 30, 1922.

Economic condition	Stockton		Napa		Agnews		Mendocino		Southern California		Norwalk		Total
	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	
Dependent	15	61	37	98	195	171	91	78	43	61	108	119	1,077
Marginal	516	503	261	236	138	134			370	441	56	114	2,789
Comfortable		10	225	157	24	167	185	89	48	103	30	25	1,093
Unascertained	24	63		8	35	3		1	30	40	28	18	220
Totals	555	637	523	499	392	495	276	168	491	645	222	276	5,179

TABLE No. 9.

Use of Alcohol by First Admissions for the Biennial Period Ended June 30, 1922.

Alcoholic addiction	Stockton		Napa		Agnews		Mendocino		Southern California		Norwalk		Total
	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	
Abstinent	134	181	226	202	227	274	47	33	209	266	82	136	2,008
Temperate	175	271	159	190	51	97	159	85	46	73	70	50	1,432
Intemperate	75	77	116	95	44	40	54	39	62	103	21	41	767
Unascertained	171	108	22	12	70	84	16	11	174	203	43	55	972
Totals	555	637	523	499	392	495	276	168	491	645	222	276	5,179

TABLE No. 10.

Marital Condition of First Admissions for the Biennial Period Ended June 30, 1922.

Marital condition	Stockton		Napa		Agnews		Mendocino		Southern California		Norwalk		Total
	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	
Single	228	287	227	216	150	185	181	108	182	237	87	109	2,197
Married	217	228	198	194	162	218	62	41	201	263	97	114	1,995
Widowed	50	56	54	52	47	53	13	6	49	53	19	25	477
Separated	10	12	12	12	2	2	2	1	7	25	4	4	93
Divorced	23	26	17	17	22	19	15	9	30	46	9	2	235
Unascertained	27	28	15	8	9	18	3	3	22	21	6	22	182
Totals	555	637	523	499	392	495	276	168	491	645	222	276	5,179

TABLE No. 11.

Psychoses of Readmissions for the Biennial Period Ended June 30, 1922.

Psychoses	Stockton		Napa		Agnews		Mendocino		Southern California		Norwalk		Total
	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	
umatic psychoses				1	3	2							6
ile psychoses	2	2	4	3	3		1		2	12	4	4	37
choses with cerebral arteriosclerosis	11	4	1	3	3	2			1	2			27
eral paralysis	4	4	6	8	7	7	1		7	9	4	6	63
choses with cerebral syphilis	1												1
choses with Huntington's chorea													
choses with brain tumor													
choses with other brain or nervous diseases		1											1
oholic psychoses	7	7	9	8	1	4	3		3	4		2	48
choses due to drugs and other exogenous toxins		1			1					1			3
choses with pellagra		1											1
choses with other somatic diseases	4		1				1		2	3			11
nic-depressive psychoses	46	36	54	45	48	45	21	10	56	61	12	23	457
olution melancholia		3		1	5	5	1				2	2	19
mentia praecox	47	51	35	48	43	46	17	13	42	31	19	34	426
ranoia and paranoic conditions			8	2	2	6	1		1			1	21
ileptic psychoses	1	1	6	4	1	6	1		2	3	1	2	28
ychoneurose and neuroses		1	3	7	3	5	2						21
ychoses with constitutional psychopathic inferiority	10	3	2	1	1		2	2		1			22
ychoses with mental deficiency	5	2	2	3	4		5	2	10	3	1	3	40
diagnosed psychoses		9			3	10							22
t insane:													
. Epilepsy without psychoses			1			1							2
. Alcoholism without psychoses	2			1						3			6
. Drug addiction without psychoses		1		1		2		1		4			9
d. Constitutional psychopathic inferiority without psychoses			1	2		3	1	1					8
e. Mental deficiency without psychoses	1		1		1		3	4			1		11
. Others	1	2			1			1			3	2	10
Totals	142	129	135	138	130	144	60	34	126	137	46	79	1,300

TABLE No. 12.

Causes of Death of Patients During the Biennial Period Ended June 30, 1922.

Cause of death	Stockton		Napa		Agnews		Mendocino		Southern California		Norwalk		Total
	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	
eral diseases:													
typhoid fever													
malaria													
smallpox													
measles													
scarlet fever													
diphtheria					1								1
influenza										11	1		12
dysentery													
erysipelas		1		1	1	1							4
septicemia	1	1	1	1	2	2							8
phlegmon		1		1	2								4
acute articular rheumatism													
tuberculosis of lungs	51	48	26	14	11	9	9	5	7	22	9	4	215
other forms of tuberculosis	9	2		1		1		1		1	1	1	17
syphilis (non-nervous forms)													
cancer	2	2	2	1	1	6	2	1	1	4			25
tumor (non-cancerous)		1		1									2
diabetes			1		1	1		1		1			5
other general diseases	3	1		6		2	1			1		1	15
nervous system:													
cerebro-spinal meningitis													
diseases of spinal cord								1		1			2
apoplexy (cerebral hemorrhage)	16	35	6	7	18	15	3	3	20	12	2	2	139
general paralysis of insane	55	69	55	47	45	55	28	29	56	75	27	46	578
cerebro-spinal syphilis		7	3					1	1				12
exhaustion from other mental diseases	9	8	4	1	9	11	1			1	32	33	109
brain tumor		1		1						1	1		4
other diseases of brain	2				2	2				4			10
epilepsy	7	7		4	4	9	2		5	5	2	5	50
chorea	1					1				2			4
other diseases of nervous system	1	1			1	1					1	1	6
circulatory system:													
pericarditis													
endocarditis and myocarditis	19	18	31	44	6	24	8	4	42	32	3	2	233
angina pectoris													

her diseases of the heart														
erlosclerosis	52	74	19	24	28	64	10	10	3	4	3	2	293
her diseases of the arteries		3						1		3			7
her diseases of circulatory system			17	1	4		2	2		5		2	33
iratory system:													
onchitis													
onchopneumonia	16	21	15	19	7	3	1	2	3	4	2	3	99
bar pneumonia	5	3	6	14		6	7	10		5	3	1	60
eurisy			1										1
thma													
ngrene of lungs		1											1
her diseases of the respiratory system			1									1	2
stive system:													
er of stomach				1									1
her diseases of the stomach (cancer excepted)			1			1							2
arrhea and enteritis			1	4	7				2	2			16
pendicitis and typhlitis						3							3
rnia and intestinal obstruction						1	2						3
her diseases of intestines	1			2						1	2		6
rrhosis of liver	2								1				3
her diseases of liver				2					1	2			5
her diseases of digestive system (cancer and tuberculosis excepted)		2						1				1	4
to-urinary system:													
ute nephritis	1	3	2	1			1	1	1				10
ronic nephritis	15	11	1	5	6		3	2	3	7		2	55
her diseases of kidneys and annexa						7							7
seases of bladder	2			1					1				4
seases of genital organs													
her diseases of genito-urinary system													
ases of the skin:													
ngrene		2						1					3
her diseases of the skin										1			1
ases of bones and locomotor system (tuberculosis and rheumatism excepted)													
ence:													
icide	3	2	3	1	2			5	3	2		1	22
cidental poisoning						2							2
cidental traumatism									1				1
omicide													
her external violence		1			2	1		1	1	3			9
Totals	273	329	196	205	163	228	80	73	152	212	89	108	2,108

TABLE No. 13.

Duration of Hospital Life of Patients Dying During the Biennial Period Ended June 30, 1922.

Duration of hospital life	Stockton		Napa		Agnews		Mendocino		Southern California		Norwalk		Totals
	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	
Less than 1 month	30	66	24	31	31	37	7	5	20	25	16	34	326
1–3 months	43	36	41	18	26	50	9	6	24	26	25	12	316
4–7 months	28	29	18	33	18	22	6	8	14	24	10	10	220
8–12 months	16	21	18	16	9	13	9	7	10	15	10	5	149
1–2 years	66	64	35	36	32	48	15	16	31	42	20	31	436
3–4 years	26	28	20	17	15	16	8	4	21	19	7	10	191
5–6 years	15	17	8	12	9	9	4	5	11	17	1	6	114
7–8 years	6	12	2	7	5	6	4	4	3	13	.....	.....	62
9–10 years	8	9	2	5	5	4	4	2	6	7	.....	.....	52
11–12 years	9	6	1	4	1	2	2	4	3	3	.....	.....	35
13–14 years	5	4	4	3	3	.....	3	2	3	5	.....	.....	32
15–19 years	1	11	8	6	4	1	3	2	3	7	.....	.....	49
20 years and over	20	26	15	17	5	17	6	8	3	9	.....	.....	126
Totals	273	329	196	205	163	228	80	73	152	212	89	108	2,108

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